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The Bioarchaeology of Societal Collapse and Regeneration in Ancient Peru

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For Richard, Allyn, and Jaclyn Kurin
and for Manuel—tusukuy sonqomi kuyayki

Foreword

This engaging and important volume on the bioarchaeology of societal collapse and regeneration in ancient Peru has information that will be of interest to anyone hoping to understand continuity in cultures over the long arc of time. Additionally, this study informs us on how individuals and groups weather governmental collapse and possible apocalypse with rebirth built on innovation, reinvention of identities, and rebirth of alliances and new polities. Using a rich and diverse bioarchaeological data set from the Andean Highlands, the author takes a close and careful look at how people on the ground as well as groups at the population level were impacted by the collapse of their state. More importantly, this study looks at how cultures can be transformed, reconfigured, and regenerated in the aftermath of collapse.

One of the hallmarks of the new bioarchaeology is the ability to draw on multiple lines of evidence to build robust interpretive frameworks. In this case, skeletal data is but one line of evidence. Additional data is drawn from ethnohistory, archaeology, and biogeochemistry. In this way, a nuanced picture emerges around several key areas of interest: ethno-social identities, the use of direct and performative violence, technological innovations, patterns of migration, and changes in demography, health, and diet.

Using the collapse of the Wari empire around AD 950 as the starting point, this study follows the Chanka society among other smaller groups that emerged during this time in a region referred to as Andahuaylas in Peru's central highlands. This study demonstrates with an astounding amount of empirical data the kinds of changes that were wrought in the aftermath of the Wari collapse. For example, mortuary practices shifted with smaller, less showy grave goods, and signs of feasting and continued interactions over time between the living descendants and their dead ancestors were emphasized.

Biological indicators of genetic relationships among and between groups after collapse seem to support a decreased gene flow, but not population replacement. However, those working in the nearby salt mines show more biologically disparate groups. Isotopic data suggests that the groups stayed largely homogeneous, except for the possibility of foreign female captives and males who immigrated into the area who might have been a welcome influx of manpower for defense and other tasks.

The study goes on to demonstrate how the collapse of empires can be the beginning of new ethnic identities (ethnogenesis). Using cranial modification as one signal of ethnic identity, we see that cranial modification became widespread after collapse as a way to emphasize within and between group boundaries. But all was not well in these reconstituting groups within and between their kinship-based and place-based alliances and formulations. At the same time, violence increased in the form of lethal cranial fractures seen on young adults and juveniles, a surprise finding. And females were also experiencing increased violence in the form of domestic abuse and raids. Thus, the author points out that what we see simultaneously is both ethnogenesis and ethnocide, and she sees these as strongly tethered processes. As the author suggests, groups formerly defined and bound by state notions of alliances and enemies now became groups united by residence, kinship, and ethnic affiliations. But this new configuration came at a cost: stepped up acts of violence.

What makes this study so powerful is the strong application of social theory at every step of the analyses so that complex ideas surrounding violence, gender, identity, kinship, alliance-making, and subsistence are interpreted within compelling theoretical lenses having to do with where power is located and how it is manifested and used in the aftermath of collapse. The author does not ask simple questions such as why was there violence or who was doing the killing. She frames a much better set of questions to explore involving the asking about who benefits from the use of violence and how does violence facilitate the production and reproduction of power structures.

This study reads often like a complex historical novel set over many generations, with factions using all of their resources and wits to find creative ways of formulating their new post-collapse reality and survival after generations of being subjects of the Wari empire. The complexity and nuance brought to the multiple levels of analysis is innovative, compelling, and important. This bioarchaeology of collapse sets an important research agenda for how to bridge complex social theory, innumerable data sets, and the varieties of human agency into a cohesive analytical framework that sheds light explanations about human behavior. This is both bioarchaeology *and* anthropology at its best.

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Molina, Guni Monteagudo, Marco Antonio Naverros, Steph Peña, Socorro Quispe, Yanet Quispe, Daniel Segura, and Antonio Vasquez and the entire Gómez clan have become family. I'm also grateful to collaborators Dr. Christine Pink, who evaluated biological affinities within the entire skeletal population, and Valda Black, who directed the 3D digitization of crania for morphometric assessment. Ellen Lofaro prepped our dental samples for isotopic analysis, Davette Gadison helped classify cranial lesions, and Sarah Jolly and Anna Gurevitz coauthored our project codebook while examining thousands of bones. Scotti Norman, Kassie Sugimoto, and Diana Ochoa simultaneously managed field operations and conducted advanced field research. Our plunge into biogeochemistry—and the very completion of this manuscript—is due to KurinLab members including Ema Angeles, Laura Billard, Rhian Dunn, Katrina Elkins, Charleigh Grenade, Hari Kota, Ashleigh Lopes, Julianna Santillan, and Clayton Tyler. Scholars Heather Simpson and Allison Adelman assisted with proofreading.

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About the Author

Danielle S. Kurin Dr. Kurin serves as an assistant professor of anthropology and director of the PL Walker Bioarchaeology and Biogeochemistry Laboratory at the University of California, Santa Barbara. A broadly trained anthropological bioarchaeologist, she earned her A.B. from Bryn Mawr College (2005) and her Ph.D. from Vanderbilt University (2012). Kurin currently leads the Andahuaylas Bioarchaeology Project, a multidisciplinary field program in south-central Peru supported by institutions such as the University of California, the National Science Foundation, and the Fulbright program, among others. An award-winning teacher-scholar, Kurin has authored high-impact publications in English, Spanish, and Quechua and has advised scores of student researchers from both North and South America. She also dedicates her services to local and international authorities in cases of forensic human identification. While Kurin often lectures at universities, museums, and other professional events in the United States and abroad, she regularly engages with more popular outlets such as *National Public Radio*, *TV Peru*, and the *LA Times*.

Chapter 1
Societal Collapse and Reorganization

This book investigates how state collapse and social reorganization impacts human bodies, from the level of individual molecules, up to the scale of entire archaeological populations. One only has to observe contemporary studies of "state failure" to intuit that the disaggregation of complex societies can have significant biological, social, and cultural implications for the people who emerge from such transformations. As society is reconfigured, communities, groups of people therein, and individual human bodies are both conceptually and physically altered. Using the collapse of an archaic Andean empire and the societies that emerged post-collapse as a case study, this research comprehensively evaluates the nature of shifts in several key domains that would have been profoundly affected by the fragmentation of a once expansive and seemingly timeless empire. Osteological, ethnohistoric, archaeological, and bio-geochemical methods are employed to test hypotheses related to mortuary practices and community organization, ethno-social identity, violence, technical innovations, migration, health, and diet.

Perhaps most notably, state collapse can dramatically alter how people physically interact with one another. Social science scholarship across disciplines, from anthropology to sociology and political science, has observed that those who experience state disintergration first hand bear witness to persistent, recurring violence, ranging from interpersonal brawls to outright war (see McAnany and Yoffee 2010; Schwartz 2006; Tainter 1988). So too, state collapse can also spur striking yet stalwart reformulations of group identity; that is, how people conceive of and represent themselves and others. Finally, tempestuous times are known to generate novel migratory practices, new types of social inequality, dietary and health shifts, and pioneering technical procedures to cope with new, unique challenges.

Be they migrations across the landscape, specialized innovations, experiences of violence, or the embodiment of reformulated identities, the attendant phenomena of state collapse may be experienced differently by different groups of people.

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Imperial fragmentation in particular can create social repercussions such that some segments within a population are specifically targeted and thus disproportionately predisposed to becoming victims of deprivation and physical assault (see Brubaker and Laitin 1998; Hinton 2002; Gould 1999; Boskovic 2005; Talbot 1995).

Conceptualizing Collapse

Anthropologists tend to view *collapse* as a process which entails the decline or dramatic reordering of institutions, infrastructure, and administration necessary to the functioning of complex polities, such as states and empires (sensu Eisenstadt 1964). By extension, collapse also entails the disintegration of political hierarchies. Systems of ranking, management, and succession are invalidated as the ideological basis of leadership crumbles (Tainter 1988). When leaders can no longer convincingly evangelize, pilgrims forsake sacred sites, and associated iconography is abandoned or destroyed (Janusek 2004). In short, people are no longer united by shared beliefs. Concomitant social transformation can occur as whole classes of people cease to exist, including professional soldiers, bureaucrats, intermediate elites, craft specialists, and religious personnel. In archaic states, social, political, economic, and ideological systems are so tightly imbricated that the disaggregation of one institution contributes to the instability and fragmentation of others.

Many scholars suggest an underlying cause of collapse is due to environmental changes (see Diamond 2005), be they cataclysmic natural disasters, or sustained, detrimental climate shifts. But cultural factors play an equally important role. The seeds of state collapse are usually sewn by decision-makers in the face of novel challenges. Although one could convincingly argue that ancient peoples were defenseless against, and dependent on the environment, it is more often the mismanagement of climate-sensitive economic resources and not necessarily changes in net production, which weaken political hierarchies. The disintegration of traditional modes of production and the demise of systems of transport and communication (e.g., roads) further inhibit intra- and interregional economic production and movement (Dillehay and Kolata 2004). Without the hierarchical administration of goods, imperial infrastructures cannot be maintained and systems of redistribution are predisposed to fall back on communal or kin-based organization (Tainter 1988). Group identities are profoundly altered or newly created following state fragmentation, because at even the most basic level, people can no longer define themselves vis-à-vis the state.

Sociopolitical systems that emerge following the decline of an empire tend to be radically different in their organization. Nevertheless, vestiges of more ancient traditions resolutely linger on. Our job as anthropologists is to tease out those remnants in order to better understand how novel iterations of society come to fruition, and how human lifeways are impacted by such processes, even if they occur in the prehistoric past.

Wari Collapse and Chanka and Quichua Society in Andahuaylas

For 400 years during an era archaeologists call the Middle Horizon [MH], a perplexingly complex and sophisticated empire known today as Wari thrived in Peru's central highlands. For reasons still unclear, Wari imperial authority and its attendant infrastructure began to crumble around AD 1000. A century later, the empire was gone. The subsequent era, a time in Andean history unspectacularly referred to as the Late Intermediate Period, or LIP, was characterized by abrupt and widespread changes in settlement and subsistence patterns and increasing conflict and isolation (Arkush and Tung 2013; Covey 2008).

Following Wari collapse, the Chanka Society – among other small groups – emerged as a formidable and distinctive presence in a region known as Andahuaylas, translated from Quechua as, "the prairie of the copper-colored clouds"(Fig. 1.1) (Markham 1871; Bauer et al. 2010). Scholars have generally characterized societies in this region as independent polities based on complementary ranked moieties, called *hanan* (the upper moiety) and *hurin* (the lower moiety). Each moiety was composed of an amalgam of nested social units called *ayllus*. This slippery and often unwieldy social unit defies a single definition. Members of the same *ayllu* tend to maintain common landholdings, communal burial crypts, and descent from a common ancestor reified by the bonds of real and imagined kinship (Salomon 1995; Isbell 1997). Within Andahuaylas, early Colonial documents attest that members of the same *ayllu* shared a common language, dress, and belief system, among other collective practices of affiliation (see Hostnig et al. 2007). Spatial dimensions also define and delimit Andean social units. Because *ayllus* are bound to certain territories (Julien 2002), they can be geographically distinguished to some extent in terms of residence and burial.

However, archaeological characterizations of the *ayllus* that consolidated during the post-collapse era remain enigmatic. While common architectural features and ceramic forms suggest that dispersed groups in Andahuaylas shared cultural practices and a sense of common affiliation, evidence of regional hierarchy is conspicuously absent; settlements lack public storage buildings, iconography denoting a state religion, and administrative and elite architecture (Bauer et al. 2010; Kellett 2010). To archaeologists, these patterns signal a "flattening" of status differences between people. A great spackling of impressive hill- and ridge-top settlements built and occupied in Andahuaylas between AD 1000 and 1100 consist of defensive features like walls, ditches, precipices on three sides, and lookouts. Caches of used, functional weaponry, including mace heads and sling stones, are ubiquitous at archaeological sites (Gomez Choque 2009). These material signatures point to pressing concerns regarding community defense against periodic but persistent assualts by enemy groups.

So too, local ethnohistoric sources indicate fierce competition among different *ayllu* factions in the centuries succeding Wari fragmentation. The bounty included water springs, agricultural fields, and pastoral territory. Control and use-

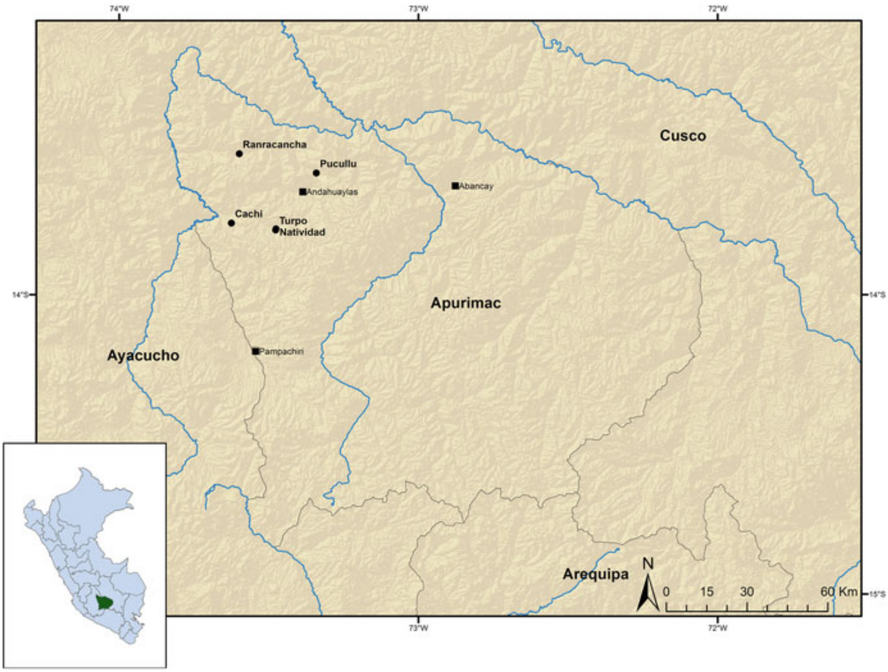

Fig. 1.1 Archaeological sites in the Andahuaylas region of Apurimac, Peru (map by Scotti Norman)

rights were assumed or renegotiated by force. *Ayllu* leaders dispossessed rivals by, "pulling crops from the root and slinging stones" (Hostnig et al. 2007 [1612]: 491). Combatants were known to enthusiastically and gleefully crack the skulls of their enemies with war clubs. The corpses of the vanquished were skinned, set, and ultimately transformed into war drums, whose deafening and distinctive beat would ominously announce an imminent military engagement(Montesinos 1920 [1642]).

In the early 1400s, Andahuaylas' largest and fiercest group, called the Chanka, suffered an epic military defeat against the Inca, a seminal event that marks the coalescence of the Inca Empire (ca. AD 1400–1532). The decimation of the Chanka is often attributed to a strategic alliance between the Inca and another cultural group in Andahuaylas known as the Quichua. Prior to the Inca-Chanka War, the Quichua maintained small enclaves throughout the province and an uneasy detente with their Chanka neighbors (see Betanzos 1996 [1551]).

Although historic portrayals of Andahuaylan communites purport to accurately highlight the rise of capriciously bellicose societies in the aftermath of Wari collapse, these incomplete and tendentious accounts should be digested with a healthy dose of skepticism. For crucial questions remain: How did Wari collapse restructure subsequent populations in Andahuaylas? And what were the biological and cultural consequences of this transformation?

Key corollary inquiries will help structure and approach this research quandary.

- Did the disintegration of Wari ideology spur novel mortuary traditions in Andahuaylas? What was the basis of mortuary collectivity in Andahuaylas?
- Did the disintegration of Wari social and political hierarchies instigate reformulations of group identity, as determined through practices of affiliation which permanently altered the body?
- Did Wari sociopolitical fragmentation lead to an increase in violence during the subsequent era? If so, was violence indiscriminate and haphazard, or were certain age, sex, cultural, or ethnic group disproportionately victimized?
- Was the era following Wari collapse a time of technical stagnation, or is there evidence of technological and methodological innovations developed to confront novel challenges?
- How did Wari collapse impact patterns of migration and transhumance? Did Wari fragmentation cause mass migrations in Andahuaylas or rather the more limited movement of subpopulation groups across the landscape?
- How did Wari disintegration impact health and diet? Did certain dietary staples like maize become scarce? Did consumptive practices change from imperial to postimperial times? Was the health of specific communities or subpopulation group more negatively impacted than others?

We can answer these questions through the punctilious assessment of skeletonized bodies belonging to people who lived and died in Andahuaylas during this tumultous period in Andean prehistory. If Wari collapse was indeed a traumatic event for local populations, then human skeletons from that era should bear the scars of these hardships on, and in, their very bones. However, if Wari fragmentation was a "nonevent" in Andahuaylas, local lifeways are expected to remain consistent between imperial and postimperial eras. This would be reflected in archaeological poulations though the manifestation of diagnostic skeletal features that do not change in frequency or intensity over time.

A Social Bioarchaeological Approach

This study employs a comprehensive social bioarchaeological approach to directly evaluate how local Andahuaylan people were impacted by societal restructuring during and after Wari imperial collapse. In this approach, human skeletal remains are the primary unit of analysis, and a person's bio-geochemical makeup and gross morphology are conceptually understood as products of synergistic social, cultural, and biophysical forces shaped by life experiences (Agarwal and Glencross 2011: 1; see also Sofaer 2006 and Tung 2012). This type of research approach marshals several distinct but complementary anthropological methods to produce comprable lines of data which can be analized and synthesized in order to systematically reconstruct the lived experiences of individuals, segments of society, and entire populations. This agenda allows investigators to more fully understand social processes in past societies

(Agarwal and Glencross 2011: 3). Because the life experiences of an individual are sedimented into their bones (Larsen 1997), analysis of human remains is the most direct way of understanding biocultural transformations in the ancient past.

Social bioarchaeological approaches are fundamentally comprehensive and synergistic. Based on both lab and fieldwork, skeletal, artifactual, bio-geochemical, ethnohistoric, and ethnographic data are incorporated within their social and environmental archaeological context. In the present study, our research design focused on the systematic recovery and excavation of Andahuaylan skeletons ($N=477$) from a Wari-era tomb and from over a dozen cave ossuaries, called *machays*, at 5 sites associated with imperial and postimperial groups. All the skeletal remains pertain to the later Middle Horizon (ca. AD 700–1000) and the subsequent early Late Intermediate Period (ca. AD 1000–1250). Skeletons from the later period derive from two infamous Andahuaylan tribes: the warlike Chanka, and the beleaguered Quichua (Cieza de Leon 1996 [1553]).

Osteological evidence is used as part of the social bioarchaeological approach in order to address a number of outstanding research questions using fairly straightforward observations corroborated by analogous associations documented in similar types of studies (Tung 2012). Standard bioarchaeological methods were used to inventory and analyze tens of thousands of ancient, fragmentary bones. The age and skeletal sex of a particular bone or skeletal element was determined based on sexually dimorphic characteristics (Brooks and Suchey 1990; Hoppa 2000; Lovejoy et al. 1985). Inferring the realtive wellbeing of ancient individuals was also a concern. To obtain a general health index, the individual bones of the skull were examined for the presence and severity of a pathology which produces sieve-like lesions, called porotic hyperostosis. The ubiquity of pin-prick sized cranial lesions within the population informs on the etiology (cause) and prevalence of disease and illuminates more general states of compromised well-being (Walker et al. 2009; Stuart-Macadam 1992; El-Najjar et al. 1976; See Buikstra and Ublaker 1994 for scoring methods). Given the strong circumstantial evidence that violence was prevalent in Andahuaylas, skeletal elements were examined for signs of trauma (Galloway 1999; Lovell 1997). The number of wounds, trauma lethality, and the location of affected areas on bone were documented. Together, these data demonstrate how wound patterning, frequency, and lethality corresponded with age, sex, social identity, and political affiliation at different sites and over time.

In order to address how individuals coped with the particular flavor of hardship wrought by state collapse, we critically assessed an invasive form of prehistoric cranial surgery, called trepanation (see Andrushko and Verano 2008). Teasing out broad trends in biological relatedness and distance before and after Wari collapse was an important avenue of inquiry which we approached through the statistical evalution of highly variable bumps and holes in the skull. These heritable morphological peculiarities are commonly referred to as either nometric or epigenetic traits. Finally, in order to elucidate patterns of diet, residential origin, and mobility, we relied on a complex series of steps in the lab to chemically release, and ultimatley quantify the unique molecular composition of key elements long-trapped within the well-preserved matrix of hard tissue. Both human teeth and bone were subjected to radiogenic strontium isotope analysis and stable carbon, nitrogen, and oxygen isotope analysis. Data gathered from human remains were correlated with AMS radiometric dates, which allowed us to interpret results within the appropriate cultural context, temporal period and geographic zone. Finally, independent variables like sex, age, polity, and social category were statistically tested against dependent variables including pathological lesion presence, isotopic values, skeletal trauma, and head shape. Variable patterns of migration, health, diet, gender, biological affinity, body modification, and mortuary practices are interrogated to better understand how the phenomena factor into the formulation of group identity and experiences of violence. Data culled from a social bioarchaeological approach are thus able to further elucidate how ancient lifeways and social organizations were renegotiated in eras emerging from tempestuous sociopolitical transformations.

Organization of the Chapters

Chapter 2 more fully interrogates the bioarchaeological consequences of state collapse and presents bioarchaeological correlates that scholars can use to test hypotheses regarding the human impacts of social fragmentation. Chapter 3 describes the environment of Andahuaylas, as gleaned through paleo-climactic data. This is followed by a discussion on the nature of Wari imperial presence and collapse in the greater south-central Andean region in general, and Andahuaylas in particular. Next, archaeological and ethnohistoric data are marshaled to summarize current understandings regarding two infamous postimperial groups that emerged in the region: the Chanka and the Quichua. In Chapter 4, we explore how community organization and population structure may be inferred from radiogenic strontium isotopic data, which inform on human migration, cranial nonmetric traits, which illuminate biological relationships, and skeletal sex and age-at-death data. Information on grave goods and mortuary rituals help reveal people's beliefs about the dead, and can illustrate the unique role that dead ancestors played in structuring the destiny of living descendants.

Chapter 5 reports on the abrupt appearance, widespread adoption, and morphological variability of an enigmatic, intentional head shaping tradition, generally referred to as cranial modification. Data are presented on when head remodeling began in Andahuaylas, and how modification correlates with variables including sex, site, and political affiliation. We will see how head reshaping developed into a prominent signifier of ethnic-like social categories for the Chanka and Quichua. The stalwart maintenance of this cultural tradition clearly and creatively demonstrates a poorly-understood but vital process of identity-formation, known as *ethnogenesis*. More generally, ethnogenesis refers to the emergence of cultural distinctions that come to prominence as novel social boundary markers.

A discussion of trauma and violence prior to, and after Wari collapse, is detailed in Chapter 6. Trauma frequencies, lethality, and distribution are compared between sites and over time. This palimpsest of patterned information is then tested against subpopulation groupings based on age, sex, and cultural affiliation. The spatial distribution of trauma throughout the entire body is evaluated so that it is possible to infer motivations for violent encounters which run the gamut from raids, ambushes, massacres, to persistent genocidal warfare.

In Chapter 7, we review how a collapse-induced violent milieu impacts the health and diet of those living in the post-collapse era. Living in any mountainous environment presents inhabitants with both unique health risks and amenities which may benefit well-being. As people moved up and down vertical Andean landscapes, they would have had uninhibited access to a range of produce. However, in the aftermath of collapse, access to crucial food staples and freshwater sources may have become more restricted. Access to nutritious food and clean water often become scarce in troubled times, and health can suffer as a consequence. Forced displacement and restricted freedom of movement further exacerbates rates of disease among the most vulnerable members of any post-collapse community. Population movements, consumptive practices, and the general well-being of local communities are explained using osteological and bio-geochemical evidence. Data from stable isotope studies clearly reveal that disparities existed in terms of consumptive practices. Finally, where people live and what people eat can impact their health. With this in mind, results derived from analysis of pathological cranial lesions are presented in order to reconstruct individual, group, and population-level health profiles. The chapter concludes with an interpretation and summary of results.

Chapter 8 reports on the use and success of prehistoric cranial surgery in Andahuaylas. This innovative medico-cultural procedure articulated with emic beliefs concerning invasive treatments on bodies sickened directly or indirectly by the ravages of tumult and instability. Trepanation frequency, cutting methods, technical standardization, and survival rates are explored. Startling evidence of perioperative procedures and experimentation on corpses further reveal the inherent, grave solemnity of these seemingly primitive operations. Careful attention to trepantion traditions thus provide a means of gauguing how local conceptions of illness and well-being were transformed in the aftermath of the Wari Empire.

Chapter 9 concludes with a summary of the findings. Overall, this study aims to demonstrate that migration and inequality, the nature of violent interactions, and the boundaries that defined ethnic-like groups were drastically, but variably, transformed by the aftershocks of imperial disintegration and sociopolitical upheaval in the ancient Andes.

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Chapter 2
Theorizing and Operationalizing a Bioarchaeology of Societal Collapse and Reorganization

Archaeological inquiry has recently focused on understanding what state collapse practically entails and why it occurs (Tainter 1988; Schwartz and Nichols 2006; McAnany and Yoffee 2010). State fragmentation has historically been attributed to a host of factors, from invading hordes, to bacchanalian decadence and mismanagement, to environmental calamity or even the wrath of an unforgiving deity (see Diamond 2005). Yet, despite intriguing avenues of inquiry by anthropologists, sociologists, and political scientists on predicting why or anticipating when an empire may decline or a state may "fail," an important question remains: how does sociopolitical fragmentation restructure local populations?

This chapter evaluates how societies reorganize in the aftermath of state collapse. The research introduces bioarchaeological correlates which can be used to determine how individuals, groups within the population, and entire regions may have been variably impacted by sociopolitical fragmentation. We focus on five domains that tend to be dramatically restructured in postimperial eras: (1) community organization; (2) migration; (3) social identity; (4) violence; (5) health and diet; and (6) technical innovation.

Collapse and Reorganization

Located in the mountain highlands of central Peru, an enigmatic society known as Wari emerged to become the first empire in the Americas, and amongst the most expansive (Schreiber 1992). Empires and states (the term is interchangeable here) are political systems composed of a centralized authority that rules over a large noncontiguous territory and integrates diverse ethnic groups. Material infrastructure and systems of tribute and redistribution are also characteristic. In the archaeological past, these complex polities may be identified through rank-site hierarchies of first- through fourth-order sites, from capitals and regional centers, to colonial

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outposts, and finally local villages (Isbell and Schreiber 1978). States also invest in infrastructure, from roads and storage units to military garrisons. Iconography denoting a state religion is usually prevalent in both heart and hinterland. Finally, material signs of social differentiation and inequality are usually present. This differentiation may be reflected horizontally (e.g., artifacts denoting different occupations) and vertically (e.g., the variable quality of artifacts possessed by royals, elites, intermediate elites, and commoners) (Schreiber 1992; Tung and Cook 2006).

Hollywood movies aside, collapse is not a finite apocalyptic event, but rather a process of social and political reorganization. When an empire collapses, people still exist, and underlying institutions – or vestiges thereof – may survive and stabilize at lower levels of differentiation (Nichols and Weber 2006: 38; Eisenstadt 1964: 378–379). As communities become unburdened from tribute requirements, people upend from state-related labor commitments (Morris 2006). Provinces are restructured, reorganized, and recuperated, and traditional ways of life may reemerge to provide security and a foundation on which to build a new political system (Conlee and Schreiber 2006: 100).

Even so, the cultural tropes from previously existing states can limit the range of responses available when postimperial populations are confronted with new or reemerging circumstances or challenges. In some cases, like Moquegua, in southern Peru, state incursion inhibited the political and economic expansion of local postimperial groups (Sims 2006). When Wari and Tiwanaku – another highland state centered near Lake Titicaca in Bolivia, retreated from the province, overarching administration disappeared, leaving unemployed middle-managers behind without state direction and oversight, as well as local elites ill-equipped for statecraft and administration (Sims 2006: 120). The lack of reemerging centralization in Andahuaylas suggests a similar scenario might have been taking place there as well.

Although collapse is viewed as an inherently volatile process, the actual degree of instability in a region will vary depending on how it articulated with the former state, and what local people thought of external control. Wari managed the vast majority of its territory without direct administration, a case of what archaeologist Alan Kolata (2006: 14, 215) calls, "hegemony without sovereignty." Ancient material residues indicate that imperial control was applied through the tactical use of coercion and force, as well as conspicuous demonstrations of cultural superiority. Even if Wari administrators were sequestered in walled outposts far away, and even if interactions were prosaic or periodic, local peoples likely became complicit in their own subjugation; foreign ideals became embedded in local thought and practice, transforming interpersonal relationships and senses of individual and group identity. This process produced strategic subjects, and not necessarily committed citizens (*ibid*, 2006: 215).

The Biocultural Impacts of Collapse

In areas where an empire's presence existed as an extractive relationship, and not an integrative relationship, the fissures of collapse likely generated novel institutions, innovative social practices, and new forms of historical consciousness

(Kolata 2006: 219). The process of collapse is composed of a series of transformative sociopolitical, economic, ideological, and cultural processes, which can impact local populations biologically and leave permanent morphological changes on bone. Using the human skeletonized as the primary unit of analysis, the following sections detail how imperial collapse not only causes major transformations in how people represent and interact with one another, but how it subtly impacts the more mundane activities of daily life (Tung 2012: 3).

Mortuary Practices and Social Structure

Funerary contexts are structured by the beliefs and practices the living have about death and the dead (Chesson 2001; Carr 1995; Dillehay 1995; Metcalf and Huntington 1991). In cases of state collapse, mortuary beliefs based on imperial ideologies tend to disintegrate as peoples' ideas about life and death are fundamentally altered (Schiller 2001). Consequently, burial culture may be dramatically transformed.

The most common Andean highland mortuary practice was collective internment in burial caves known as *machays*. Most of our knowledge concerning the demographic and social composition of burial caves comes by way of ethnohistory and the work of funerary archaeologists (Dillehay 1995; Salomon 1995; Cieza de Leon 1996 [1553]; Rossi et al. 2002; Doyle 1988; Duviols 1986; Parssinen 1993; Hyslop 1977; Mantha 2009). Yet scholars still debate the cultural function of *machays* and the social principles that structured collective inhumation. If *machays* are being used as mass graves, we may expect a large number of war casualties (young adult males) or massacred individuals (wounded individuals of all ages) (Willey and Emerson 1993) to be unceremoniously and haphazardly deposited in caves. Few grave goods would be expected, and there would be no evidence of postdepositional feasting or offerings.

Other scholars contend that the bones in *machays* represent dead apical (first-buried) ancestors (see Dillehay 1995; Salomon 1995; Doyle 1988; Duviols 1986; Harris 1982). These mummies, termed *mallquis*, were recognized, remembered, and venerated by descendants. If *machays* in Andahuaylas were only used to inhume elite ancestors and lineage heads, then we might expect sophisticated mummification or body curation practices, caches of sumptuary grave goods, and evidence of frequent feasting and feting by devoted descendants.

Displacement, Migration, and Mobility

State collapse can spur striking changes in where people may reside. Perhaps most fundamentally, collapse may cause entire groups of people to perish or become permanently displaced. This is an especially important theme in the ancient Andes.

Ethnohistoric sources postulate that the Chanka people migrated *en masse* from Huancavelica around the time of Wari collapse to the Valley of Andahuaylas, where they conquered and relegated the resident Quichua population into enclave communities (Cieza de Leon 1996 [1553]; Betanzos 2004 [1557]; Sarmiento de Gamboa 2007 [1572]; Poma de Ayala 2006 [1616]; Markham 1871; Lafone Quevedo 1913; Navarro de Aguila 1939; Lumbreras 1959; Ravines 1980; Huerta Vallejos 1990; Gonzalez Carre 1992; Rosworowski 2001). Mass migrations were not just interprovincial. Settlement survey data from the Middle Horizon imperial capitals at Huari and Tiwanaku both demonstrate clear out-migrations from the core into the surrounding periphery (Schreiber 1992; Albarracin-Jordan 1996). If mass migrations were common after Wari collapse, we would expect Chanka and Quichua society to be composed of first-generation migrants who do not show any sort of genetic continuity or affinity with the imperial era (Gonzalez Carre and Bragayrac Davila 1986; Gutierrez Velasco 1999; Lumbreras 1974, Montesinos 1920 [1642]; Moseley 1999; Perez et al. 2003; Ramos Gomez 2002; Vivanco 2005).

This population replacement model can be tested utilizing multivariate analyses of cranial nonmetric traits. In nonmetric analysis, observed shared phenotypic characteristics are used as a proxy for shared genotype and thus biological affinity. Genetic relatedness in skeletal populations can be measured through a comparison of traits that are strongly genetically controlled and generally unaffected by extrasomatic cultural or environmental changes (Turner et al. 1991; White 1996; Rhode and Arriaza 2006; Cheverud et al. 1979; Pink and Kurin 2011).

In this study, multivariate analysis and cluster analysis of amalgamated nonmetric trait data are marshaled to assess the relative genetic distance of different burial populations and help clarify migration trends at the population level (Papa and Perez 2007; Hauser and DeStefano 1989; Hanihara 2008; Hallgrimsson et al. 2005; Fabra et al. 2007; Sutter and Verano 2007). Increasing insulation in Andahuaylas after Wari collapse would be reflected by a decrease in gene flow. The biological reality of Chanka and Quichua endogamy would be reflected by significant genetic distance between those groups (see Sutter 2005)

While nonmetric data allow us to examine population movement on a large scale, bio-geochemistry allows us to trace the movement of individuals, and by extension, subpopulation groups. A large, diverse body of scholarship has reported on how individuals and/or social groups move about the landscape in the aftermath of natural and social disasters. For instance, research from the Old World suggests that the *Barbaricum* migrations were not composed of invading hordes responsible for the fall of the Western Roman Empire; rather Rome's decline spurred mass population movements of *Barbaricum* people (Halsall 2008: 37).

Rome is an exemplary case of state collapse provoking forced migration (or more precisely, displacement) (see also Patrick 2005). Often, this displacement is permanent. In modern Peru (1980–2000), only 20 % of more than 600,000 displaced people returned to their previolence homes when the civil war there finally ended (CVR 2003). These refugees (over 97 % of whom spoke Quechua as their first language) tended to migrate to provincial capitals and Lima where they had distant kin or *compadres* and could easily reforge social bonds (Skar 1994).

Almost all (99.4 %) migrants cited the threat of violence as the prime motivation for moving out of a *comunidad.* Given that in Apurimac, 52.3 % (192/368) of all indigenous communities were impacted by conflict over a 20-year period, local peoples' fear of violence appears to be justified (PROMUDEH 2001: 186).

Despite a seemingly chaotic milieu, research has shown that in eras following collapse, patterns of mobility are not haphazard but rather quite predictable. For instance, during the recent 2010 earthquake in Port au Prince, Haiti, the population of the capital city dropped 23 % in the weeks and months after the disaster. Post-quake destinations of fleeing Port-au-Princians correlated with normal mobility patterns structured by social bonds (Lu et al. 2012). Together, the Haiti earthquake and Peru civil war data reveal an important factor in disaster-motivated migration: people fled to areas where they had already formed social connections. Was this also the case in postimperial Andahuaylas? If there is indeed evidence of in-migration in Andahuaylas, then who might these foreigners be?

Isotopic studies can be used to illuminate patterns of paleo-mobility on the individual level. This study examines strontium and isotope signatures culled from archaeological human dental enamel. These isotopes can be used to "source" remains to a geologic area, and thus determine residential origin. Although it travels up the food chain, the ratio of $^{87}Sr/^{86}Sr$ measured in human dental enamel ultimately reflects the ratios present in the bedrock of a geologic or geographic area (Knudson and Price 2007). Assuming an individual consumed locally produced foods, signatures in the teeth will reflect the biologically available strontium in the geologic region in which an individual lived during the formation of those teeth.

Ethnogenesis and the Formation of Novel Identities

In postimperial eras, ethnic-like groups are often created or reformulated in response to changed political boundaries (Fearon 2009: 4; Horowitz 1985; Reycraft 2005: 5). This process of dramatic restructuring is known as ethnogenesis. Ethnogenesis can be operationalized through the sudden and widespread appearance of novel traditions, which come to prominence as social boundary-markers.

But this process does not exist in a vacuum. Postimperial social reorganization relies on the widespread acquisition of power by a newly significant groups, and the use of real or feigned ethnic, or ethnic-like, affiliations (Nichols and Weber 2006: 41). Evidence from ancient Peru suggests that newly crafted political systems tend to consist of leaders who maintained power accrued during the imperial era, as well as those emerging elites who take advantage of the situation to consolidate power and legitimize authority. For instance, after Wari collapse in the Nazca region of southern Peru, rituals closely associated with the former empire were abandoned (Conlee and Schreiber 2006: 109). Subsequently, a new power structure afforded individuals from different swaths of society to consolidate political power. Postimperial intrasite differences suddenly began to show material signs of increasing inequality, and also a greater number of elites (*ibid*: 112). Nonelite behaviors were also altered as new forms of sociopolitical organization were developed. In Andahuaylas, Wari's collapse may have facilitated the development of factions and novel ethnic-like groups. Leaders of these factions may have accumulated and maintained power through tactics like controlling mineral extraction, engaging in communal and exclusive rituals involving dead ancestors, and probably warfare.

If ethnogenesis is the process by which novel socially contingent identities are formed, then this begs an important question: what constitutes and structures this identity in the first place?

Members of prototypical ethnic (or ethnic-like) groups trace their descent from a common ancestor and share a common language, religion, customs, a sense of a common homeland, and relatively dense social networks (Fearon and Laitin 2003). However, these features do not have to be present, nor shared by all group members to define an ethnic group. For instance, the Roma do not claim a common homeland, Jews speak multiple first languages, and different Somali clans have indistinguishable cultural practices (Fearon and Laitin 2003). Yet all these groups may be considered "ethnic groups," by both group members, as well as outsiders. These groups are thus self-conscious entities that exist in the minds of those who identify as members (Anderson 1983). Ethnicity, lineage, clan, and social identity can become socially relevant entities when those distinctions are acknowledged, tacitly or implicitly, as people go about their day-to-day lives.

But, as anthropologists have learned, ethnic and ethnic-like groups cannot be defined by trait lists of cultural characteristics or perceived physiological traits. Rather, as Barth (1969: 15) notes, it is the *boundary* that defines the group, not the cultural stuff that it encloses. These "boundaries" are patterns of social practice and interaction that give rise to, and subsequently reinforce, in-group members' self-identification and outsiders' confirmation of group distinctions (Sanders 2002: 327). Practically, ethnic-like groups may draw contrasts along lines of material culture, geographic origin, language, religious beliefs, body modification practices, or dietary customs.

Nevertheless, because this flavor of group identity is generally reckoned by descent and further ascribed soon after birth, it is largely unchangeable over one's lifetime. In cases where ethnic groups are distinguished by permanent somatic features (skin color, eye color, even modified head shape, etc.), the cost of switching or attempting to pass between them may be quite high, if not impossible (Caselli and Coleman 2006). So, although suites of shared cultural attributes often distinguish ethnic-like groups, these are not the constitutive units of group identity, but rather the contingent ones.

Contrasts drawn between these groups are not just a matter of biology; rather they are historically and politically contextualized and embedded conventions. As boundary-markers, salient attributes emerge depending on where and how counter-positioning concatenates between them. These articulations are themselves a consequence of the sociohistorical and political context in which interactions take place. Because of this, practices must be reaffirmed throughout generations. Yet, although the material and social content that shapes identity is culturally constructed and changes over time, it is perceived as immutable (see Barth 1969; Torres-Rouff 2002; Toft 2003). In order for componential categories to become naturalized, intentionally visible boundary-marking practices are needed to maintain group identity over long periods of time (Lim et al. 2007; Blom 2005; Wobst 1977).

Ethnic-like identities are fundamentally politically relevant. Because passing between groups can be difficult, ethnicity forms a solid basis for forming coalitions. The largely intractable nature of ethnic identities within a generation makes mobilization – the rousing of fellow members – and conflict a distinct possibility. These instrumental and situational coalitions naturally form for a couple of reasons. First, it is easier to mobilize members that speak the same language and enact the same cultural practices, drawing on salient themes of common descent (kinship) and affiliation. Second, territories tend to encompass resources shared by a group of people. Agricultural terraces, large canals, irrigation systems, and roads tend to be used and maintained by social groups that share both the responsibilities as well as the benefits of such resources (Fearon 2009). Novel groups, with ethnic-like characteristics may form as situational, yet politically valent, collectives that draw on shared histories to enact common cultural practices as a means of reifying salient intergroup distinctions.

Because ethnicity is fluid, situational, and dynamic over generations, it has traditionally been difficult to assign bounded groups based on assemblages of material artifacts (Jones 1997). In order to investigate how ethnicity emerges in the bioarchaeological record, key attributes cannot simply be identified with a checklist, but need to be evaluated as correlates that demonstrate "patterns of interactions that link groups" (Sanders 2002: 328). Because the body is a congealed record of social and physical interactions, it is a permanent record of intractable indicators of ascribed and achieved group affiliation.

In order to operationalize and identify ethnogenesis, we must document evidence that "vestigial" cultural elements became imbricated with new traditions after Wari's disintegration ca. AD 1000/1050. Bioarchaeologically, ethnogenesis may be signaled if the same biological population suddenly adopts new boundary-marking cultural practices. We can directly investigate the creation of new social boundaries and group formation by looking at intentional, culturally mediated alterations to the body. These modifications are often inscribed soon after birth and are retained permanently through life. As such, it is a powerful marker of social affiliation and is a tangible signifier of the production of membership as ascribed by others in the group. Given that artificial body modification must be reenacted in every generation, its use over time and across space serves as a sensitive litmus test on the conspicuousness of the performance and expression of group difference over time.

Remodeling the Body to Signal Identity

Cranial modification is a socially ascribed boundary-marking practice amenable to bioarchaeological analysis. Permanent, altered head shape was achieved through the intentional deformation of an infant's malleable skull using ropes and pads. Diachronic studies show that cranial modification was embraced during both the emergence *and* the disintegration of Andean states and empires (Torres-Rouff 2002, 2003; Andrushko 2007).

Cranial modification is perhaps the most salient corporeal indicator of social identity in the Andes (Cieza de Leon 1996 [1553]; Betanzos 2004 [1557]; Garcilaso de la Vega 1968 [1609–1613]). Studies have consistently demonstrated that cranial modification was employed to demarcate different sectors of the population, including social or ethnic groups (Torres-Rouff 2002), occupational classes (Lozada and Buikstra 2002), moiety and residential descent groups (*ayllu* clusters) (Hoshower et al. 1995) and lineage, regional, or local group membership (Blom 2005). All of these groupings could be considered "ethnic" since they all likely maintained similar subsistence and cultural/ritual practices, spoke the same language, wore similar clothing, had similar beliefs and a common sense of history, and claimed descent from a common mytho-historic ancestor. However, modification cannot simultaneously indicate scalar (*ayllu*) and fixed (lineage) social affiliations. So, one of the aims of this study is to investigate the type of social and biological grouping signaled by an intentionally remolded head.

Modification use may also inform on possible correlations with bounded occupational groups (see Lozada and Buikstra 2002). For instance, Kellett (2010) has argued that "bi-ethnic" Chanka socio-settlements may have been composed of two groups: pastoralists who worked in the highlands, and agriculturalists who worked in the warm valleys. If cranial modification is based on occupational or status differences, then we would expect those with and without modification to be living at different elevations, eating different foods (only grown at specific elevations), and drinking water from different sources (one group perhaps drinking from *puquios* in the *puna*, and another group consuming river water from the valley bottom). These scenarios can be confirmed to some extent through bio-geochemical analysis. Osteologically, if modified and unmodified individuals conformed to separate social groups, then they are not expected to be interred collectively in the same *machay*. Correspondingly, we would expect grave-good assemblages to have some association with those occupations (Conkey and Hastorf 1990; Lozada and Buikstra 2002).

Violence Flourishes

Violence is an action characterized by the fact that participants employ deadly weapons[1] with deadly force (Kelly 2000). The injury or deaths of other people are envisioned in advance, and this anticipation is encoded in the purposeful act of taking up lethal weapons.

Postimperial societies often witness increasing conflict (Tainter 1988; Yoffee 2005; Covey 2008; Chase-Dunn and Taylor 1994). Violence may be persistent or recurring, and range in scale from domestic abuse, to small-scale scuffles, to raids and other acts of warfare (Arkush and Tung 2013; Nielsen and Walker 2009; Brubaker and Laitin 1998; Tung 2008). Proximate explanations for this trend include material poverty (Torres-Rouff and Costa Junquiera 2006), resource

[1] This can be a physical weapon, like a club, or clenched fists.

scarcity (Frye and de la Vega 2005; Arkush and Stanish 2005), increased reliance on pastoralism (Kellett 2010), population migrations (see Bamforth 1994), and general sociopolitical instability (Cahill 2010). This study hypothesizes that Wari's imperial retraction from Andahuaylas caused a political vacuum, which transformed local intergroup relationships; these relationships were antagonistic and consequently involved physical violence.

There are strong indicators that Wari's collapse elsewhere in Peru was an underlying catalyst for violence (Tainter 1988; LaLone 2000; Schreiber 1987). For instance, in the Wari imperial core, skull fractures increased from 24 % to 70 % after Wari collapse (Tung 2008). This same pattern is present among Wari-affiliated populations in the Cusco region (Andrushko 2007). At roughly the same time as Wari's disappearance, the Tiwanaku state, centered on the Bolivian *altiplano*, was also disintegrating (ca. AD 1100). In San Pedro de Atacama, an oasis located on the fringes of the former state, cranial fracture rates peaked at over 35 % (Torres-Rouff and Costa Junquiera 2006). In short, regions emerging from state collapse were plagued with insecurity, scarcity, instability, and hardship. If the same processes were at work in Andahuaylas, then we would expect an analogous increase in trauma.

Physical violence does more than injure an individual. The reverberations of state collapse and ensuing conflict can also impact the demographic profiles of subsequent populations; when adults of reproductive age are killed or displaced, future generations cease to exist. Nevertheless, violence may not be experienced equally by everyone. In cases of natural or social disasters or "catastrophes" like wars, flood, genocide, earthquakes, and famine, older juveniles and young adults may flee affected areas (Margerison and Knüsel 2002), fertility rates may decrease, and infant mortality rates may increase (Jackes and Meiklejohn 2008: 239; Wood et al. 1992). As stressed populations struggle to access resources crucial to maintain healthy mothers and babies, indirect factors like poor health conditions caused by insufficient water supplies, sewage problems, a lack of health services, and population displacement may also contribute to premature death (Burnham et al. 2006).

However, more so than ailing health, excess mortality (premature death) following state collapse usually occurs on account of direct factors like increasing conflict (Depootere et al. 2004; Morgan 2004; Stuart-Macadam 1992). For example, after the 2003 disintegration of Iraq's sociopolitical system, monitors observed significant increases in excess mortality due to violence that targeted adolescent to middle-aged men (Burnham et al. 2006). Despite the collapse of infrastructure and resource scarcity, there was no significant increase in nonviolent deaths in post-collapse Iraq. The pattern in Iraq is not unique in post-collapse communities. Cross-culturally, when violence is the main catalyst for excess mortality, the highest rates of death generally occur among adults in their prime (De Walque 2006: 355, 358). While victims tend to be males, mortality may also be concentrated in certain social groups. For instance, in Khmer Rouge-era Cambodia (1975–1979), the social group most likely to experience excess mortality were well-educated urban adults (*ibid.*: 365). Similarly, Taylor (2010, 1999: 42) noted that during the 1994 genocide in Rwanda, Tutsi women in their prime were killed in numbers equal to, if not exceeding, those of men. Instead of being perceived as innocent noncombatants, Tutsi women were deliberately targeted for genocidal violence. Conflict led to significant increases in trauma-induced excess mortality for late teens and adults (~16–45 years old) (De Walque and Verwimp 2010); Andahuaylan individuals in those age categories may also show signs of deadly violence.

Aside from significant increases in violence in general, cross-cultural ethnographic studies suggest that state collapse can create social repercussions such that particular segments of a population are specifically targeted and thus disproportionately predisposed to becoming victims of violence (see Brubaker and Laitin 1998; Hinton 2002; Gould 1999; Boskovic 2005; Talbot 1995). Despite the great diversity of political, religious, economic, linguistic, and other social affiliations in the modern world, conflict mediated by ethnic, or ethnic-like identity is still the most prevalent form of armed conflict experienced (Toft 2003: 5). Such may have been the case in the premodern past as well.

Why do ethnic-like identities spur and structure violence? Previous studies suggest that violent attacks made along these lines cause rapid and extreme polarization in society (Laitin 1995; Kaufman 1996; Mueller 2000; Fearon 2009; Fearon and Laitin 1999, 2003). Ethnic violence and the (re)creation of ethnic identity form a recursive, often symbiotic, relationship. When administrative, hierarchical, and occupational divisions in a noncontiguous, multiethnic empire crumble, instability often ensues and violence may erupt. If that violence is mediated along "immutable" ethnic lines, then the collective identity of both the assailants and victims are newly cast in relationship to these reforged social and physical interactions (see de Waal 1994: 3). Antagonisms between ethnic groups may turn violent more often than groups organized along other political or ideological lines because group members may conceive of each other metaphorically in terms of kinship, heightening emotions and sensitizing members to external (and/or existential) threats (Horowitz 1985). In these circumstances, lethal violence is conceived as a reasonable and justified reaction.

In ethnographic contexts, killing or causing serious bodily harm to members of a group based on recognition of their identity is considered ethnocide or, more generally, genocide (cf. United Nations Article II, 1948 on Genocide). This identity may be based on perceived ethnic (Lemarchand 1994; Wittayapak 2008), religious (Seul 1999), sociocultural (Bhavnani 2006), economic (Besanccon 2005; Sen 2008), or political (Mann 2005) affiliation.

Widespread, sustained, and lethal ethnocidal violence likely existed prior to the formation of modern nation-states, and likely existed independent of ancient empires (Potter and Chuipka 2010). Yet models that suggest ethnocidal actions have not typically been applied to ancient societies. Rather, ethnocide tends to be viewed as consequences of expanding empires (Ferguson and Whitehead 1992). Generally, incidences of mass killings in prehistory are interpreted as the result of warfare between politically organized groups (Steadman 2008; Frayer 1997), massacres (Erdal 2010; Smith 2003; Novak 1999; Slaus et al. 2010; Liston and Baker 1996; Milner et al. 1991), or killing sprees (Willey and Emerson 1993; Tung 2008) linked to resource scarcity or other aggravating sociopolitical factors. In other instances, systematic, mass killings are defined in a ritual context as sacrifices (Benson and Cook 2001; Verano 2007) or as the sanctioned executions of undesirables like witches (Darling 1999; Santos-Granero 2004) or war captives (Verano 1986, 2007).

Ethnocidal violence may be a more fruitful concept in understanding the motivation and interpreting the meaning behind acts of asymmetric physical aggression in postimperial contexts. Catalyzed by the breakdown of Wari imperial control, ethnocidal violence may have been a strategic mechanism used to gain access over resources, build allegiances with like-minded members, completely eliminate rivals, and legitimize dominant authority and beliefs (Fearon and Laitin 1999, 2003; Gould 1999; Bhavnani and Backer 2000).

Newly emergent, populous, ranked societies potentially employed ethnocidal violence as a tactic of terror in the ancient past. Post-collapse landscapes provide a social milieu where this type of violence could have been deemed culturally appropriate. If ethnocide indeed impacted expansive polities like Chanka after Wari collapse, then trauma rates are expected to be significantly higher among those males, females, and juveniles whose ethnic-like identity was prominently and permanently marked.

Finally, in contemporary situations of pervasive instability, like war or genocide, the formation of homogeneous cultural enclaves of minority groups is common, because they are easier to defend (Kaufman 1996). Nevertheless, these residential "island" communities are still under the constant threat of isolation, raids, or sieges. Such may have been the case among the Quichua, who subsisted as a small enclave community within a sea of large Chanka settlements. Experiences of violence might have been significantly distinct between Chanka and Quichua groups. Raids may have plagued the Quichua enclave, while ethnocide was a distinct possibility among the Chanka.

Technical Innovation in Medico-cultural Practices

Great hardship can provoke incredible innovation. Times of war, specifically, have been a somber crucible for technical, medico-cultural invention. The American Civil War of the 1860 witnessed the mass production of the Minnie bullet, and a rise in concomitant eye injuries. Disfigured soldiers eventually benefitted from the development of high-quality prosthetic eyes. Some were fashioned from calcified animal bone, such that new vascularization could potentially take place. More recently, Improvised Explosive Devices (IEDs) being used throughout the world, but particularly in the greater Middle East and South Asia, have blown off the limbs of civilian and combatant alike. The desire to give soldiers and other victims renewed mobility and independence has spurred a renaissance in prosthetics fabrication and innovative leaps in design and functionality.

So too, as empires wax and wane, new challenges may arise, which require technological innovations. For instance, there is ample evidence that suggests Wari's innovative terracing technology was created in response to a severe drought ca. AD 550–650 (Ortloff 2009), and actually helped ease imperial expansion. Buoyed by high-yield maize varieties (Meddens and Branch 2010), Wari terracing was later exported to conquered regions in order to feed an ever-increasing empire. Aside from technological innovations, Wari's incursion in provinces like Andahuaylas spurred an influx of new ideas, new material "horizons" (Rowe 1945), new raw materials, and new types of people with international identities.

When Wari collapsed, old technology (like terracing) was largely abandoned (Kellett 2010) and new innovations were adopted. This is not surprising. Despite the common perception that state collapse is a time of innovatory stagnation (Diamond 2005), technical advancements are likely to emerge in these eras as people struggle to cope with novel challenges (Baker and Ausink 1996). State collapse may provoke a convergence of new ideas as capable people (specialists) out-migrate from unstable areas back to home provinces (in this case, "brain drain" benefits the provinces to the detriment of the heartland).

From a bioarchaeological perspective, surgery is one such class of invention that is amenable to analysis. Specifically, this study operationalizes cranial trepanation (surgery on the skull) to inform on technical innovation. Trepanation is a surgical procedure involving the intentional piercing and removal of a part of the cranial vault. This medicocultural practice was likely realized to alleviate pain and intracranial swelling due to traumatic injury, neurological disorders, or other psychosomatic illnesses (Verano 2003; Andrushko 2007; Andrushko and Verano 2008). Because trepanation methods directly bear on the survival of a patient, it provides a unique way to test hypotheses related to adoption of avant-garde medicocultural procedures and informs on novel conceptions of intervention on an unwell body. Data on its implementation, survival, and experimentation give us some insight on how the practice came about, how techniques improved, and what social rules mediated its use on a potential patient.

Resource Insecurities

In addition to increasing violence, ethnogenesis, and technical innovations, health and diet may also significantly change in the aftermath of collapse. Standards of living may decrease and social inequality may increase (Conlee and Schreiber 2006). In the Andes, these conditions may have been exasperated by the maturing social system that was complementary but inherently unequal. Unhealthy diets and unhygienic living conditions might have impacted whole populations, or segments thereof. This study operationalizes inequality by combining food and water accessibility (gleaned from stable isotope analysis) and compromised health or "frailty" (determined through assessment of pathological cranial lesions indicative of anemia) and compares these correlations within different subpopulation groups.

Emerging Inequalities Revealed Through Dietary Heterogeneity

Any discussion of dietary practices in the Andes must address maize. Maize was the most ubiquitous – and archaeologically visible – crops in the Andes. In some cases access to maize was restricted to certain social groups (Berryman 2010), while in other instances, like that of the LIP-era Wanka society (Junin Department), elites and commoners enjoyed similar diets (Hastorf and Johannessen 1993). Bauer and colleagues (2010; Kellett 2010) have suggested that, due to climate changes, maize may have become relatively scarce over the course of time in Andahuaylas. Less rainfall, fewer arable fields, increasing settlement agglutination, and more competition for territory would have impacted crop yields, and consequently, the diets of those who depended on a robust, yearly harvest.

Among foods common to prehispanic Peruvian populations, maize was amongst the most highly valued. A quotidian dietary staple, maize also had great symbolic value, and mediated ritual and political activities (Hastorf and Johannessen 1993). The present study employs bio-geochemistry in order to evaluate dietary patterns as a way of indirectly measuring differential resource access. Relative maize consumption can be reconstructed through carbon isotope analysis. The $\delta\ ^{13}C$ enamel values culled from this type of analysis provides a measure of the contributions of C_3 and C_4 plants (like maize) in the diet during childhood (Kingston and Harrison 2007). Similarly, oxygen isotopes imbibed in water and eventually fixed in tooth enamel serve as proxies for climate, water sources, ecological zones, and by extension, residential origin (Knudson 2009; Wright 2005; Andrushko 2007). If Wari collapse impacted a certain group's access to particular foods and water, then stable isotope values should be heterogeneous.

Increasing Health and Frailty

This study investigates how state collapse may impact the physiological health of subsequent populations. Prolonged or chronic exposure to pathogens or malnutrition may be reflected in skeletal remains as pathological lesions (Wood et al. 1992). The systematic and comprehensive analysis of the frequency and severity of lesions across a population can be used to reliably reconstruct health indices. Differences in health indices can then be used to infer inequalities based on social factors such as age, sex, status, or ethnicity.

A significant debate in bioarchaeology is the so-called Osteological Paradox (Wood et al. 1992), where the health of a population might not be accurately reflected by the frequency and severity of pathological lesions indicative of disease. For example, those individuals who were healthy enough to survive an illness may have traces of the disease preserved as bony scarring on the skeleton, while those individuals with no bony scarring may have died quickly, before those lesions could develop. In this case, the population with skeletal lesions may be more healthy and "hearty" than unlesioned populations. Paradoxically, a person with no lesions may have died quickly from a disease, or may not have experienced any disease at all. Nevertheless, other researchers have consistently shown that, despite factors which complicate paleodemographic analyses (demographic nonstationarity, selective mortality, and hidden heterogeneity in risks [Wood et al. 1992: 344–345]), pathological lesions are indeed signs of frailty (compromised health) and are generally correlated with increasing morbidity and lower mean ages-at-death (see Steckel and

Rose 2002). In this study, the integration of multiple lines of data is employed to avoid the interpretive pitfalls of the osteological paradox.

State collapse impacts accessibility to food and clean water, or prompts new types of unsanitary living conditions in overcrowded hilltop settlements. Ethnographic research suggests that maligned social or ethnic-like groups in the aftermath of state "failure" may be denied access to crucial nutritive resources, or be forced to live in squalid conditions (Patrick 2005). If such was the case in Andahuaylas, we would expect members of some groups to exhibit significantly higher rates of disease than other individuals in society.

Reconstructing Lifeways Through the Skeleton

Age-at-Death and Sex Estimation

In order to interpret how community profiles were impacted by Wari collapse, we need to reconstruct the sex and age-at-death of those individuals buried in Andahuaylas. We can determine an age range when someone died because bones and teeth grow – and get worn down – at known, fairly consistent rates. In cases of subadults, dental development and eruption were used to determine age-at-death following Hillson (1996) and Ubelaker (1989). Postcranial bones were evaluated based on size and epiphyseal development following standard rates of growth described in Baker et al. (2005) and Scheuer et al. (2008). Likewise, adult aging methods for crania followed established standards. Cranial vault suture closure scores (from no closure to suture obliteration) were summed to determine a score called an S-value, which can be correlated with mean ages (Buikstra and Ublaker 1994: 38). Dental wear (Scott 1979) was also used to determine age categories, since they correlated fairly well with basal cranial suture closure scores. Because remains were commingled, individuals were assigned into broad age categories which could be compared to other Andean populations (Tung 2003: 93, 2012) (Table 2.1).

Table 2.1 Age categories

Age code	Age category	Years
F	Fetus	In utero–birth
I	Infant	Birth–4 years
C	Child	5–14 years
T	Teen	15–19 years
YA	Young adult	20–34 years
MA	Middle adult	35–49 years
OA	Old adult	50+ years
A	Adult	20–50+ years

After puberty, male and female bodies take on different characteristics. Consequently, sexually dimorphic indicators can be marshaled to discern the sex of skeletal remains. On the skull, sexually dimorphic features include the mastoid process, nuchal crest, supraorbital margin, and glabella. Each feature was scored on a 5-point scale (1 = most gracile/sharp, 5 = most robust/prominent) (Buikstra and Ublaker 1994: 21). When associated mandibles were present, the robusticity of the gonial angle (the jaw line), and the shape and prominence of the mental eminence (the chin) were also scored. It was also possible to assign sex to isolated postcranial remains that displayed significant dimorphism, such as the pelvis and sacrum. Using nomenclature established by crania, they were designated as male, female, probable male or female, or unknown. Because sexually dimorphic features are not expressed in individuals until after puberty, subadults under about 15 years of age could not be sexed, and were designated as *unknown*.

Determining Cranial Modification Presence and Variability

Cranial modification, our signal of intentional cultural practice, is a permanent phenomenon that can be straightforwardly assessed by anthropologists. Despite a number of transformative studies on cranial remodeling in the Andes (see Hoshower et al. 1995; Torres-Rouff 2003; Lozada and Buikstra 2002; see Tiesler 2014), as well as standardized data collection forms (*sensu* Buikstra and Ublaker 1994), it remains a challenge to identify discrete categories of head shapes, interpret the nature of morphological variation, and infer the motivation for such a conspicuous tradition. This task can be further complicated when different observers are taking data from distinct populations. Despite potential pitfalls, in this study, a couple of different methods were developed to quantify and qualify differences in cranial modification.

First, each cranium was measured with a spreading caliper and measuring tape to inform on the presence, style, and intensity of modification. Because all modified crania were elongated using circumferential bindings that prevented parietal expansion, simple methods were developed to tease out more nuanced patterns of modification variability. A numeric modification code was developed based on Buikstra and Ubelaker's (1994) cranial modification data collection form. 3D morphometric analysis of digital scans of skull measures was used to help us better quantify shape differences.

Identifying planes of pressure was an efficient means of qualifying slight differences in modification techniques because the placement of bands on the skull ultimately accounts for the shape of the cranium (Fig. 2.1). As the cranium is compressed and ultimately modified by external pressure from bands and pads, the frontal bone is flattened, forcing *bregma* posterior. The occipital is forced anteriorly and superiorly, and the parietals are pushed superiorly and posteriorly. More specifically, pressure applied to areas *lamda* and above *inion* will give the posterior of the cranium an "erect" shape when viewed in profile, while force placed below *inion* gives the

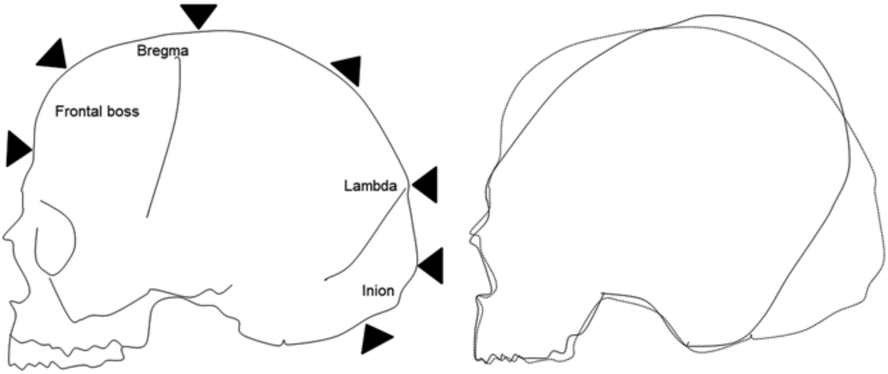

Fig. 2.1 On the left, *arrows* demarcate areas where pressure from bands could have impacted osseous expansion or compression, while the image on the right shows how the cranium is elongated

posterior skull an oblique shape. Using a numeric code to qualify modification in terms of organoplastic function shifts the focus to the intention of the practitioner, and not unintended outcomes of the practice – like asymmetric modification or irregular pad or binding impressions. Like many permanent body modification customs (e.g., circumcision), the process of modifying the cranium may have been a more integral component of ethnic affiliation than the aesthetic of the end result.

Finally, modification heterogeneity was also assessed. Standardization in modification practices would suggest that infants' heads are being bound by a single or small group of practitioners using prescribed techniques. Conversely, great diversity in binding styles would suggest that modification is being practiced in the home, by parents or close kin. Although these individuals may have had a general knowledge of binding practices, they may have been performing it infrequently (see Arriaza et al. 1988: 17). Different types of social and biological groups may have shared a common ideal of desirable skull shape, but outcomes would be distinct and variable given the imprecision of modification techniques.

The Pathophysiology of Trauma

To ascertain how violence was experienced in Andahuaylas, skeletal elements were examined for evidence of trauma (Galloway 1999; Lovell 1997). Physical evidence of trauma on bone depends on several factors including the element affected, the weapon used, and amount of force applied. Properties of the bone itself are further affected by age, sex, and pathological conditions (Novak 1999). Despite remodeling, evidence of injury becomes sedimented in bone for several years, usually leaving residual deformities that allow us to see the accumulative effects of violence over the life of an individual (Glencross 2011: 395).

The minimum number and sequence of injuries can be calculated from the inventory and distribution of wound impacts and fracture intersection and arrest lines (Kimmerle and Baraybar 2008; Lovell 1997; Jurmain 1999). Identifying the etiology of trauma, either intentional or accidental, can be inferred through an assessment of the way (or mechanism) the injury was inflicted, where it was inflicted on the body, and how common that form of injury is in a population or subsegment therein.

Because the location of the victim and the assailant's weapon can be deduced from the point of impact, we can determine victim positioning. For instance, if a significant proportion of total head wounds in a large sample of crania are clustered on the backs of female skulls, we can infer that those women were turned away (and possibly escaping) their assailants at the moment of impact; these sorts of "fleeing" wounds are common in cases of raids (Tung 2012). Overall, this class of data can help inform of the motivation for conflict.

Used in conjunction with wound distribution, trauma lethality can signal the likely intent of an assailant during a violent confrontation. Injuries on crania are then classified as either (1) lethal or (2) sublethal. Sublethal, antemortem injuries bear evidence of bone remodeling (healing), while perimortem injuries, which occur at or around the time of death, do not (Lovell 1997). In cases where different types of violence can result in similar trauma distribution patterns, wound lethality can offer key insights on motivation. For instance, while multiple perimortem facial injuries on a single individual may be an example of excessive rage-filled "overkill" violence (Rautman and Fenton 2005), multiple antemortem injuries on male left frontal bones (Tung 2012) or nasal bones are all indicators of the type of violence where the intent was to injure (but not kill) a competitor (Walker 1997: 146).

Finally, standard rates of healing help indicate when an injury was received in relation to the time of death. Although bone remodels at a fairly consistent rate, actual healing times will be affected by a victim's age, health status, the extent and severity of injury, and any therapeutic intervention (Kimmerle and Baraybar 2008; Lovell 1997; Ortner 2003).

In this study, infant/child and late teen/adult trauma rates are calculated separately (see Tung 2012). Data were collected on the location of affected areas on bone, including the side, region, and aspect. The number and types of fractures or defects were recorded and concomitant abnormal bone changes were described. Three classes of injury were observed in the present sample: penetrating injuries, sharp force trauma (SFT), and, most commonly, blunt force trauma (BFT) (Lovell 1997; Galloway 1999; Jurmain 1999). The timing of fractures was estimated based on healing. The mechanism of injury and the class of weapon used (if applicable) was classified by wound shape and size. The victim's position relevant to the direction of force was inferred based on impact location and radiating fracture direction (Lovell 1997; Galloway 1999). Dental abnormalities with suspected traumatic etiologies, including fractures and antemortem maxillary incisor loss (Lukacs 2007), were also documented. Together, these data were marshaled to evaluate how wound patterning, frequency, and lethality varied within distinct subpopulation groups.

Constituting a Health Profile

Creating a health profile for an archaeological population remains difficult because differential susceptibility in all human skeletal samples impacts the presence of pathological lesions (Wood et al. 1992). Similarly, in cases of injury, bone healing and remodeling time will be affected by issues of frailty (Wood et al. 1992), which is affected by a victim's age, health status, the extent and severity of a given pathology, the bone affected, and therapeutic intervention (Kimmerle and Baraybar 2008; Lovell 1997; Ortner 2003). Nevertheless, pathological lesions indicative of disease can still inform on general health trends when combined with multiple lines of data (Steckel and Rose 2002; Blom et al. 2005; El-Najjar et al. 1976; Walker et al. 2009). In this study, human crania were examined for evidence of porotic hyperostosis on the vault. Porotic hyperostosis, a proxy for compromised health, was coded as present or absent; visible lesions were coded as healed or unhealed. The degree to which porotic hyperostosis was expressed, and the location of porosity on the cranium were coded using standard observational protocols.

Evaluating Trepanation

Finally, one of the key ways bioarchaeologists can evaluate evidence of innovation is by investigating risky medicocultural practices. Following Verano (2003) and Andrushko (2007; Andrushko and Verano 2008; see also Buikstra and Ubelaker 1994), all crania of individuals over 5 years of age with at least four vault bones (frontal, parietals, and occipital) were evaluated for evidence of trepanations. Trepanation method, location, size, degree of healing, and evidence of concomitant traumatic injury or pathology were also recorded. Trepanation apertures were categorized as either "complete," which perforated the internal table, or "attempted" trepanations, which only pierced the external table. When possible, the number of individual bore holes or cut marks that comprised a single trepanation was also tallied. To discern whether certain regions of the skull were preferred for surgery, trepanation location was recorded, and a caliper was used to measure the size of the perforation. Trepanations were also categorized as either healing (if the borders showed signs of active remodeling), or unhealed (if the margins were "crisp"), as these data inform on whether a patient survived the surgery. Cases of concomitant traumatic injury or pathological lesions were also recorded in order to determine whether any meaningful associations existed (see Andrushko and Verano 2008). Crania that lacked evidence of trepanation were also examined, following Verano (2003: 224), to serve as a comparison for sex, age, modification, and trauma rates within the general population. There were also several instances of errant bore holes, or "praxis marks." Descriptive statistics were used to assess data patterns and identify any meaningful correlations or associations between variables. The following chapter puts collapse theory into practice as we investigate the reasons for the Wari empire's presence–and evidence of its retraction, in the remote Andean highlands.

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Chapter 3
Lifeways in Andahuaylas Under the Aegis of the Wari Empire and After Its Collapse

The Andahuaylas region is located in the southern portion of the Andean *sierra central*, and comprises the western part of modern Apurimac Department, Peru. It's a 2-day walk to Andahuaylas from the Wari imperial capital. The territory is bordered by the Pampas River to the north and northwest, the Chicha-Soras River to the west and south, and the Pachachaca River to the east (see Map, Fig. 2.1). Rugged peaks that tower over 5000 meters above sea level [MASL] rise abruptly from valley bottoms as low as 1800 MASL. Given the large expanses of high *Puna* grasslands (over 4000 MASL), much of Andahuaylas is geographically well suited to high-altitude subsistence practices, like pastoralism, as well as lower-altitude agricultural cultivation.

The mortuary sites that form the basis of this study are all located near the juncture of the *Kichwa* ecotone (located between 2700 and 3500 MASL) and the *Suni* zone (3500–3800 MASL) (Pulgar Vidal 1981). In Andahuaylas, the *Kichwa* zone currently supports major indigenous cultigens like maize, as well as minor cultigens like legumes, amaranth, quinoa, and potatoes (Kellett 2010: 30). In the *Suni* ecotone, tubers and lupines can be cultivated, and the grasslands make for accessible grazing by llamas and alpacas. Apart from stacked, ecological niches, those living in the *sierra* must also contend with seasonal changes that impact subsistence activities and food availability. Andahuaylas has a wet and a dry season. The warmer, rainy season lasts from November through April (punctuated at its height in February–March by carnival season, when the landscape becomes a vibrant patchwork of fat, green cornstalks, physical relationships are consummated, and organized ritual fights take place in rural communities throughout the region). The cooler, dry season lasts from May through October and is characterized by greater fluctuations in day time temperatures (Kellett 2010: 30–33). Perhaps due in part to its geographic isolotation, Quechua-speaking agro-pastoralists in modern Andahuaylas still engage in routinized practices of subsistence and community traditions which have endured for centuries.

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The Nature of Wari Imperialism

With its orgins dating back over 1,400 years, Wari was the first pristine empire to emerge in the Americas (Isbell 2008) (ca. AD 600–1000). Its capital, Huari, near modern-day Ayacucho City, was a massive metropolis, covering at least 4 km^2. The capital was home to some 30,000 people who lived in multistoried compounds divided by high, thick walls (Isbell 2000). Wari nourished its population – and likely flourished as an empire – through innovative terrace agriculture, supported by complex irrigation systems, fed by high-altitude springs. Paleoclimatic data suggest these achievements were developed to confront arid environmental conditions (Ortloff 2009).

Wari emerged from the formative Huarpa culture, ca. AD 500–600, at the beginning of the Middle Horizon (Ochatoma Paravicino 2007) (Table 3.1). The early era of Wari cultural development, from about AD 600 to 700, is characterized by organic urbanization in the capital city, and a focus on religious proselytization in the heartland and near-hinterland. Wari's southern imperial expansion and consolidation began in earnest in the late seventh and early eighth centuries AD (Williams 2001; Tung 2007; McEwen 2005). Accompanied by a persuasive, distinctive, and sophisticated architectural and artistic style, much of Wari's strategy of conquest and consolidation involved militarism as well as elaborate rituals (Tung and Knudson 2011). Colonial outposts were established in hinterland provinces and the heartland was significantly transformed as agricultural production intensified (Isbell 2010; Vivanco and Valdez 1994). At Huari, artifactual remains and iconography attest to increasing secularization, economic specialization, and wealth (Isbell 2010; Isbell and Cook 1987). During the eighth century, the demand and importation of nonlocal durable goods increased (Craig and Jennings 2001; Edwards 2011) as did the interregional exchange of prestige items and staples (Jennings 2006). Craft specialists in the capital fabricated inimitable ceramics, forged metal and shell *objets d'art*, and wove exquisite textiles (Grossman 1983). Those portable, finished goods, wrapped in compelling Wari iconographic motifs, were exchanged through-

Table 3.1 Andean chronology

Era	Epoch/phase	Polity/cultural group		Approximate dates
		Peru	Andahuaylas	
Early Horizon		Chavin	Muyu Moqo	800–200 BC
Early Intermediate Period		Regional polities	Qasawirka	200 BC–AD 600
Middle Horizon	1A	Wari	Warified, Qasawirka	AD 550–650
	1B			AD 650–750
	2A			AD 750–900
	2B			AD 900–1000
Late Intermediate Period	1	Regional polities	Chanka, Quichua	AD 1000–1250
	2			AD 1250–1400
Late Horizon		Inca	Chanka and others	AD 1400–1532

out the Andes (Isbell and Shreiber 1978; Perez Calderon 1999). At the same time, Wari elites in the capital satiated their desire for foreign goods through delivery by llama caravans (Silverman and Isbell 2008). An essential component of Wari political economy, the use of pack animal caravans largely account for rate at which the empire expanded long-distance trade routes and increased the volume of goods that could be moved across the landscape.

Wari conquest extended to people, different vertical ecological niches, and non-agro-pastoral resources (e.g., mining) (Kaulicke and Isbell 2001; Schreiber 1992; Valdez 2011; Vaughn et al. 2007) and the state radiated economic, military, and ideological power into the provinces (LaLone 2000: 89). As an expansive empire, Wari needed to co-opt local leaders, raise an army, and mobilize large amounts of human labor for public works projects; this required large crop yields. Scholars posit that Wari administered a network of regional centers that organized resource extraction, storage, and redistribution (Jennings 2006: 265). In general, Wari deployed an imperial political strategy characterized as a *mosaic* of control (Schreiber 1992). So, in regions with low populations and little complexity, Wari tended to establish outposts and concomitant infrastructure—a form of engagement that signals close oversight and *direct control*. Conversely, in areas where there was a higher level of sociopolitical complexity, Wari ruled *indirectly*, by co-opting local leaders who aided in the reorganization and management of local economic systems. The enfolding of provincial elites and manipulation of local political structures likely occurred through the bestowment of gifts during grand parties. This form of diplomacy created a class of dependent gentry who affirmed social differences through feasting, fictive kinship, and luxury items (Schreiber 1992). As a state preoccupied with rank and status, Wari mobilized divisive strategies like exclusionary feasting and ancestor mummy kidnappings to reify social and political hierarchies (McEwen 2005). These mechanisms were meant to coerce emerging elites. Local leaders were expected to to detach themselves from the obligations and bonds of local kin and instead ally and subject of the state (Isbell 2000). When called for, the Wari coolly employed the threat of force (and actual attack) as tactics of coercion (Tung 2012).

Bioarchaeological and Archaeological Evidence of Wari in Andahuaylas

Material culture and radiocarbon dates indicate that Wari's presence was primarily experienced in Andahuaylas between the eighth and eleventh centuries AD, but the exact nature of this infiltration remains imprecise. Before Wari's incursion into Andahuaylas, the region was inhabited by folks whom archaeologists now call the Qasawirka (ca. 300 BC–AD 1000) (Grossman 1972, 1983). For over a 1000 years, family groups lived in small villages and made recognizable but still simple, utilitarian pottery (Bauer et al. 2010). The technical stasis and conservatism of Qasawirka ceramics may have been embraced in order to maintain community affiliations through shared traditions.

Shortly after AD 690, Qasawirka lifeways were abruptly and permanently altered when the resplendent Wari Empire, and all its attendant trappings, entered the humble Andahuaylas region. Evidence of this new, foreign influence is present in Qasawirka pottery that dates to the Wari imperial era. New forms, colors, pastes, and images suddenly appear in the region. Enticed local potters soon began to emulate Wari ceramic styles and iconography – albeit with varying degrees of success. It was a noble attempt to situate their largely unremarkable creations within the stately and sumptuous cultural milieu of the exalted Andean empire (Isbell 2008).

During the ensuing century, many of the over 400 Qasawirka hamlets in Andahuaylas were abandoned (Kellett 2010: 78), as Wari villages (or “fourth-order” installations) expanded into new ecological zones (Isbell and Shreiber 1978). Archaeologists think that these sites were newly founded in order to exploit high-altitude (3500–3700 MASL) agro-pastoralism. At least a third[1] of all Middle Horizon settlements (N = 66) in densely-populated central Andahuaylas had imperial Wari-style ceramics; this evidence makes it clear that Andahuaylans were both importing fancy ceramics from the capital and fabricating their own crude imitations (Bauer and Kellett 2010).

In western Andahuaylas, the recently reported site of Patahuasi (3900 MASL) (Gómez Choque 2015) is replete with Wari-style orthogonal architecture and a characteristic D-shaped ritual building. This probable Wari outpost (Isbell, personal communication 2012) might have been used to manage camelid herds and organize copper and salt mining labor during the Middle Horizon. Further south, in the Chicha-Soras River Valley, survey and excavation work found overwhelming evidence affirming Wari imperial incursion (Meddens 1985; Meddens and Branch 2010). The Wari imperial aestetic is in full display at the site of Yako (.65 ha. 3330 MASL). Established during the late seventh century, Yako is composed of a motley arrangement of circular and quadrangular buildings, over a dozen rubble mounds, and one large, D-shaped structure made from rough fieldstones set in mud mortar with lines of thin, slab-like stones with flat faces irregularly spaced throughout the wall (Meddens and Branch 2010: 157). Sometime after AD 700, agricultural production around Yako intensified as terrace agriculture was introduced (Kemp et al. 2006) and additional Wari sites were established in previously unoccupied zones (Meddens and Branch 2010). The largest of these new sites, Chiqna Jota (9 ha. 3450 masl), contained over 200 buildings, had at least three sunken plazas, and was occupied through the Late Intermediate Period (until ca. AD 1400). Plaster-covered orthogonal and cellular buildings at Chiqna Jota follow Wari construction tenants, and both Yako and Chiqna Jota were littered with with Wari imperial ceramics (specifically Ocros, Vinaque, and Black Decorated styles) (see Menzel 1968).

Just down the road from Yako, human remains from the Wari era were interred in small rectangular rooms with white plaster walls and windows. The rooms were

[1] This figure might be higher. Archaeologist Bauer and colleagues documented 405 Qasawirka sites and 66 Wari sites. However, given the longevity of the Qasawirka culture (300 BC–AD 1000), it is unclear how many Qasawirka sites were abandoned, and how many were functioning during the Middle Horizon (AD 600–1000).

fastidiously constructed and confined within the gaping maw of a large rock shelter called Charrangochayoq (Fig. 3.1) (Meddens and Branch 2010: 158). The tomb complex is dated to the Middle Horizon, but was used continuously through the Late Intermediate Period. This is a strong indication that cultural integrity was maintained in the region following Wari's dissolution.

Given its high, flat location on the *Puna*, southern Andahuaylas was exploited by the Wari Empire for the purposes of camelid (llama and alpaca) breeding and herding (Meddens 1985). Camelid iconography, wool textiles, and great quantities of camelid skeletal remains provide evidence for intensified animal husbandry. The establishment of extensive Wari-directed terraces in the region was likely initiated to support pastoralists and others in the Chicha-Soras Valley.

In sum, archaeological data is replete with conspicuous circumstantial evidence that a foreign imperial presence was active in Andahuaylas during the later Middle Horizon. While Wari's influence in Andahuaylas was surely impacting people in areas of strategic and economic importancel, imperial saturation overall was somewhat uneven. As such, the province likely existed as a small subdivision within a broader regional administrative unit (Schreiber 1987: 278). Wari leaders orchestrated a strategy of indirect and direct statecraft, variably altering local settlement patterns, architectural configurations, and artifactual assemblages, and possibly sending in colonists to administer the territory.

Fig. 3.1 Charangochayoq Cave with Wari-era burial houses (Photo courtesy Enmanuel Gómez Choque)

Reasons for Wari Investment in Andahuaylas

There are several reasons Wari may have invested in Andahuaylas. First, the province is strategically located (Fig. 3.2) and would have been an obligatory artery for Wari commodities, soldiers, caravans, and administrators traveling from the imperial capital in Ayacucho, east toward the mega-outpost of Pikillacta in Cuzco, and south to regional highland centers like Yako, Chiqna Jota, Collota, and Jincamocco (Meddens 1985; Schreiber 1992; McEwen 2005; Jennings 2006). Andahuaylas was economically valuable as well. Known for its exquisite textiles and extensive trade networks, Wari had to rely on and manage large herds of camelids that could be culled for their wool and meat, and saddled up in large caravans. Evidence of this investment, from industrial-sized corrals to ample *Puna* grazing lands and even mold-made ceramics in the form of camelids, are abundant in Andahuaylas. Finally, Andahuaylas is also rich in mineral resources. Wari likely benefitted from the robust salt and copper veins that flow through the region (Kurin, Pink, and Boulanger, n.d.). While the salt was used to supplement the diets of both people and their

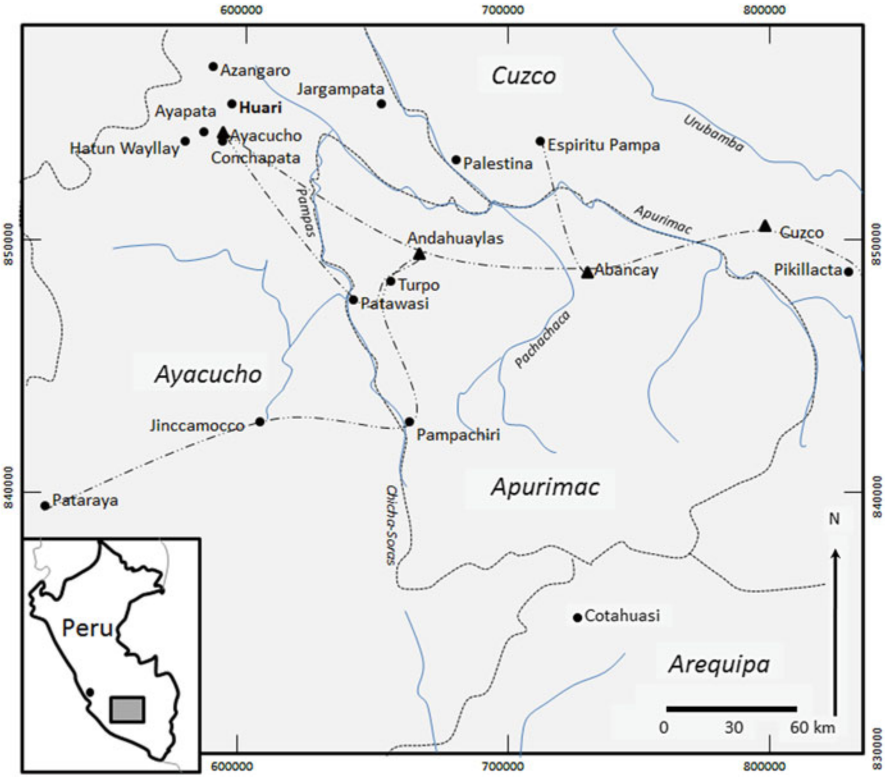

Fig. 3.2 Known Wari sites in the south-central Peruvian highlands connected by roads (*dashed lines*)

livestock, the copper was smelted, annealed, and fashioned into a host of ornaments, the most ubiquitous of which were shawl pins called *tupus*.

After ca. AD 700, small Wari installations expanded into the steep slopes and high-altitude grasslands in Andahuaylas. Local Qasawirka sites were abandoned as imperial authorities oversaw the transformation of the landscape through innovative terrace architecture, sophisticated hydraulic management, intensified camelid breeding and herding, and mineral extraction; (Bauer and Kellett 2010; Meddens and Branch 2010; Gómez Choque 2015). Current archaeological data indicate that, unlike other hinterland regions subsumed within the imperial sphere (see Tung 2003, 2007), Wari's incursion in Andahuaylas was not violent, nor was violence an outgrowth of Wari's investment in the region. Warrior iconography is absent on ceramics from the region, and defensive architecture is lacking. And although Andahuaylas was a crucial transitory region, Wari's control of the Andahuaylan body politic seems to have been limited to material goods and economic reorganization. In sum, Wari economic investment in the region extended to agro-industrial innovation, camelid husbandry, and mining. Nestled within a network of regional capitals, major imperial highways crisscrossed Andahuaylas, and the stability of the region would have been crucial to ensure continued local production as well as the unimpeded flow of ideas, goods, and people throughout the state.

Wari Influence at Turpo

Located in the most maize-rich valley in Andahuaylas, the Wari-era village of Turpo was settled on the slopes of the Qasiachi plateau in the modern community of Chaupimolle. A prehispanic *runa ñan* road runs next to the site, and is still used by the community today. Culturally unaffiliated terraces are located nearby, although most are eroded and covered by vegetation, or are being reused by local farmers who reassemble the stones to demarcate property. In the middle of the Qasiachi plateau are circular structures – possibly houses. In the late 2000s, road constructions exposed a circular semi-subterranean tomb in an area known as Qatun Rumi (3206 MASL). Subsequent rescue excavations focused on the timely, yet systematic documentation and recovery of culturally diagnostic material from the exposed interior of the tomb. Radiocarbon dates show the tomb was used for internment after AD 880–990, placing it squarely in the twilight of Wari's imperial existence during the later Middle Horizon.

The stone-lined, circular, semi-subterranean tomb was similar in style to graves from Beringa (Tung 2007: 251), a Middle Horizon site on the periphery of the Wari Empire in Arequipa; similar styles have also been observed in the Wari heartland in Ayacucho. Within the tomb, a fully articulated individual, a middle adult male, was laid to rest above sterile soil. His body was placed face down in a tightly flexed position on a thin-beamed wooden pallet. Immediately above the articulated male was a sizeable bed of largely dispersed and extremely fragmentary human bones and teeth (Fig. 3.3). Well-cobbled ground stone tools were recovered within the bone bed. This practice is

Fig. 3.3 The Wari Era tomb at Turpo largely consisted of a bed of commingled and mostly fragmentary human remains (Photo courtesy of Enmanuel Gómez Choque)

Fig. 3.4 Material evidence of Wari influence in Andahuaylas

not unique to the region: cobbles were used to cover flexed skeletal remains as early as the Initial Period in Andahuaylas (ca. 2000 BC–250 BC) (Grossman 1972).

Several other classes of material artifacts recovered during excavations further demonstrate that Wari's influence was pervasive in western Andahuaylas (Fig. 3.4). High-quality Vinaque, Wamanga, and late-phase Huari-style pottery (see Menzel 1968: 143–144) are present in mortuary contexts along with locally produced vessels emulating Wari motifs. High-status Wari goods include a pendant depicting an elite, collared individual. He wears a four-cornered hat – a sign of high rank and authority. His arms are crossed and he gazes out with pupil-less eyes (Ochatoma

Paravicino 2007: 203–204; Cook 1992) (Fig. 3.4). Other important personages were also depicted. Part of a Wari face-neck jar depicts an enigmatic individual, termed "Agent 102" (Knobloch 2002). This man has black hair and sideburns and colored rectangular motifs on the cheeks. Agent 102 played an integral role in the proselytization and subjugation of distant regions during ca. AD 700. His presence, along with the Wari pendant man and other objects that conform to Wari stylistic tropes, confirm that the presence of the State was altering mortuary traditions.

The Nature of Wari Collapse

While the scene in Middle Horizon Andahuaylas appears to have been one of relatively peaceful assimilation and integration, such unanimity ultimately did not last. After some four centuries of imperial rule, the Wari Empire collapsed. Reasons for fragmentation remain unknown, and it is unclear if Wari collapse was a seismic phenomenon that emanated from the core and rippled out, or a corrosive phenomenon where provinces broke away and ultimately undermined the cohesion and survival of the capital. Given that site abandonment on a regional scale can signal imperial retraction (Cameron and Tomka 1996), Wari's more-or-less contemporaneous withdrawal from all of its major imperial provinces, with no signs of anticipated return, is a key archaeological proxy for widespread state fragmentation.

The capital city of Huari was abandoned and left destroyed and desolate around the mid-eleventh century (sensu Lumbreras 1959; Finucane et al. 2007). In the hinterland provinces, the abandonment of Wari outposts was varied, in some cases, spanning several generations. At some Wari outposts, there is evidence of planned, tactical retraction, while other colonial outposts evince signs of hasty, unanticipated withdrawal.

For instance, at the massive installation of Pikillacta, in Cuzco, construction of the final sector of the complex was canceled around ca. AD 850–900, perhaps anticipating future problems (McEwen 2005). Rooms were cleaned and sealed, offerings were deposited, and sectors were deserted before ever being finished. Nevertheless, the unexpected acceleration of Wari collapse may account for why other sectors of Pikillacta show evidence of hurried, perhaps even violent, abandonment. A site-wide burning episode and a decapitated skeleton found strewn over a wall (Verano in McEwen 2005) attest to the conflict that may have accompanied the provincial capital's abrogation.

Pikillacta's apparently violent end contrasts with findings from Pataraya, a small colonial outpost staffed by elites and retainers for some 200 years during the eighth and ninth centuries AD. Abandonment at Pataraya was an orderly affair that lasted several weeks to months (Edwards 2011) *terminus post quem* ca. AD 922. Another pattern of retraction is seen in Moquegua, in southern Peru, where Wari constructed a massive complex at the summit of a steep mesa called Cero Baúl. At Cerro Baúl, abandonment was slow and methodical, taking place around AD 1000–1050. Planned, sequential ritual closure of the site suggests that the residents had an orderly retreat. Some scholars (Williams 2001) suggest that the abandonment of the site was related to changes in political and diplomatic relations with the neighboring Tiwanaku state, rather than Wari imperial disintegration (Moseley et al. 2005; Goldstein 2005). A likely scenario suggests that Tiwanaku's retreat from Moquegua (and the migration of Tiwanaku subjects up valley to the Wari-controlled region) made Cerro Baúl's presence as a locus of diplomatic engagement between Tiwanaku and Wari unnecessary (Williams 2001).

Archaeological Evidence of Wari Collapse in Andahuaylas

By the end of the Middle Horizon, Wari's economic, ideological, and political infrastructure was stressed. Systems of production and redistribution, the role of ritual in an increasingly secularized society, and foreign affairs could have been strained as military, diplomatic, and bureaucratic systems became increasingly ineffective. Sometime during the eleventh century AD, the once prosperous Wari Empire finally disintegrated and disappeared completely. Irregardless of causality and the nature of chaos, evidence from imperial installations throughout south-central Peru is consistent with models which posit that Wari collapse was an extended process which may have persisted for several generations beginning in the late tenth century AD (Table 3.2).

Table 3.2 Wari abandonment in south-central Peru

Wari site	Heart or hinterland	Site description	*Terminus post quem*/dates of abandonment	Skeletal evidence of violence at terminus?	References
Huari	Heartland	Capital	1050	Yes	Tung (2008)
Conchapata	Heartland	Elite second city	1000	N/A	Isbell and Cook (1987)
Pikillacta	Hinterland	Eastern provincial capital	850/900–1000/1100	Yes	McEwen (2005)
Cerro Baúl	Hinterland	Southern provincial capital	1000–1050	N/A	Williams (2001)
Azangaro	Heartland	Urban center	1000	Yes	Anders (1991), Finucane et al. (2007)
Pataraya	Hinterland	Outpost-weigh station	922	N/A	Edwards (2011)
Jinccamocco	Near-hinterland	Outpost-agriculture	1000	N/A	Schreiber (1992)
Yako	Near-hinterland	Outpost-herding	1000	N/A	Meddens and Branch (2010)

Although Wari's presence in Andahuaylas was somewhat variable, its withdrawal around AD 1000–1050 seems to have been uniformly tumultuous and coincides with striking changes in local lifeways. Throughout the province, Qasawirka ceramics suddenly disappeared after some 1300 years of stylistic continuity and uniform distribution. Settlement patterns also shifted dramatically. In southern Andahuaylas, Yako was swiftly abandoned around AD 1000 (Meddens and Branch 2010: 167). Such was also the case in northern Andahuaylas, where almost all Qasawirka and Wari sites were deserted, as populations moved to ridge and hilltop settlements, located between 3500 and 4000 MASL (Bauer and Kellett 2010; Kellett 2010).

Wari's disappearance in Andahuaylas in the early to middle eleventh century was accompanied by the breakdown of road networks, dramatic shifts in the style and quality of artifacts, transformations in the nature of iconography, the disappearance of regional hierarchies, and demographic expansion (Isbell 2008; Bauer et al. 2010; see also McAnany and Yoffee 2010; Yoffee 2005; Tainter 1988; Schwartz and Nichols 2006). In some cases, Wari or Wari-affiliated retainer populations were tactically disengaged (Williams 2001), while in other instances abandonment was unexpected and accompanied by violence (McEwen 2005). In areas where Wari's presence could be described as influence more than control, collapse instigated changes in systems of trade and exchange and in the social and political relationships represented by those material artifacts. In Andahuaylas, the swift abandonment of Wari-affiliated sites, the sudden absence of Wari goods, and the abrupt repudiation of Qasawirka ceramics all occuring around AD 1000, point to a dramatic retraction or rejection of Wari prestige, traditions, and clout in the area. With the Empire in ashes, there came a dark age, and an ominous political vacuum enveloped hundreds of *sierra* communities provoking significant civil unrest (Conlee and Schreiber 2006; Tung 2008; Finucane et al. 2007; Glowacki 2002; Kemp et al. 2006; LaLone 2000; McEwen 2005; Moseley et al. 2005; Nash 2002; Schreiber 1987, 1992; Arkush and Stanish 2005). Such postimperial unrest has been characterized most famously in the saga of the Chanka of Andahuaylas.

Environmental, Archaeological, and Ethnohistoric Underpinnings of Late Prehispanic Andahuaylas

Between the tenth and eleventh centuries AD, Wari disintegrated. Although the precise timing, order, and causes of Wari fragmentation remain unknown, imperial withdrawal from Andahuaylas is concomitant with dramatic changes in cultural assemblages and settlement patterns, all of which point to shifting power relations and even turmoil among different postimperial groups. Traditionally, this tumult has been attributed to climate changes. Yet although the Late Intermediate Period in Andahuaylas was more arid than the preceding Middle Horizon (the time of the Wari Empire), paleo-climatological data indicate the most intense period of drought occurred well over two centuries after Wari's decline (Hillyer et al. 2009; Valencia et al. 2010). These data suggest that striking changes in early LIP lifeways may be structured by the reverberations caused by Wari's disappearance in Andahuaylas to a greater extent than by macroclimatic fluctuations.

Climate Instability in Andahuaylas

Deteriorating macroenvironmental changes are often cited as an important underlying cause of state collapse. In the Andes, the fragmentation of several prehistoric polities have been attributed to largely unforeseen environmental calamites, ranging from extended droughts in the circum-Titicaca region (see Janusek 2004), to catastrophic ENSO (El Nino Southern Oscillation) flooding (van Buren 2001) on the Peruvian north coast (Dillehay and Kolata 2004). As an agro-pastoral society, worsening environmental conditions in Andahuaylas, including drought and frequent frosts, would have reduced the amount of available land for grazing and planting. Competition for economic resources and the failure to manage the redistribution of food and luxury goods could have been a catalyst for increasing conflict both before and after Wari collapse. Similar patterns have been observed elsewhere in the highland Andes.

Pinpointing the timing and duration of environmental changes in south-central Peru is crucial in order to gauge the role that increasing drought may have played in the collapse of the Wari Empire, and determine how these challenging conditions may have structured the lifeways of people eking out an existence in a formerly prosperous near-hinterland province.

There is ample paleo-ecological evidence to suggest that the south-central Peruvian sierra endured dramatic climatic changes over the past 2000 years, alternating from cooler, wetter periods to hotter, more arid periods (see Thompson et al. 1994; Hillyer et al. 2009; Binford et al. 1997; Abbott et al. 1997; Valencia et al. 2010; Chepstow-Lusty et al. 2009). To draw these conclusions, scientists drill cores into glaciers and lake beds and study the pollen, microbiota, and other molecules trapped in the sediment. Radiocarbon dates allow scholars to pinpoint the timing of changes in the concentration of particular climate-sensitive plant species and through the isotopes in oxygen. Because overall the Late Intermediate Period was significantly more arid than the preceding Middle Horizon, some scholars have interpreted the shift to hilltop settlements in Andahuaylas as an adaptation to climatic changes (Kellett 2010; Bauer et al. 2010). They posit that high-altitude pastoralism was newly emphasized in the postimperial era as a risk reduction strategy in the face of increased aridity and drought.

However, Wari fragmentation appears to have occurred several centuries prior to an era of worsening drought in several imperial provinces, including Andahuaylas. Data gleaned from ice and lake cores from Andahuaylas' Lake Pacucha and the greater south-central Andes suggest that the most intense period of drought in Andahuaylas began several hundred years after Wari's disappearance – after ca. AD 1250 (Kellett 2010: 221; Valencia personal communication 2011; Guido personal

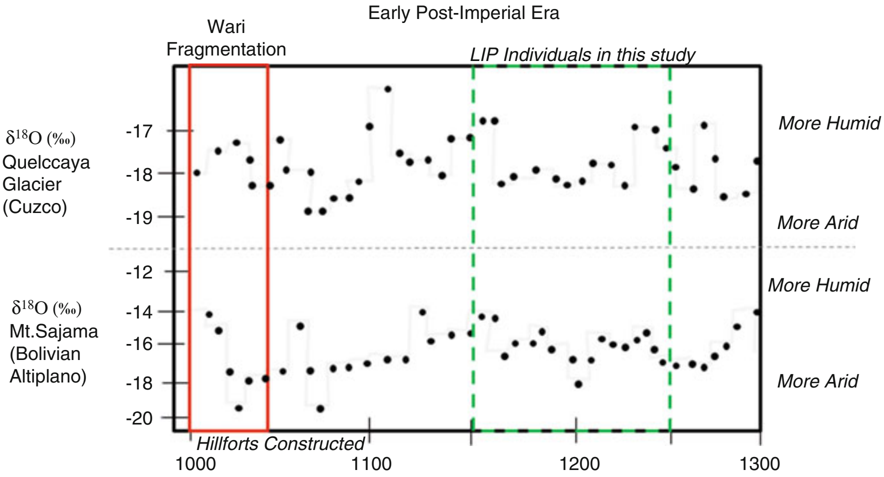

Fig. 3.5 Paleo-climate data drawn from ice cores and their correspondence with major social changes in Andahuaylas

communication 2011; Chepstow-Lusty et al. 2003; Thompson et al. 1994; Kane 2011; Hillyer et al. 2009; Valencia et al. 2010; Ortloff and Kolata 1993; Mosblech et al. 2012). Before this time, climate changes were less significant and more manageable.

Thus, while paleo-climate data are conspicuously absent of evidence for enduring environmental calamities, Andahuaylas was experiencing tumultuous social and cultural changes unlike anything ever recorded in prehistory (Fig. 3.5). These shifts in early postimperial lifeways were not adaptations to a worsening climate, but rather more strongly structured by Wari collapse itself.

Settlement Patterns

Although the nature of Wari collapse is still uncertain, the ensuing period coincides with profound changes in individual and community experiences with food, disease, and warfare. Indirect evidence of tumult is most strongly signaled by shifts in settlement practices (Bauer et al. 2010; Gómez Choque 2009; see Covey 2008). At the dawn of the eleventh century, once-dispersed hamlets were abruptly abandoned as populations moved upslope to hills, promontories, and ridgetops located between 3200 and 3600 MASL. Displacement was widespread, swift, and permanent (Bauer et al. 2010; Covey 2008; Kellett 2010; Kurin 2012). On cold, windy hilltops, rough-hewn stone masonry was opportunistically quarried from the settlement slopes and haphazardly arranged into densely clustered patio groups. These permanently occupied settlements ranged from 1 to 15 hectares in size, and consisted of dozens to

Fig. 3.6 The Cachi Hillfort and its defensive and subsistence characteristics

hundreds of 2- to 3-meter wide circular houses, organically arranged into patio groups.

Signs of emerging elites are absent. Sites lack public plazas, monumental works, and other public infrastructure. There are no large and stately homes, tombs, or luxury goods commonly associated with self-aggrandizing, high-status individuals. Archaeologically, this signals a socioeconomically egalitarian society.

Instead, settlement configurations appear to be more strongly structured around community security and group defense (Fig. 3.6). Based on the number of houses built within site walls, hundreds of people were aggregating on rugged terrain that spanned mere hectares. These settlements had commanding views of the landscape and other sites: up to 85 % of the terrain would have been visible (Kellett 2010: 172). Lookout posts and *sangars* – earthen-work abutments – were constructed in strategic positions nearby (Gómez Choque 2009). Ramparts and protective ditches encircled habitation areas, baffled entries, long defensive curtain walls with posterns, boulder *glacis*, and steep cliffs and ravines all served to impede movement by attackers while at the same time confining residents within the relative safety of the settlement (sensu Arkush and Allen 2006). Weaponry is also abundant. Caches of donut-stone maces, hafted clubs, and sling stones – all used in interpersonal conflict – are ubiquitous in grave assemblages and on surface surveys. Finally, getting food and clean water would have been challenging. Clean water sources were located far offsite at hillslope springs (*puquios*) and in deep ravines (*quebradas*)

(Kellett 2010: 348). Agricultural terraces were located a 30 min walk from sites, and corrals were about twice as far. Andahuaylans travel much further today, walking several hours' to-and-from inherited plots of land (Gómez Choque 2009, 2015).

In fact, recent research points to increasing social isolation and spatial balkanization across the entire region. Settlement survey work, specifically, supports a scenario of population decline in the aftermath of Wari collapse. Nearest neighbor analysis of settlements shows that site frequency and total site areas decreased after collapse, but settlement sizes remained the same (Kellett 2010). The fact that the number of sites is decreasing but the sizes of settlements do not get bigger points to population aggregation, but not population growth. Shrinking community territories signal the growth of no man's lands formed by the negative space between fortifications (LeBlanc 2006). Consequently, these larger buffer zones would have impacted food production, because in Andahuaylas, the buffer zones *are* the productive zones.

Given potential hazards such as high population densities, food security concerns, burdensome access to clean water, a conspicuous dearth of infrastructure related to sanitation, reduced freedom of movement, a cold windy environment, and persistent violent attack, living conditions in fortified settlements were likely substandard and could have contributed to elevated rates of disease, conflict, and death (Arriaza et al. 2013).

Archaeological Evidence of Subsistence

Eking out an existence as a subsistence farmer in Andahuaylas is tough work. Even in the best of times, only around 10 % of the Province is suitable for agriculture (INEI 2009); social and climactic insecurities today exacerbate peoples' ability to acquire food. Such occurances are not restricted to contemporary times. Most archaeological studies of food habits in the region have largely focused on animal bones and macrobotanical remains to infer ancient diets (c.f., Kellett 2010). Relative proportions of faunal remains and preserved (usually carbonized) plant material from Andahuaylas suggest sources of subsistence varied only slightly between the pre- and post-collapse eras (see Kellett 2010: 95). The proportion of maize (*Zea mays*) was steady over time (~33 % of the total), while amaranths (*Amaranthus caudatis*) increased in relative ubiquity during the LIP, as potatoes (*Solanum tuberosum*) decreased. Similarly, the faunal data suggest that camelids (*Camelidae*) consumption and fecundity rates remained constant between the Wari era and LIP (Kellett 2010: 497). Small proportions of guinea pigs (*Cavia porcellus*), dogs (*Canis familiaris*), and deer (*Cervidae*) round out the assemblage of available comestibles (Baiker 2012; Gómez Choque 2009). Yet, these data are hard to interpret due to significant preservation biases[2] and small sample sizes. Nevertheless, some scenerios posit that hilltop sites were built primarily to facilitate the intensification

[2] For instance, Quinoa (*Chenopodium quinoa*), long a major cultigen, was conspicuously absent; sample sizes of other major foodstuff range are in the single digits and low dozens.

of high altitude camelid pastoralism and crop cultivation (Bauer and Kellett 2010; Bauer et al. 2010; Kellett 2010). As we will see in the next few chapters, this was probably not the case.

Andahuaylan Ethnohistoric Sources

The peoples that reorganized in Andahuaylas after Wari collapse eventually formed small polities that are known from historical record as the *Chanka* and the *Quichua*. Drawn from oral testimony, and recorded soon after the Spanish Conquest, the plight of the Chanka was meticulously logged in several texts from the sixteenth and seventeenth centuries. These ethnohistoric sources provide some clues about the lifeways of late prehispanic groups in the Andes. The most vivid come from the *chronicles*, a collection of travelogues and official histories written by colonial administrators, overzealous priests, mestizo elites, and ruffians-cum-soldiers.

Descriptions in the chronicles are generally plagued by the biases, inaccuracies, and inconsistencies of informants and authors. Ethnohistorians Guevara-Gil and Salomon (1994) have cautioned that native social structures depicted through colonial texts are not mimetic representations of real life. These idealized reconstitutions usually do not account for demographic fluctuations due to catastrophic events like violence, epidemics, and immigration. Rather, depictions of social structure in Colonial texts had to fit Spanish administrative and ideological paradigms while also reaffirming the traditional "immemorial" legacy of native leaders. While early colonial native lords – called *kurakas* – had some authority when it came to providing ethnographic testimony (Guevara-Gil and Salomon 1994: 25), later *kurakas* were strained by factors like Spanish labor and tribute obligations. Privileges and cultural understandings, once based on kinship, gave way to those based on political office.

Nevertheless, legal and procedural documents related to judicial cases and land tenure disputes written in the sixteenth through early nineteenth centuries provide another avenue of ethnohistoric inquiry. These documents are not fanciful fabrications; *visitas* (census records) and other legal documents for regions like Andahuaylas, truthfully recorded processes by which social order underwent real and effective change (Guevara-Gil and Salomon 1994: 25). These colonial-era documents aid in identifying Chanka and Quichua communities, while genealogies reconstructed from court testimony are helpful in clarifying the social basis of prehispanic social and mortuary organization.

Chanka and Quichua Mytho-History

Among late prehispanic cultural groups, perhaps none is as well-known as the Chanka. The infamy of the Chanka is largely due to their crucial role in official Inca history. Oft characterized as a complex polity where brilliant war captains led thousands of troops to conquer and decimate neighboring populations, the Chanka apparently made several forays toward Cuzco in attempts to subdue the Inca until ultimately vanquished by the Inca Lord Pachacutic in a decisive battle that catalyzed the consolidation of Tawantinsuyu. In other words, the Inca–Chanka war was a nation-making event for the Inca. For the Chanka, it was the literary end of a manifest destiny unfulfilled. However, the characterization of the Chanka as fierce warriors has been cemented into historical consciousness. Given that they were major rivals (or at least literary foils) of the Inca, the chronicles (whose authors largely relied on Inca informants) tend to illustrate an overwhelmingly static and largely negative view of the Chanka. Even their origin legend conforms to common pan-Andes tropes like migration, antagonisms, and conflict, rather than revealing the nuanced cultural machinations of a prehistoric society (Urton, personel communication 2014).

According to official Inca history, the Chanka emerged after Wari collapse, during a time period chronicler Inca Garcilaso de la Vega (1968 [1613]) has called the Age of *Auca Runa* (warlike men). This mythic era of Andean prehistory was defined by military engagement, territorial conquest, and political subjugation. Ayacucho-born Felipe Guaman Poma de Ayala (1980 [1616]) relates that the epoch was characterized by population expansion and conflictive resource procurement, with people living on hilltop fortresses (called *pukaras*), governed by *señores* (hereditary lords) and *sinchis* (military leaders).

Spanish military captain and amateur ethnographer, Pedro Cieza de León (1996 [1553]) actually met several Chanka lords. His testimony relates that they all maintained long, luxurious hair, which was delicately braided, and arranged with wool cord that came to fall below their chins.[3] The Chanka of the mid-16th century still dressed themselves in woolen shirts and *mantas* (mantles), raised their children in round, stone houses, and, according to Cieza de Leon, buried their dead in caves surrounded by "treasure and apparel."

Regarding Chanka ethnic and political genesis, chronicler Sarmiento de Gamboa (2007 [1572]: 104) points to an ancestral homeland in the Ayacucho-Huamanga area – the former Wari heartland. Cieza de León (1996 [1553]: 284) concurs, noting that Chanka-affiliated Pocras and Iquichanos tribes still occupied the region around the ruins of Huari in the sixteenth century. The Chanka people trace the origin of thier group to two founding brothers. These brothers – both war captains – were named Uscovilca and Ancovilca. They were said to have emerged from two high-altitude lakes, called Urcococha and Choclococha, in Huancavelica, a cold, desolate region to the west of Andahuaylas (Sarmiento 2007: 104–105). Following their migration to Andahuaylas in times immemorial, Cieza de León (1996 [1553]), Martin de Murua (2008 [1613]), and other historiographers all relate that the Chanka defeated the previously residing Quichua cultural group in a bloody battle.

Vivid and suspenseful historical accounts describe centuries of animosity between the Chanka and the Quichua. Upon their initial migration to Andahuaylas, the Chanka defeated the Quichua, and several hundred years later, the Quichua allied with the Inca against the Chanka (Cieza de León 1996 [1553]). Yet despite

[3] Original: *Todos traen cabellos largos, entrenzados menudamente, puestos unos cordones de lana que les venía a caer debajo de la barba.*

apparent historical enmity, the ethnic and cultural affiliation of the Quichua is still the subject of debate. Referencing an intriguing legal document written in 1539, ethnohistorian Catherine Julien (2002) posited that a people the Spanish described as the "Quichuas of Vilcaporo" allude to a group from Cuzco led by a cacique named Vilcaporo. However, recently completed transcriptions of early historic documents from Andahuaylas (Hostnig et al. 2007) make it more likely that the name Vilcaporo actually designates the region near the archaeological site of Pucullu, located in north-central Andahuaylas. In 1573, "Vilcaporo" is listed as one of the *ayllus* in Andarapa, just downstream (north) of Pucullu, while an *ayllu* called "Quichua" is listed among the groups composing the lower moiety (*hurin*) Chanka population (Bauer et al. 2010: 41). By 1594, the names, "Achan Quichuas" and "Bilca Poros" appear on a list of *hurin* Chanka *ayllus*. How might we explain these changes? The increased number of Chanka upper and lower moiety *ayllus* over time most likely reflects the collapse of other neighboring political systems, and the incorporation of those populations into the Andahuaylas Colonial tributary system (Bauer et al. 2010: 42). So, it seems possible that what had once been a distinct cultural group, was later amalgamated into the (less prestigious) lower moiety Chanka *ayllu* for administrative purposes. Finally, one last clue can be teased forth from the dusty douments. In the early eighteenth century, a man named Coyca appeared before the courts as part of a land dispute. In the testimony he affirms that he is a direct descendant of a man known as *Coicca*, a Quichua *kuraka* known from the 1530s. In court records, Coyca refers to himself as "Principal Indian, *cacique*, and legitimate governor of the town of Andarapa Vilcaporo, in this province of Andahuaylas" (in Hostnig et al. 2007 [1745]). All told, there is convincing historic documentation which confrims the existence of both the Chanka *and* the Quichua in Andahuaylas.

Chanka and Quichua *Ayllus*

Ethnohistoric texts tend to characterize the Chanka and Quichua, as a coalition of smaller *ayllus* that only come together for means of conquest and defense. For example, in his *Comentarios Reales,* chronicler Garcilaso de la Vega (1968: 299–300 [1609–1613]) noted that, "The denomination 'Chanka' encapsulates many other nations like the Huancohuayllu, Utunslla, Vilcas, Yquichanos, Morochucos, Tacmanas, Quiñuallas and Pocras; they who boast ascendance from various parents, some from springs, some from lakes, other from the heights of the mountains."[4] Royal cosmographer Sarmiento de Gamboa (2007 [1572]) similarly observed that the Chanka were organized according to *ayllus* and moieties with dual divisions at

[4] Original: *Debajo de este apellido Chanca, se encierran otras muchas naciones como son Hancohuallu, Utunsulla, Urumarca, Vilcas, Yquichanos, Morochucos, Tacmanas, Quiñuallas y Pocras; las cuales se jactan de descender de varios padres, unas de una fuente, otras de una laguna, otras collado muy alto*.

every nested sociopolitical level.[5] This ontological ambiguity requires a brief aside to answer a question crucial in this study: What is an *ayllu*, and how is it distinct from a lineage or an ethnic group?

Ayllus and *Ethnicity*

Ayllus are malleable, nested, scalar social units, which have been variously described as collectives of individuals joined by real and imagined kinship (Salomon 1995; Isbell 2010), as people who share a common origin place (called a *pacarina*) and common ancestor (Urton 1999), and a corporate group that maintains rights to communal landholdings (Cunow 1929). Crucially, kinship and kin obligations are important organizing principles. *Ayllus* may contain exogamous kindred, where boys of one *ayllu* marry girls of another (Betanzos 2004 [1557]), but *ayllus* also exist as endogamous bilateral or patrilineal descent groups (Rowe 1945). Like Betanzos, ethnographer Harald Skar (1982) views the *ayllu* as an asymmetric affinal alliance system of wife givers and wife receivers (and their *compadres* and families). Essentially factions, *ayllus* need a leader (Isbell 1985), but few institutionalized positions exist. To compensate, people attain power and prestige through activities like the cargo system or by being an exceptional fighter. However, to execute leadership responsibilities effectively, "big men" (Skar 1982: 169) have to rely on the support of their allied kin, affines, and *compadres*. In this sense, the size of *ayllu* depends on how many people a leader can mobilize.

Spatially, *ayllu* can mean residential sector, village, district, or region (see Wernke 2006). *Ayllus* can be organized along stacked, vertical ecological niches (throughout steep terrain), or horizontally (e.g., along a valley system) (Murra 1972). In Andahuaylas, boundaries between paired *ayllus* followed the natural and social topography (Fig. 3.7). Frontiers were demarcated by rivers, *huayccos* (streams), *puquios* (springs), roads, caves, *chullpas* (tombs), and mountain peaks (in Hostnig et al. 2007 [1612]).

On a scalar level, the minimal *ayllu* is a composed of the *wasifamilia*, household corporate units that share work obligations and whose organization is expressed in relation to other groups. On the other hand, maximal *ayllus* may represent moieties in a single village, several villages, or an entire region or cultural group. Regardless of scale, *ayllus* are nested, and consist of people classed together and recruited on diverse principles of conceptualized opposition to other groups (Skar 1982: 169). With *ayllus,* there can be no upper moitey without a lower moiety, and, crucially, awareness of the other half creates a consciousness of one's individual position in society (*ibid*: 192). Thus, two moieties of a village are only an *ayllu* when confronting another analogous village.

[5] Original: *Habían venido asentar al valle de Andahuailas y ahí habían hecho dos parcialidades. Uscovilca que era el mayor y el más principal instituyo su tierra y llamo lo Hananchanca (Antahuaila) y Ancovilca hizo la otra parcialidad (Uranmarca) llamándola Urinchanca.*

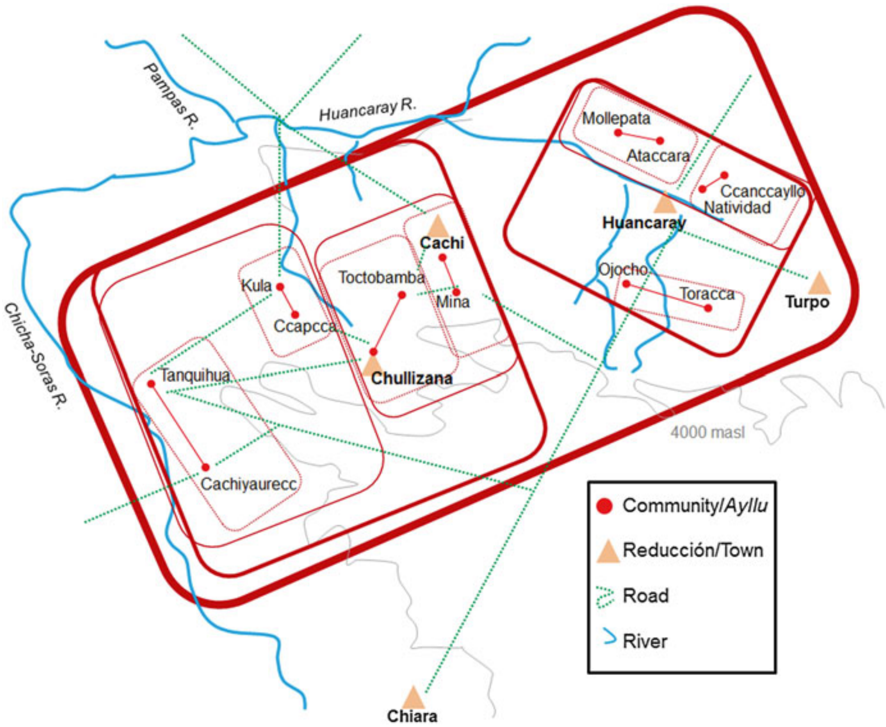

Fig. 3.7 Scalar nature of *ayllus* in study region. Paired settlements are connected by *dots* and *lines*. Sites come together to form increasingly expansive *ayllus* (higher level = thicker boxed outline)

Archaeological evidence appears to demonstrate that nested, dual *ayllu* organization existed in Andahuaylas during the post-collapse era. Hilltop communities might have benefitted from *ayllu*-like economically integrative facilities, where labor pooling was based on shared occupational activities like herding or agriculture (Kellett 2010: 14–16, 196–197). Because constructing settlements in spatially restrictive areas limited population size, growth, and architectural expansion, larger sites in Andahuaylas "budded off" into small hilltop communities (*ibid*: 288–290).

Ayllus and *Violence*

As complementary entities, whenever parts of an *ayllu* or different *ayllus* come together, violence is always a possible outgrowth of interaction. Anthropologist Harald Skar's (1982: 160) research in central Andahuaylas during the 1970s and 1980s suggests intervillage raiding for cattle and women contributed to high rates of violence; as much as a third of crop was stolen in any given year. Informants relate that "people were killed in these confrontations and…villages' livestock was severely depleted…That part of the flock that the robbers' couldn't carry with them was rendered useless…The robbers would cut up all the remaining sheep and urinate on the carcasses" (*ibid*: 226). Retribution for these acts was swift. Skar himself witnessed a case where a cattle rustler was caught and killed by being made to eat poison, with the approval of the *ayllu* headman (called a *Varaoq*), whose other responsibilities included settling disputes and meting out punishments – both physical and punitive.

Violence between competing *ayllus* and moieties has been observed throughout Andahuaylas. In these cases, conflicts stem from inherent inequalities in the *ayllu* system. These inequalities are manifested through access to resources like water springs, agricultural fields, or prime grazing areas. For instance, in Matapuquio, villagers from the upper moiety have access to ten water springs, while the lower moiety folks only have access to five. Those with more political power or reside closer to springs and rivers tend to get more water, while those with less power, or those who live farther away, receive less (Skar 1982: 150). The consequences of these inequalities can be a matter of life or death. Households that have to rely primarily on rainfall to water crops and feed animals can be devastated in times of drought. When times are lean, water and field access is a potent catalyst for violent confrontation.

Parts of an *ayllu* or different *ayllus* come together in conflict during periodic or internecine events. These violent encounters, called *takanakuy*, still occur during festivals and funerals (see Bastien 1985) and likely have prehispanic antecedents (see Tung 2012; Andrushko 2007). In Andahuaylas, these engagements are often lethal. The location where conflict takes place depends on whether antagonisms emerge between communities or within communities. In Andahuaylas, intravillage fights occur where the two *acequias* (canals) for moieties meet (Skar 1982: 192), while intervillage fighting takes place high up in the *puna* no-man's land between the villages. During these encounters, bones are broken and blood saturates the earth. As Skar (1982: 192) reports:

> Taking careful aim at each other's legs, [fighters] would take turns whipping their opponents as hard as they could, sometimes crippling each other for life. The winners of such fights were extremely popular among the women and were also held in high esteem among the men. The Copisa fighters all fought as representatives of their villages and aided each other as large scale fighting between highland and lowland villages broke out.

Intra-community violence was also highly structured, with most conflict taking place during the Day of the Dead, on November 1st:

> During this *fiesta* people gathered first in their core *ayllus* and finally converged on the cemetery. As they danced and poured libations on the graves of the deceased of the past years, ritual fighting broke out in which stones were thrown and slingshots used. The lines of conflict were moiety-based and…were an expression of moiety antagonism.

The Chanka of prehispanic Andahuaylas were also notoriously bellicose. Warfare appears to have been a common – even defining – feature of Chanka society. Encounters between the Chanka and their rivals were brutal and excessively violent.

For instance, Betanzos (2004: 244 [1557]) illustrates one particularly gruesome episode of violence where,

> [Lord] Inca Yupanque…had set in the ground many posts from which [the Chanka] would be hanged. And after being hanged, their heads would be cut off and placed on top of the posts. Their bodies would be burned, turned into dust, and from the highest hills cast to the winds so that this would be remembered. Thus the Inca Yupanque ordered that nobody dare bury any of the bodies of the enemies who had died in battle so that they would be eaten by foxes and birds and their bones would be seen all the time.

In other instances, entire communities were exterminated as,

> Babies were torn alive from the womb, hanging them by their umbilical cords from their mothers' legs. The rest of the lords and ladies who were prisoners were tortured by a type of torture they call *chacnac* [whipping], before they were killed. After being tormented, they were killed by smashing their heads to pieces with battle axes they call *chambi*, which are used in battle.

Similarly, Monzon et al. (1881 [1583]: 222) reports that Vilcas tribes from Ayacuhco constantly fought with their near neighbors, the Chanka, using, "slings and stones with holes in which had been inserted a stick, which they call…*collotas*."[6] Spanish Administrator Ondegardo de Polo (1873: 163) observed that the endemic violence of the early Colonial period usually did not occur between, "an Indian and another of the same village, but between one village and another." Ondegardo's account appears to be confirmed by an eighteenth-century court dispute from Andahuaylas in which Chanka locals from the Cuncataca barrio attempted to legally – then violently – dispossess intrusive *forasteros*, (nonlocal people) who had settled in the zone (see Hostnig et al. 2007).

The Chanka also celebrated warriors who were victorious in battle. Indeed, the names of these war lords are still known today, and their deeds are still heralded by Andahuaylans. Bernabé Cobó, a Jesuit priest whose 1653 *Historia* borrows heavily from earlier works by Polo de Ondegardo, Cristobal de Molina, Jose de Acosta, and Garcilaso de la Vega (see Urton 1999: 31), relates that the Chanka, "were natural leaders, who resented taking orders from others and took as their leader a brave Indian named Ancohuallo." Under his leadership, the Chanka were able to conquer much of south-central Peru (Cobó 1964 [1653]). During the time of the Inca Lord Viracocha (perhaps the late fourteenth century), Chanka brothers Astoyguaraca and Tomayguaraca led thousands of warriors toward Cuzco (Cieza de León 1996 [1553]). The Chanka brothers were described as pillaging thieves and cruel tyrants who threatened to dye their spears with the Incas' blood (Sarmiento de Gamboa 2007 [1572]: 104, 111).

Chronicler Juan de Betanzos, a Spaniard who spent much of his adult life in Peru, where he married an Inca princess, learned Quechua, and socialized with the descendants of Inca elite, recounts a slightly different version of the Chanka

[6] Original: *Los naturales de esta provincial [Guamanga]….traían guerra con los indios Chancas, provincial de Andaguaylas [sic], que son sus más cercanos vecinos. Y que peleaban con hondas y con unas piedras horadadas con unos palos atravesados en ellas. Que llaman en su lengua* collotas.

warlord myth. His official history, published in 1557, was completed by order of Antonio de Mendoza, the Viceroy of Peru. According to Betanzos' (2004 [1557]: vi) elite Inca informants, Uscovilca, the head of the upper moiety Chanka, was supported by six war captains divided into three paired infantry units: Mallma and Rapa, Yanavilca and Tecllovilca, and Guamanguaraca and Tomayguaraca. Uscovilca sent Mallma and Rapa to conquer *Condesuyu* (southwestern Peru), and Yanavilca and Tecllovilca to conquer *Antisuyu* (the Amazon jungle), while the rest of the brigade headed toward Cuzco. With the threat of the advancing Chanka, a fearful Viracocha Inca fled Cuzco with his heir, a prince named Urco, leaving his youngest son, Inca Yupanqui, and a couple of the boy's friends behind to defend the city. The battle between Inca Yupanqui and the Chanka was vicious, with hand-to-hand combat and weapons yielding high numbers of killed and injured. The Chanka were said to have employed lances, halberds, axes, clubs, slings, and round shields during conflict (Betanzos 2004: 20). Confrontations were punctuated by throngs of Chankas thrusting their long spears, and Incas fighting back with slings, clubs, axes, and arrows (Sarmiento de Gamboa 2007 [1572]: 113).

Eventually, as the story goes, the young Yupanqui defeats the Chanka, aided by his buddies and the miraculous *Purunrauca,* supernatural warriors who transformed from fieldstones. The Chanka warlords were killed in battle and Yupanqui placed their heads on tall spears, so their own men would see them. Once the Chanka saw the gruesome, disembodied heads, they doubted they could win without leaders, and fled the field of battle (Sarmiento de Gamboa 2007 [1572]: 113).

In mestizo chronicler Pachacuti Yamqui's (1993 [1613]: 92) version of this crucial battle, the Anccohuayllos (a macro-*ayllu* from the Ranracancha region of northwestern Apurimac) and the Chankas formed a confederated unit that unsuccessfully fought against the Inca. After a hasty retreat, Inca Yupanqui followed his enemies to a place called Quizachilla, where Chanka warlords Tomayhuaraca, Astohuaraca, and Huasco Tomayrimac were beheaded. The heads of these war captains are presented to Yupanqui's father, the cowardly Viracocha Inca. The demoralized Anccohuayllos and Chanka score a minor victory when an Inca general and esteemed royal family member named Vilcaquiri was killed by a warrior's sling stone. Nevertheless, the Chanka were ultimately overwhelmed by Yupanqui's Inca forces at the Apurimac River (Pachacuti Yamqui 1993 [1613]: 92). Upon victory, the young Inca Yupanqui took on a new name, *Pachacutic*, which means the World Transformer or Fin de siècle-maker. With that act, the era of Inca imperial expansion began in earnest.

Although the climactic battle between the Chanka and the Inca is often set within the reigns of Viracocha Inca and his son Pachacutic Inca Yupanqui (Pachacuti Yamqui 1993 [1613]; Juan de Betanzos 2004 [1557]; Cieza de León 1996 [1553]; Polo de Ondegardo 1873 [1561–1571]; Sarmiento de Gamboa 2007 [1572]; Jose de Acosta 1954 [1590]), other authors move the action back chronologically, placing the decisive battle during the twelfth- or thirteenth-century reigns of Lords Inca Roca and Yawar Huaccac (Gutierrez de Santa Clara 1905 [c.1550]; Cabello de Balboa 1951 [c.1600]; Guaman Poma de Ayala 1980 [c.1616]). Jesuit chonicler, Bernabé Cobó (1964 [1653]), is adamant that Inca–Chanka aggression first emerged during the tenure of Inca Roca, who cut the throats of those Chanka in battle. It was only generations later, under the rule of Lord Pachacutic Inca Yupanqui that the Chanka were finally pacified. Far from problematic, the chronological ambiguity surrounding Chanka aggression and demise may indicate that the "decisive battle" between Chanka and Inca – and warfare in general – was actually a longer, more drawn-out period of mutual conflict.

Accounts from the chronicles depict a brand of Chanka identity and organization that follows common themes of Andean origin and settlement myths of groups throughout the *sierra* (Urton 1999). Tropes describe Chanka origins from distant lands, the antagonistic relationship between the migrating/invading Chanka and the autochthonous Quichua, and later Inca (*ibid*: 40), and finally the idea of a ranked society led by warlords. These paradigmatic elements, while spectacular, really do not reveal much about unique aspects of Andahuaylan culture. Thus, if the goal is to reconstruct Chanka and Quichua origins and society in the aftermath of Wari collapse, we must turn to other, less fantastical, lines of data.

Locating Chanka and Quichua Communities on the Landscape

As mentioned earlier, a wealth of information on prehispanic social organization and identity in Andahuaylas comes from colonial-era procedural legal documents. Unlike the chronicles, which served to inform Europeans (including administrators, kings, and ecclesiastical authorities) on the history and customs of the Andes, this class of documents had a much more limited audience. The documents primarily consist of land grants and judicial disputes and appeals concerning land tenure. In most instances, cases were brought by *kurakas* on behalf of their *ayllus*.

One of the most important documents that elucidates and located prehispanic Andahuaylan communities is a land grant *cédula* [writ] awarded by the Conquistador Francisco Pizarro to one of his lieutenants, Diego Maldonado, on April 15, 1539 (Table 3.3). Known as the *Writ of the Land Grant of Andahuaylas Consisting of the Upper Moiety Chanka, Lower Moiety Chanka and the Quichuas of Vilcaporo*,[7] this document lists 63 towns, their *principales* (leaders), and their moiety and ethnic affiliations, making clear distinctions between Chanka, Quichua, and other groups. Later, as a result of the Toledan reforms of the 1570s, these same 63 towns were reduced to 13 *doctrinas* (parishes), which, for the most part, still serve as district capitals within the province today: Andahuaylas, San Jeronimo, Talavera, St. Joan Evangelista [probably modern-day Chicmo], Guancaray [Huancaray], Turpo, Chuyllanansana [Chullisana in Cachi District], Ola [Colay], Vlcay [Ulcay], Charanba [Chaccrampa], Guayana [Huayana], Onamarca [Umamarca], and

[7] Original: *Cédula de encomienda de Francisco Pizarro a Diego Maldonado…de los Hananchangas y Orinchangas con los Quichuas de Bilcaporo.*

Table 3.3 Groups in the region following the order listed in the 1539 Encomienda of Diego Maldonado

Toponym named in 1539	Modern place name	Modern district	Colonial juristiction	Chief in 1539	Status/polity affiliation
Layoguacho	Ccoyahuacho	San Jeronimo	San Geronimo	Chuquicondorlapa	*Chanka*
Pomahuacho	Cotaguacho	Pacucha	San Geronimo	Bonbo	
Guamanilla	Sr. de Huanta Sanctuary	Andahuaylas	Andahuaylas	Condorsuka	
Capaçalla	Sr. De Hunaca Sanctuary	Andahuaylas	Andahuaylas	Hasto	
Ogoro	Ongoy	Ongoy	Ongoy	Llactaconas	
Banbamalca	Pampamarca	Talavera	Talavera	Guasco	
Quevilla	Ladilla (Achanchi)	Talavera	Talavera	Guancho	
Lacacha	Ccaccacha	Talavera	Talavera	Sulcaguaman	
Chuayapa				Tomaynanpa	
Caquesamarca	Saccasamarca	Chicmo	Talavera	Marasguaman	Ynga
Guayaconi	Huasipara?	San Jeronimo	San Geronimo	Ororo	Chachapoya
Pacocha	Pacucha	Pacucha	San Geronimo	Pacovilca	*Chanka*
Guataray	Huancaray	Huancaray	Huancaray	Yanas	
Orcomalca	Orjonmarca	Talavera	Talavera	Sutaya	
Yslana	Ismana	Talavera	Talavera	Allauca	
Pocollo	Pucullu	Pacucha	San Geronimo	Coyla and Mayma	*Quichua*
Gualguayo	Huallhuayocc	Andarapa	San Geronimo	Guamanbilca	*Chanka*
Cochabanba	Cotabamba	Andarapa	San Geronimo	Tibianaypa	
Chuquibanba				Alcailla	
Guarillane				Chochuman	*Quichua*
Cocas	Cocas	Andarapa	San Geronimo	Asaca	*Chanka*
Sillusque	Silcahue	Pacucha	San Geronimo	Cachaya	
Yanama	Yanaccma	Turpo	Turpo	Lanas	
Tororo	Toruro	Turpo	Turpo	Ynda	*Quichua*

Table 3.3 (continued)

Toponym named in 1539	Modern place name	Modern district	Colonial juristiction	Chief in 1539	Status/polity affiliation
Aymayba	Aynabamba[a]			Navihasto	*Chanka*
Chuchunbe	Chumbibamba	Talavera	Talavera	Suca	
Banbamalca	Bambamarca (Ayapata)	Huancaray	Huancaray	Guamanlapa	
Cocpalla	CCapaccalla (CCoplla?)	Andahuaylas	Andahuaylas	Guaraca	
Queca	Quecapata[a]			Guasco	
Lamay	Lamay Cascabamba	Chicmo Talavera		Quillichangas	
Chuquisguayo	Chuspiguacho	Talavera	Talavera	Naupacondor	
Pupca	Pupusa	Kaquiabamba	San Geronimo	Guachaca	
Pomachaca	Pumachaca	Ongoy	Ongoy	Magula	
Andasco	Antasco	Huancaray	Huancaray	Curitomay and Tomaycondor	
Quenoabilca	Quinuavillca[a]			Llangare	
Laracalla	CCarancalla	Andahuaylas	Andahuaylas	Quequehasto	
Opabacho	Oponguache[a]			Llacaguabeya	
Tolpo	Turpo	Turpo	Turpo	Guascopachua	
Andaquechua	Belen Anta	Turpo	Turpo	Chuqillapa	
Ococho	Occocho	Huancaray	Huancaray	Ala	
Tiquillo	Tecllo	Huancaray	Huancaray	Quiquimalca	
Magusycamalca	Maucallacta	Cachi	Chullisana	Maqui	
Lachi	Cachi	Cachi	Chullisana	Quequi	
Chilaçeni	Chullizana	Cachi	Chullisana	Bilcasana	
Capacalla	CCapcca	Cachi	Chullisana	Sulla	
Cola	Kula	Cachi	Chullisana	Chocollo	
Ayachica	Chicha	Pampachiri	Pampachiri	Lastas	
Chiara	Chiara	Chiara	Chiara	Suca	
Paracaya	Parocay[a]			Guachobilca	
Chacana	Chaccrampa	Chaccrampa	Chaccrampa	Husco	
Loraya	Toraya	Turpo	Turpo	Hasto and Lapa	

Toponym named in 1539	Modern place name	Modern district	Colonial juristiction	Chief in 1539	Status/polity affiliation
Suya				Chngaguasco	
Yanapasco				Curisica	
Chunbihallanga				Guacharondoy-magula	
Guyana	Huayana	Huayana	Guayana	Chuquicamaoca	
Omamarca	Umamarca	Umamarca	Unamarca	Sibopaucar	Orejon
Bilcabamba	Vilcabamba[a]			Calbacuri and Sevinda	*Chanka*
Alcaracay				Moygua	Orejon
Yatubi				Toca	*Chanka*
Chua				Aocasibi	Orejon
Aymaras	"Mitmakuna"	Aymaraes	Aymaraes	Guachaca	Aymaraes
Mayomarca	Mayomarca[a]			Chauca	Yauyo
Cahbibanba [Sallauparco]				Horcoguaranga	Tucuyrico Orejon
Guancabamba	Huancabamba	Andahuaylas	Andahuaylas	Chuquilanqui and Cubilica	Guanca and Yauyo
Quebincha	Huinchos	Andahuaylas	Andahuaylas	Guamancagua	*Chanka*
Yanaca				Guaraca	*Chanka*
Sondor	Sondor	Pacucha	San Geronimo	Guascarquiguar	Mamaconas and Yungas from Limatambo and Collasuyu

[a]Possible name identified from the *Encomienda*, but could not be confidently geographically located in this study

Pambachiri [Pampachiri].[8] By the late 1600s, Andahuaylas was divided into two *doctrinas*: the Chanka of the *Puna*, and the Chanka of the Valley (see Hostnig et al. 2007; Bauer et al. 2010).

Late prehispanic and early colonial population declines in Andahuaylas may be inferred from the 1539 *Encomienda*. These precipitous drops are due to protohistoric Inca and Spanish imperial policies, and not mass Chanka exodus or annihilation at the end of the Chanka–Inka war in the early 1400s. Estimates based on the number of registered tributaries suggest that in 1539, Andahuaylas was home to over 7500 households with at least 120 families at every settlement – or around 40,000 people in the entire province (Julien 2002). Using Toledan *visitas*, population estimates a generation later, in 1573, dropped to around 30,000 individuals. From there, the province witnessed a yearly 2–2.5 % decline until 1602. The neighboring *repartamiento* (allotted territory) of Cayara (now part of modern Chincherros and Andahuaylas Provinces) had a population of about 3000 in 1573 but also saw devistating yearly population declines of over 2 % (Cook 1981: 227).

The *Encomienda* document itself has an intriguing history. The parchment was discovered in a folder belonging to an illegitimate son of Diego Maldonado. It occurs as a copy in a seventeenth-century property claim put together by Ariel Maldonado, who may have forged documents elsewhere. As such, ethnohistorian Sabine Hyland (personal communication 2016) has convincingly suggested that the document may be an elaborate fake drawn up to settle inheritance disputes. Nevertheless, the author of the *Encomienda* had intimate knowledge of settlements in Andahuaylas. This is evinced by the fact that settlements are grouped together by region and ordered in such a way that more or less follows major river valleys and (pre)-Inca highways; the document was clearly created with the help of someone who was extremely familiar with the local geography. For instance, someone familiar with local geography in the eastern United States would know that if one is traveling north on Interstate 95, you would pass Washington, D.C., and then Philadelphia, before arriving in New York City.

Using modern toponymic information and witness testimony, we were able to identify 52 of 68 (72 %) towns listed in the 1539 *Encomienda.* We also relied on sixteenth- to nineteenth-century legal documents to identify toponyms that no longer exist, or whose names have changed (see Hostnig et al. 2007).

While there is strong evidence for Chanka-affiliated groups in the Andahuaylas after the Chanka–Inca war, the persistence of the local Quichua people is also supported by the documents. The Quichuas were a distinct polity in Andahuaylas, and the sites of Pucullu, Tororo, and Guarillane were relatively isolated enclave communities. This distinction is highlighted in the *Encomienda*, which distinguishes between Qu*i*chuas from Andahuaylas and Qu*e*chuas (Inca) from Cuzco. In fact, a

[8] Andahuaylas is not referred to in the *Encomienda,* but it does appear in other documents. The town is listed as a *tambo* (weigh station) called *Andaguaylas* [*sic*] by chronicler Cristobal Vaca de Castro in 1543 (1908:444). Our team tentatively identified the remnants of the Andahuaylas *tambo* in a neighborhood called Aranjuez, near the site of Diego Maldonado's original sixteenth-century home.

host of Incan people and administrative classes are identified (i.e., Incas, *Orejones*, *Mamaconas*, *Mitmaes*, and even a *Tucuyrico*).

By the time conquistador Diego Maldonado was granted the territory in 1539, Andahuaylas was home to a plurality of cultural and social categories like the *Orejones* (Inca nobility), *Yungas* (lowlanders), Yauyos, Chachapoyas, Aymarayes, and a few resistant Quichua enclaves. This diversity is probably the result of a well-documented Inca economic and political strategy of forced resettlement (*mitma*) and corvee labor (*mit'a*) (Rowe 1945). And just as foreign groups were being resettled in Andahuaylas, pockets of Chanka *mit'a* and *mitma* laborers could be found in locales as diverse as Andahuaylilas in Cuzco, Lucanas in Ayacucho, in the quicksilver mines of Huancavelica, and possibly as far away as Lamas, in the steamy jungles of northeastern Peru (see Cook 1981: 227; Cobó 1964 [1653]; Monzon et al. 1881 [1586]). Other towns in the *Encomienda* are newly-founded communities established and/or governed by the Inca (see Wernke 2006). Three towns are led by *Orejones* and another town is populated by conscripted laborers from Aymaraes, a province just southeast of Andahuaylas. The areas of Mayomarca and Chabibanba (still unidentified) are led by a Yauyo (an ethnic group from the central coast) and a *Tucuyrico*, an Inca captain and administrator.

The *Encomienda* sheds some light on the pluri-cultural nature of Andahuaylas in the years after conquest. Although it reflects migratory practices that were instituted as part of Inca imperial policies, pre-Incan cultural groupings may also be inferred. This is especially true given areas that many communities appear to have maintained their pre-Incaic Chanka and Quichua identities.

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Chapter 4
Chanka and Quichua Community Profiles and Mortuary Practices

Wari's collapse reverberated throughout the Andes. Monumental sites, colonial outposts and imperial road networks were abandoned, left desolate, and destroyed. Classes of people – administrators, diplomats, rulers, subjects – ceased to exist. From this calamitous political vacuum, the Chanka and Quichua polities were forged. But where did these folks come from?

Approaching this enigma required us to excavate and evaluate the skeletal remains of Chanka and Quichua people from mortuary sites in Andahuaylas (Fig. 4.1).

Machay Cave Burials and Mortuary Practices

Andahuaylas, like much of the Peruvian sierra, witnessed a unique mortuary phenomenon during the early LIP: the proliferation of mostly small, anthropogenic burial caves called *machays* (Salomon 1995; Duviols 1986; Doyle 1988; Arriaga 1968 [1621]). In Andahuaylas, *machays* are located on the skirts of natural rocky exfoliations and cliff sides and necessarily conform to the natural topography (Fig. 4.1). These caves are found both outside archaeological domestic settlements and within them. Spatial dimensions conform to the natural geomorphology, but internal wall divisions are sometimes built within the confines of larger caves. Smaller *machay*s are hewn from the bedrock. Caves may be sealed with boulders, and will often have thin, prepared earthen floors, and a stone bench or lip that runs across the aperture. Sometimes the stone benches extend in front of the cave aperture, outlining a rectangular or parabolic activity area (Fig. 4.2).

Machays were created to collectively inhume the dead. The corpses curated within played a profound role in structuring the lives of living descendants and were venerated and appeased through tangible, material offerings (Dillehay 1995).

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Fig. 4.1 A view of Sonhuayo Cave 1 at the Chanka site of Cachi after removal of a large boulder that had sealed the aperture

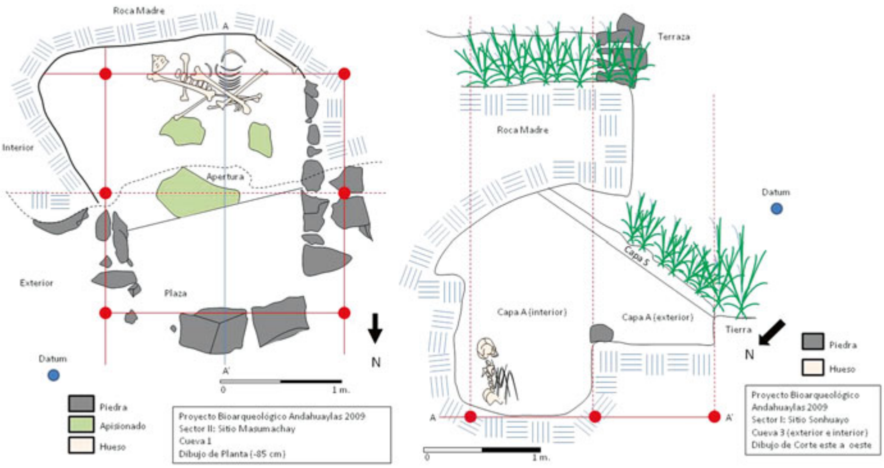

Fig. 4.2 Plan view (*left*) and transverse view (*right*) of a typical *machay* (note the parabolic stone bench that forms a small plaza space in front of the aperture)

As religious inquisition records relate, offerings would usually include small, personal, "utensils used during their lifetimes…sometimes gourds, sometimes vessels of clay or wood or made of silver or of seashells…spindles and skeins of spun cotton for the women, and *tacllas* [foot plows] for men to work the fields, or the weapons they used in war" (Arriaga 1968 [1621]: 27–28). Feasting at the Andahuaylan caves is confirmed by the presence of butchered camelid remains and

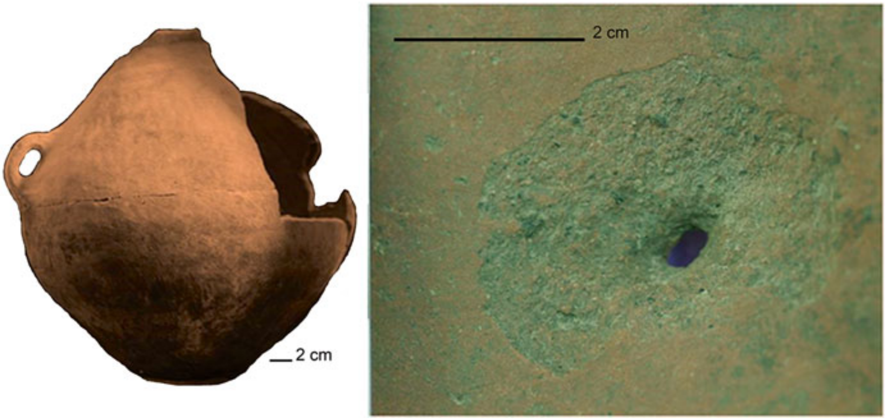

Fig. 4.3 One of several partially reconstructed *chicha* (maize beer) vessels recovered from the aperture of a *machay* (*left*); intentional, acute dashing *left* an impact scar on the vessel's interior (*right*)

intentionally fractured large *chicha ollas* (corn beer vessels) (see Duviols 1986) (Fig. 4.3).

Machays also served as natural territorial indicators. Land dispute testimony from Andahuaylas (Hostnig et al. 2007 [1612] and [1626]) cite *machays* as legal boundary markers. For instance, in the eighteenth century, Antonio Benites' property was identified by, "fields of wheat in Casacirca located on the outskirts of San Jeronimo, that are enclosed on the high end by ancient sepultures from the time of the Inca." Similarly, Nicolas Casango's lands were demarcated by a road that led up to a cave, a point brought forth in a written land dispute affidavit (Hostnig et al. 2007 [1730]).

Most *machays* are cavities hewn from bedrock, and in the Andes stone is viewed as a highly charged, multivalent material with transformative properties. For example, the *purunrauca,* were supernatural warriors transmuted from field stones who mercilessly slaughtered the Chanka (Urton 1999). Andahuaylan folk tales describe an event in time immemorial when the people of Laguna Pacucha were turned to stone by a vengeful water spirit. From the hardening of a baby's malleable skull to the petrification of the dead, local Andahuaylans today talk about becoming more "stone-like" as they age.

Because of their ontologically liminal properties, *machays* are conceived of as passageways (called *t'occo*) that straddle the natural and supernatural worlds. As such, they are auspicious and potentially dangerous places. *Machays* in Andahuaylas are sometimes referred to as *wayrancalla wasi,* the houses where malevolent winds are housed. Andahuaylan caves are auspicious today for other reasons as well. Livestock rustlers and thieves hide in *machays*, and during Peru's recent civil war, Shining Path "*terrucos"* (terrorists) slept in caves, and government soldiers used caves to clandestinely dispose of victims. For miners and prospectors, large and deep *machays* pose clear physical risks. Short-term hazards include cave-ins, rock falls, suffocation, and other accidents, while long-term risks associated with spending time in *machays* include bacterial or metal contamination and chronic respiratory problems (see Nash 1979).

Bural caves contain the remains of the recently and long deceased. Prehispanic peoples were acutely aware that corpses are polluting, and could easily inflict sickness on the living (Harris 1982: 54). Montesinos (1920 [1642]: xxii) relates that after a particularly bloody battle in Andahuaylas between the Inca and the Chanka, the Inca Sinchi Roca, "Ordered that many sepulchers be built, in which were interred the bodies of those who had been slain in the battle; and he took especial care about this matter on account of the plague which had been caused by the decaying of bodies in former years."

Once desiccated or skeletonized and deposited in caves or sepulchers,[1] human remains were exposed to a host of taphonomic processes, including root growth, animal scavenging and gnawing, rock falls, "body-burn," soil acidity and alkali variability, humidity and temperature fluctuations, earthquakes, and rain.

Machays are also loci of ethnic and political origin and reproduce idealized social orders (Salomon 1995). Inca lore recounts how Manco Inca, his *panaca* (lineage), and allied ethnic groups emerged from a series of *machays* at Paucaritambo in the Cuzco heartland (Urton 1999). As a fitting postscript, Manco Inca's brother, a man named Ayar Cachi, was eventually entombed alive in a small *machay*, where he suffered a slow and painful death.

Colonial priests zealously reported to superiors that *machays* concealed the remains of *mallquis,* apical ancestors who were venerated as lineage progenitors. Furthermore, members of the same *ayllu* were collectively interred in well-known *machays* (Duviols 1986: 289; Doyle 1988). The Spanish inquisitors observed that different descent lines from the same *ayllu* were placed in caves next to each other.[2] A seventeenth century account from the central Peruvian Andes recounts:

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[1] *Chullpas*, aboveground open mortuary sepulchers (Isbell 1997), may have been used in Andahuaylas to temporarily store human remains. Throughout the course of our survey work, we encountered several *chullpa* sites. These sites were located on windy saddles with wide viewsheds. They are associated with agricultural terraces and *apachetas* (passes with stone cairns) or *huacas* (shrines). Due to their small size, only ~2–3 adult mummy bundles would have been able to fit in each cylindrical sepulcher. Similar to food-storing *collqa*s, *chullpas* in Andahuaylas might have been used to desiccate bodies, and may not have been intended for more permanent storage. Given the less architecturally integrated nature of *chullpas*, relative to *machay*s, as well as practical space limitations, aboveground sepulchers may have been used intermittently, as either a desiccation stage of the mortuary process, or as a temporary, performative "showcase" for certain important mummies. Today, *chullpas* sites in Andahuaylas remain important loci of yearly, ritual, and festive congregation.

[2] Original Colonial Spanish: *Los tenian en tres bobedas muy curiosas debajo de la tierra arriba en los pueblo biejos llamados Marca Patacum entrrados en ellas y toda su familia en la bobeda o* machay *Choqueruntu y su hermano Carua Runtuc estaba en otro con su familia donde abia setenta y cinco cabezas del* aillo *Conde Ricuy y en el* aillo *Chaupis Otuco y el de Xulca estaba libiac Raupoma Libiac Uchupoma y su familia que eran quarenta y dos cabezas y en el del* aillo *Allauca esta Libiac Rum Tupia con su hermano Libiac Guacac Tupia con quarenta y quarto cabezas de su familia… Y asimesmo manifestaro los susodichos a Cuspa* malqui *con sinquenta y seis cuerpos de su familia y diejieron que abia cuerpos de cristianos rebueltos entre los jentiles.*

> In three curious subterranean vaults above the old town, were the remains of Marca Cuipac and his brother Paria Putacac in the vault or *machay* called Choqueruntu, and their brother, Carua Runtuc, was in the other cave with his family where there were seventy-five heads from the *ayllu* Conde Ricuy; in the cave of the Chaupis Otuco and Xulca *ayllus*, there was Libiac Raupoma, Libiac Uchupoma, and his family who numbered forty-two heads; in the cave of the Allauca *ayllu* there was Libiac Rum Tupia with his brother Libiac Guacac Tupia, with forty-four heads of his family. (Duviols 1986: 52–53)

The inquisition testimony makes it clear that *ayllus* maintained several *machays* where less than a dozen and up to several hundred people were interred. It also appears that communities, or at least members therein, had detailed knowledge of descent groups and caves. Records from extirpation campaigns relate that bodies would be disinterred from church grounds and redeposited back to specific, named *machays,* known from social memory. Extirpators lamented when they discovered that one particular cave not only held the remains of *mallqui* Cuspa and 56 of his family members, but also a cache of intentionally exhumed baptized corpses, which had become commingled with the pre-Christian dead (Duviols 1986: 289).

Keeping track of complicated genealogies and assuaging the dead was no easy feat. As such, *machays* were tended to by a ritual specialist whose job it was to make offerings, serve as an oracle, maintain an active memory of interred individuals, and remember the name of the cave itself. Cobó (1964: 165) reaffirms these customs as well as the patrilineal basis of *machay* collectivity. He relates that not all living people venerated all the dead bodies, nor all their relatives, but rather those from whom they directly descended. In that respect, everyone could remember their father, grandfather, and great-grandfather but not the brother of their father, nor their great uncle, nor those that died without leaving descendants. While prominent chiefs were recalled, the memory of their children or grandchildren was lost in death.

Cobo's account appears to be supported by modern genetics. Recent ancient DNA studies on LIP skeletal remains from *chullpas*, above ground tombs contemporaneous with the more humble *machays,* are starting to elucidate the biological basis of burial collectivity in Arequipa, Peru. Kinship analyses using both uniparentally (mtDNA from the maternal line, and Y-STRs from the paternal line) and biparentally (autosomal STRs from both parents) inherited markers indicate a complex pattern of relationships between individuals buried in the same grave (Baca et al. 2012). Microsatellite data revealed that in some tombs, all male individuals were kindred because they possessed identical Y chromosome profiles. Relatedness coefficients indicate that those males were rather distant relatives and probably belonged to different generations. These data support a model whereby tombs were composed of patrilineal family groups where members of each family group were buried in a common and distinct grave. Patterns in burial collectivity were structured by marriages between members of distinct groups, such as the inclusion of the bride into the grooms family, and her burial in the husband's family grave. However, the rules for internment were apparently flexible. In one *chullpa*, several different Y chromosome lineages were found, but individuals shared the same mtDNA. These individuals had the same mother, but different fathers. While patrilineal burial appears to be the idealized norm, the realities of procreation will show that this was not always the case.

The Chanka Hillfort and Salt Mine at Cachi

Cachi (the Quechua word for *salt*), is an archaeological village complex located in San Antonio de Cachi District, Andahuaylas Province (Fig. 4.4). Today, as in prehistory, Cachinos are proccupied with rainfed agriculture, livestock husbandry, and salt rock mining from the Mina Salt Mine. There are prehistoric terraces in generally poor condition; *qochas* (reservoirs) are located in the grasslands above the site. Nestled within precipitous slopes covered by xerophytic vegetation, thorny shrubs, and abundant scrub ground cover, natural rock outcrops have been modified to form hundreds of *machay* burial caves.

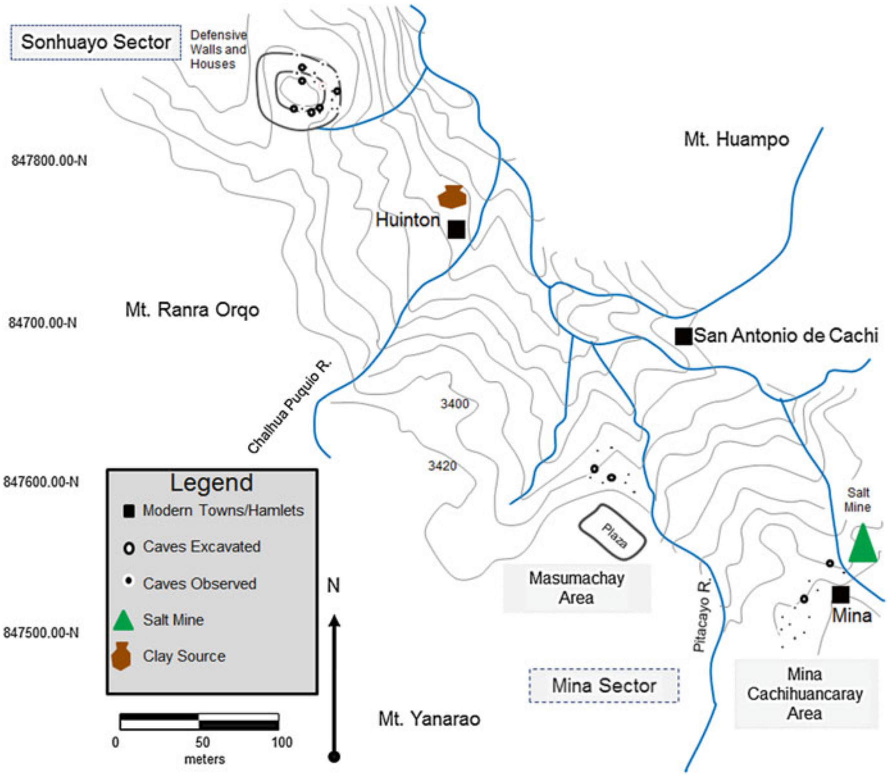

Fig. 4.4 Map of Chanka site of Cachi and its major sectors, areas, and notable features

The Sonhuayo Hillfort Sector

Sonhuayo (3365 MASL) is a 5 hectare fortified habitation site located on a promontory that has clear views across three rivers to provinces several days' walk away. The accessible south side of the site is protected by a wide ditch and a series of concentric perimeter walls. Burial caves are located in various parts of the hill, and generally extend in a line under rocky outcrops. Caves tend to be built into the bedrock that forms the foundation of agricultural terraces; these terraces extend down the slope of the settlement. Throughout the site, agglutinated circular houses are arranged into haphazard patio groups.

At Sonhuayo, burial caves were used for five-to-six generations at most (Table 4.1). Radiocarbon dates help support this assertion. For instance, the deepest part of a *machay*, identified as Cave 2, is dated to AD 1123–1257 (85 %), while the middle section of the cave dates to AD 1160–1260 (2σ). Finally, the last person entombed before the entire *machay* was sealed with a large boulder dates to AD 1260–1290 (2σ). These results demonstrate that there is significant temporal overlap between the deepest-buried individual and the last-buried individual. Remains may be contemporaneous, or at most, represent about a century of use. Impressively, over five dozen people were entombed within Cave 2, an area an area that measures around 10 cubic meters. Rather than centuries of unimpeded use, these dates show that *machay* utilization may have been more tightly circumscribed than previously considered.

At Cave 1, located less than 4 meters east of Cave 2, the deepest-buried, apical individual was dated to AD 1220–1280 (2σ), somewhat later than the neighboring cave. Internment in Cave 1 seems to have begun as Cave 2 was being filled with the remains of the dead and permanently sealed. While more dates are need to draw firm conclusions, cave use at Sonhuayo may have been staggered: new *machays* were created when old ones filled up with bodies of the dead.

The Mina Salt Mine Sector

The eastern portion of Cachi, known today as Mina Cahihuancaray, consists of a prominent salt mine. This sector, which has an ephemeral Wari presence, is composed of two areas: Masumachay (3380 MASL), a steep butte-like hill that has burial caves and agricultural terraces, a plaza, and half a dozen houses. The burial caves on Masumachay are hewn from bedrock outcrops in the middle part of the hill. Most caves are disturbed, but scattered human skeletal remains are associated with fragments of pottery and lithics from the late Middle Horizon and LIP. Two intact caves were excavated and surface remains were collected from a third cave that was heavily looted.

At Masumachay Cave 2, Wari artifacts were embedded in the deepest recesses of a clean, prepared floor that had been entombed with sterile fill and tamped down to

Table 4.1 AMS radiocarbon dates from Andahuaylan *machays*

Lab code (Beta Ana.)	Burial code	Site sector cave	Location	Material	$\delta^{13}C$	^{14}C age (years BP)	2 σ (AD)
318796	Tqr.01.01.01	Turpo, Qatun Rumi Tomb 1	Apical	Wood	−26.0	1110 ± 30	880–990
310951	Son.02.04.57	Cachi, Sonhuayo Cave 2	Apical	Tooth	−8.3	860 ± 30	1123–1257
310874	Son.02.02.12	Cachi, Sonhuayo Cave 2	Middle	Charcoal	−24.6	840 ± 30	1160–1260
323934	Son.02.02.05	Cachi, Sonhuayo Cave 2	Aperture	Tooth	−10.3	730 ± 30	1260–1290
310950	Son.01.Rinco	Cachi, Sonhuayo Cave 1	Apical	Bone	−10.8	770 ± 30	1220–1280
323935	Son.04.01.2008	Cachi, Sonhuayo Cave 4	Aperture	Bone	−13.6	340 ± 30	1450–1640
323924	Mch.01.01.xx	Cachi, Mina CH Cave 1	Apical	Charcoal	−22.9	1230 ± 30	690–880
323925	Mch.01.01.xy	Cachi, Mina CH Cave 1	Middle	Tooth	−17.0	1150 ± 30	805–973
323926	Mch.01.03.02	Cachi, Mina CH Cave 1	Aperture	Tooth	−11.8	560 ± 30	1306–1430
323927	Mpm.01.13.xx	Cachi, Mina CH Cave 2	Aperture	Tooth	−13.5	850 ± 30	1160–1260
323928	Mpm.01.01.16	Cachi, Mina CH Cave 2	Apical	Tooth	−14.4	1170 ± 30	776–966
323929	Msm.02.xx.xx	Cachi, Masumachay Cave 2	Aperture	Tooth	−13.4	860 ± 30	1123–1257
323930	Msm.02.01.xx	Cachi, Masumachay Cave 2	Apical	Bone	−14.7	810 ± 30	1170–1270
323931	Msm.05.01.01	Cachi, Masumachay Cave 5	Aperture	Bone	−10.8	530 ± 30	1351–1440
323933	Rcc.01.01.04	Ranracancha Ayamachay, Cave 1	Aperture	Tooth	−13.6	850 ± 30	1160–1260
323932	Pcu.01.01.26	Pucullu, Manchaybamba, Cave 1	Aperture	Tooth	−12.1	810 ± 30	1170–1270

create another earthen canvas. Human remains were placed on this surface. This pattern of cleaning out and repurposing caves may have been common at Cachi. AMS dates from the apical individual buried on top of the repurposed floor in Masumachay Cave 2 (Beta-323929) were dated to 1123–1257 (85 %). The individual buried nearest to the mouth of the *machay* (Beta-323930) had an AMS date of 1170–1270 (2σ).

The neighboring area, *Mina Cachihuancaray* (3530 MASL), is characterized by natural and anthropogenic burial caves used for burial during the LIP, and as early as the late Middle Horizon. The landscape is dominated by the Salt Mine, where extraction by hand has continued unabated for some ten centuries. At Mina Cave 1, excavation stratigraphy, floor preparation, and artifactual data suggest the *machay* was first used during the eighth century. A piece of charcoal (Beta-323924) and a loose tooth (Beta-323925) embedded in the corner of a cleaned prepared earthen floor at the deepest part of the *machay* were dated to AD 690–880 (2σ) and 805–973 (91.1 %), respectively. After the deposition of the charcoal and tooth, a layer of sterile fill and a new stamped earthen floor were prepared. Human remains were then collectively interred. As in other sectors, the cave was systematically cleaned out and repurposed sometime after Wari's fragmentation. A tooth from a young adult female (Beta-323926) eroding out of the aperture of Mina Cave 1 yielded a radiocarbon date of AD 1306–1430 (2σ), the late LIP. At this mine sector crypt, individuals were interred after the eleventh century, but before the fourteenth century AD, so during the early-middle Late Intermediate Period. In addition to AMS radiocarbon data, and evidence of repurposing after Wari collapse, ceramics recovered from Mina Cave 1 conform to early Chanka styles and assemblages recovered from other early LIP *machays*.

A second *machay,* locally known as *Pukamachay*, is a large, natural cave; an interior dividing wall demarcated *apica*l and *aperture* sectors. From the deepest (apical) sector of the cave, under a rock fall, we identified a young adult female cranium dated to AD 776–966 (2σ), the twilight of the Wari Empire. Given its isolation, this cranium was not included in the analysis of other Middle Horizon-era remains (all from Turpo). Finally, one of the last-buried individuals yielded an AMS date 1160–1260 (2σ). *Pukamachay* was thus primarily utilized during the terminal Middle Horizon and Late Intermediate Period (Fig. 4.5).

The long period of *machay* use in the Mina sector may be related to the importance of the region's salt industry. Use and reuse of the same cave over several centuries (versus decades like at Fort Sonhuayo) may have been a way to maintain ownership claims regarding salt extraction. Indeed, a rich documentary record attests to the fact that Cachi was an important upper moiety (*hanan*) Chanka community. And Cachi’s most valuable resource is its salt mine, the largest and most productive in the region. Ceramics from the mine itself confirm that various apertures have been exploited since at least the later Middle Horizon. Behaviorally, salt extraction in Cachi today differs little from the prehispanic period (Fig. 4.6). While homemade dynamite is now used to loosen rock, “nibbling” on the façade of the oldest parts of the mine suggests stone or bronze tools were used in prehistory. Gas lamps still light the way for modern miners (and help inform on oxygen levels), but

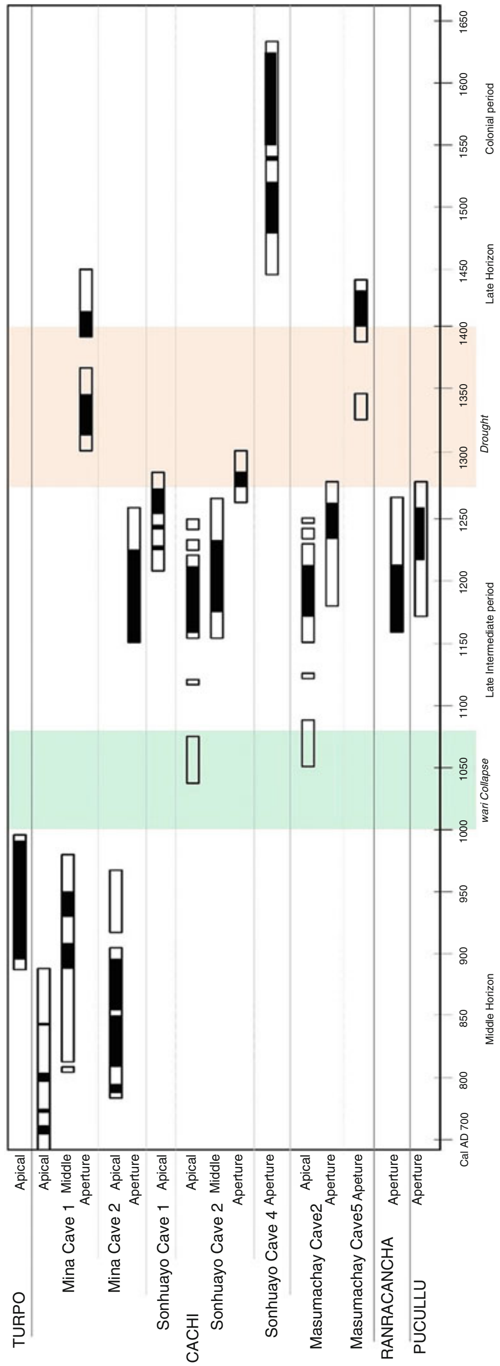

Fig. 4.5 A visual representation of AMS radiocarbon dates from Andahuaylan *machays* (*black bars* are the one-sigma range)

Fig. 4.6 *Mineros* (miners) working at the salt mine in Cachi (Photo courtesy Enmanuel Gómez Choque)

torches were employed in antiquity, as evinced by fire-blackened walls. Mine activity is highly regulated. Labor is structured by gender: only males are allowed to enter and work the veins, and boys as young as ten years old accompany their fathers into the shafts. Miners carry loads of salt up to around 40 kg on their backs. *Mantas* (mantles) and *pellejos* (animal skins) are used as padding; fiber ropes keep the rock in place during transport out of the shaft. The salt is loaded onto pack animals (and now flatbed trucks), and exported to surrounding communities, and sold by the *arroba* (1 *arroba* = 11.5 kg) at the Andahuaylas Sunday market. While most individuals in Andahuaylas City use the rock salt for their animals, people in Cachi chip small pieces of stone and dissolve them in water, creating brine that is used to season soups, eggs, and other dishes.

In prehispanic times, salt mining was likely a full-time task that peaked in the dry season (April–November), when access to subterranean veins was not impeded by rains and the possibility of flooding or erosion. This is also the season when agricultural fields lie fallow. Certainly by the Inca era, if not earlier, occupational miners were identified as a distinct social class. Monzon et al. (1881: 179) remarked that those who mined do not give any other tribute or service. All salt mines in the region were enclosed and guarded. Nevertheless, locals could still benefit from the salt that they stored in deposits.[3]

[3] Original: *Los que hacian esto no daban otro tribute ni servicio…tenian en todo la tierra Salinas acotadas y guardadas, y en ellas indios que las beneficiaban y ponian la sal en deposito.*

Mining was, and remains, a dangerous occupation. Extraction in narrow, claustrophobic conditions that lack the necessary safety measures – even by nineteenth-century occupational health standards (Arrancivia 1896: xx) – often led to accidents. Interviews with miners and the health workers in Cachi inform on common injuries including crushed fingers and toes, broken lower limb bones from falls, and osteoarthritis on vertebral, arm, and shoulder joints from salt extraction and carrying heavy loads. Chronic ailments include asthma and pneumoconiosis caused by breathing air full of dust and smoke particulates. Locals understand the physical risks inherent in salt extraction. Particularly dangerous shafts are abandoned by the community. Indeed, for several generations, the most coveted salt came from a pit shaft called *Desenbridora*, which can no longer be worked because of a lack of ventilation and structural instability from overextraction.

The mine is a resource Cachinos will defend to the death (see Hostnig et al. 2007). In 1622, *kuraka* Apohuasco affirmed that the salt mines and *chakras* of his *ayllu* would be closely guarded, "for all time, and since time immemorial." Cachinos remained steadfast in keeping other foreign *ayllus* out of the mines. Clandestine miners from nearby towns like Tocctobamaba and Chiara who attempted to open pits or enter shafts were quickly disposed of by violent means. In 1677, *Repartador de Tierras* [land grant administrator], Don Juan Antonio de Urra, noted that Cachinos regularly engaged tactics of terror against perceived usurpers. Violence was aimed at people and at their agricultural fields. Combatants threw rocks, pulled plants from the root, and revolted.

Although Cachinos are dedicated to extracting blocks of red, gritty salt called *pukacachi*, they were not historically involved in intraprovincial transport; that task fell to other communities. For long-distance exportation, long caravans of llamas were used. Even as late at the mid-late twentieth century, Cachi salt was transported to Andahuaylas City and far away provinces like Lucanas, Aymaraes and Abancay, Chincherros, Cotabamba, Ongoy, Soras, and even Arequipa and Ica, a journey that would take several days to weeks.

As a highly guarded, community-managed resourced, every inhabitant in Cachi was afforded the right to open a vein and extract salt from a communal shaft. These shared resources are analogous to collectively held agricultural fields, called *laymis* (or *tierras communales*). However, veins varied in terms of extractable volume and salt quality (Arrancivia 1896: xxvii), and throughout the late nineteenth century, apertures were controlled by specific *ayllus*. Aided by a robust salt trade during the Colonial era, several Cachinos ended up becoming the heads of huge macro *ayllus* that included hundreds of communities (Table 4.2). Certain *ayllus* appear to have regularly consolidated power by controlling valuable shafts. One such *ayllu* may have been the Mallmas. The Mallmas' leadership roles in Andahuaylas were noted by chronicler Sarmiento de Gamboa (2007) in the fifteenth century, and the *ayllu's* authority in Cachi is documented as early as 1679, when Mateo Mallma served as *kuraka* of Chullisana, a lower moiety settlement a few kilometers from the Cachi salt mine (Hostnig et al. 2007). Fortunes rose and fell for the Mallmas. By the late nineteenth century, the *ayllu* mined the lowest quality salt in Cachi. Oral history

Table 4.2 Early Colonial leaders in Cachi

Year	Position of authority	Name
1539	*Kuraka* principal	Quequi
1679	*Kuraka* principal	Juan Baptista de Mendoza
1718	Governor and upper moiety *kuraka* principal	Pedro Oscorima
1718	Lower moiety *kuraka* principal	Fransisco Sairetupa
1718	Head of *ayllu* in Cachi	Juan Mallma
1718	Head of *ayllu* in Cachi	Geronimo Mallma
1724	*Kuraka* of lower moiety Valley Chanka	Bernardo Minaia [Minaya]
1724	*Kuraka* of lower moiety *Puna* Chanka	Felix Cardenas
1730	Governor of *Puna* Chanka	Nicolas Lopes Casango

narratives from some of Cachi's older residents suggest that this inequality sparked violence; the Mallmas were known as a bellicose group that often tried to dispossess other families of their mines. Violence led to bruises, broken bones, and sometimes death.

Given historical accounts of Cachi, mining was apparently controlled locally by different *ayllus* in prehistory. Although mining was physically demanding, the rewards of controlling an important commodity outweighed the risk of accidental injury or intercommunity conflict. By the Colonial Period, powerful *kurakas* from Cachi assumed leadership of hundreds of lineages distributed over wide swaths of territory. Although perhaps not solely due to the mine, the need to protect sinewy salt veins and expansive trade networks may have been a factor in fomenting higher-than-average levels of violence. Furthermore, managing claims for mining rights among different *ayllus* may have prompted the need to implement ethnic markers in order to identify categories of individuals who had the right to extract salt.

Human Remains from Cachi's Eastern Frontier

Just over the eastern pass of Cachi's Mt. Huampo range, lie dozens of natural rock shelters. Curated for burial during the postimperial era, these *machays* are located at the top of nearly inaccessible slopes that extend in a generally linear fashion under the rocky outcrop that forms the summit of the Qasiachi plateau (3405 MASL). Although covered by thorny vegetation, all the caves have been disturbed or looted in the recent past. Sun-bleached skeletal remains were removed and curated at the Natividad (Huancaray) Community Museum in the 1990s. From Colonial-era documents, we know that the region was governed by a *kuraka* named Guasco Pachua whose descendants maintained leadership in the region through at least the eighteenth century (Hostnig et al. 2007). The human remains from the Qasiachi caves were affiliated with the upper moiety Chanka.

Ranracancha: Lower Moiety Chanka in the Wilderness

While Cachi was home to the upper moiety Chanka, those from a lower moiety macro-*ayllu*, known as the Ancohuallyos, lived near the town of Ranracancha, which pertained to an isolated region of northwestern Apurimac that Spanish chronicler Betanzos (2004: 211) derided as the hostile "Omapampa wilderness." Today, traffickers take advantage of the region's isolation, and in the 1980s, during Peru's civil war, the area was a hotbed of terrorism and flagrant human rights abuses and far from the gaze of the central government.

In a sector of Ranracancha called LLatanacu, there is a large, natural cave, known as *Ayamachay* (3436 MASL). Today, it is badly looted and poorly preserved. Associated with Late Intermediate Period ceramics, human remains in the cave date to AD 1160–1260 (2σ). The bones of the dead were deposited in the natural opening, and in hollowed niches above the main aperture. These burial niches are still sealed with clay-packed mortar and roughhewn stone cobbles. There are no other visible signs of prehispanic architecture at Llatanacu, but there are extensive, prehispanic terraces a 30-min walk to the east.

There is no mention of Llatanacu before the twentieth century, although Cieza (1996 [1553; 289–291]) posits that the local population was totally displaced during the Inca period. The area was home to *mitmaes* [foreign corveé laborers] because, the natives had all apparently died during the wars with the Inca. However, other procedural documents belie this assertion. These texts attest that Ranracancha was part of the *repartimiento* of Cayara, populated by members of the lower moiety Anccohuallyo *ayllu* (see Bauer et al. 2010; Kellet 2010) affiliated with the Chanka polity at least through the early sixteenth century.

The Quichua Enclave of Pucullu

Pucullu, in Pacucha District, is one of the towns identified in the 1539 *Encomineda* as a site affiliated with the Quichua polity. Human remains were recovered from the surface of one looted cave (3060 MASL) in the Manchaybamba sector of Pucullu. This anthropogenic cave is located along a rocky outcropping near the summit of an almost inaccessibly steep hill that rises above Laguna Pucullu. There are no visible traces of prehispanic architecture nearby. Despite the sparse evidence of prehispanic occupations in Pucullu, there are important archaeological sites near this area including Sondor, Achanchi, and Luisnayoq that date to the Late Intermediate Period and Late Horizon (Kellett 2010; Bauer et al. 2010; Bauer and Kellett 2010). Human remains from a burial cave in Pucullu were dated to AD 1160—1260.

Fig. 4.7 Chanka miniature ceramics

Machay Burial Artifact Assemblages

Because human remains were mostly commingled, it was impossible to directly associate artifacts with single individuals. In all surveyed contexts, Andahuaylan burial assemblages are characterized by nonfunctional miniature vessels (Fig. 4.7). Furthermore, *machays* always contained paired stone and metal implements, including *liwis*, *aillos*, and *porras.* While these weapons could have been used for hunting, they are important indirect signatures of warfare and violence (Fig. 4.8) (see Nielsen and Walker 2009).

The presence of puma skulls (without postcranial elements) were transformed into totemic headdresses[4] (Cobó 1964: 133) (Fig. 4.9). Today, communities in Andahuaylas still maintain this headdressing tradition during festivals. Other classes of artifacts included small personal items like spindle whorls, *tupu* mantle pins, weaving implements, and groundstone tools (Fig. 4.10). These artifacts tend to be associated with female domestic activities (Silverblatt 1987).

Some artifactual classes in *machays* pertain to gendered collectives, and not individuals. For instance, several camelid-shaped *conopas* (talismans) were recovered (Fig. 4.11). Sarmiento de Gamboa (2007) claimed that llama *conopas* are an insignia of nobility, while Betanzos (2004: 109) interpreted them as an indicator of occupation,[5] and Arriaga (1968 [1621]: 29) explained that llama *conopas* were used to assure growning, fecund herds. His account further suggests that the use of each *conopa* was limited to a single lineage, and the small totems were privately passed

[4] As Cobó (1964: 133) describes it, "On top of [their heads] they wore lion skins. The entire animal's body was skinned, and their heads were empty. Patens were placed on these heads; rings in their ears, and in place of their natural teeth, others of the same size and shape were used with *alijorcas* [sequins] on their paws…. These skins were worn in such a way that the head and neck of the lion came down over the head of the person wearing it and the animal's skin came down over the person's back."

[5] Betanzos (2004: 109) writes, "Those who raised livestock were to have an insignia of it hanging on their door, such as a sheep's…jawbone…If the man were a hunter, a fisherman, or a farmer or had any other trade, he should hang on the door of his house some insignia of it."

Fig. 4.8 Stone weaponry: sling stone (*huaracas*), mace head (*maccana*), and bolo weapon (*liwi*)

Fig. 4.9 Totemic animal affiliation. Dog (*above*) and puma (*below*) skulls from *machays*. The photo on the *right* demonstrates the modern use of curated animals to denote lineage affiliation in Andahuaylas (Photos courtesy Enmanuel Gómez Choque)

Fig. 4.10 Material indicators of female gender affiliation include copper shawl pins (tupu) and weaving implements

Fig. 4.11 Camelid (llama/alpaca) *conopa* talismans, indicators of male corporate group identity and patrilineage

within the household from father to first-born son. The presence of these emblemic totems in Chanka tombs imply that those collectively buried within may have not only shared occupational responsibilities (like camelid herding), but could also be kin, ideally related through patrilineal descent.

Regardless of moiety or Chanka or Quichua political affiliation, *machay* grave assemblages included functional personal items largely associated with gender or lineage-specific activities. Nonfunctional artifacts like paired miniature ceramics, curated local predator skulls,[6] and camelid *conopas* were also commonly encountered and are consistent with social collectives or patrilineages. Ceramic assemblages consist of unadorned utilitarian wares (see Kellett 2010; Gómez Choque 2009). Intentionally smashed *chicha* beer vessels and butchered camelid and guinea pig remains point to feasting within benched-in activity areas.

Andahuaylan Mortuary Practices

Several lines of evidence demonstrate that the dead were embalmed before being entombed in *machay*s. First, the interior dimensions of a roughly 6-cubic-meter cave would simply not hold the fleshy bodies of some five dozen individuals. Moreover, *machay*s were often located near (and sometimes upwind) of houses. Dozens of corpses collectively entombed in humid caves, at different stages of decomposition, would have created a potential health crisis. There are dozens of intact mummies on display in various community museums throughout Apurimac. Soon after death, bodies were totally eviscerated, and the knees were tucked into the emptied thoracic cavity. Corresponding cutmarks can be observed on the visceral side of ribs. These tell-tale marks are produced when a practitioner separated the lung pleura (lining) from the chest cavity (Schneider et al. 2012).

[6] Strontium isotope testing on teeth from two dog skulls at Cachi (*Canis familiaris*) revealed values consistent with western Andahuaylas.

Mummification and body curation in general contributed to delayed, secondary *machay* interment. Pupal insect casings and sedimented mud inside crania was distinct from cave soil. This key piece of evidence means that bodies decomposed for several weeks before being entombed. There is also some evidence of gnawing by small, rodent-sized, mammals. Poorly preserved remains of mummy bundling material include *ichu* grass and plain-weave textiles spun from llama wool. This material makes up the majority of cave deposition matrices. The addition, removal, or repositioning of decaying mummy bundles likely contributed to thorough commingling of body part.

Overall, Andahuaylan mortuary practices reflect the maintenance of old Wari and Qasawirka practices as well as new traditions. Signs of lingering continuity exist in a variety of media: Both pre- and post-collapse burials contain ceramic and lithic assemblages of paired miniature objects like *ollas* and bottles (see Tung and Owen 2006). Furthermore, the Middle Horizon tomb and the Chanka and Quichua *machays* all contained articulated, first-buried apical individuals and commingled secondary burials. Articulated axial and appendicular skeletal elements of apical individuals indicate limited postdepositional alteration (Duday 2009). The apical individuals were always buried either face down, or facing the back of *machays*. That these ancestors gaze into the earth, and not out in the direction of the living, may inform on the nature of power imbued in Andean skeletal remains. The obligation of the ancestor was directed towards bedrock and productive, fertile soil, to ensure a successful harvest (see Harris 1982; Allen 2002 [1988]), rather than toward devotional progeny gathered outside cave mouths and tomb walls.

However, several categories of artifacts suggest that Chanka and Quichua people totally rejected the majority of Wari precepts regarding treatment of the dead. Conspicuously, stone-lined circular tombs were not used by post-collapse groups in Andahuaylas. *Machays*, which may have been used during the Middle Horizon, were subsequently cleaned out and repurposed after Wari collapse. Wari's waning influence is further evinced by the repudiation of imperial iconography and ceramic styles. In stark contrast to Wari’s exquisite polychromes with vivid images, ceramic assemblages in *machays* are unslipped, unadorned, and brusquely fabricated. All told, these results hint at nuanced transformations in burial traditions, and signal the genesis of a novel mortuary ideology in postimperial Andahuaylas.

Osteological Indicators of Community Organization in Andahuaylas

Excavation and radiocarbon results demonstrate that: (1) caves were repurposed after Wari collapse; (2) caves became the primary form of inhuman for the Chanka and the Quichua; (3) internment was always collective; (4) caves were used only for about a century (five-to-six generations), and; (5) cave use appears to be staggered.

Investigating the skeletal remains of Wari-era, Chanka, and Quichua people in Andahuaylas can aid in our understanding of how Wari collapse directly impacted physical bodies and social lives. This is easier said than done. Before we dive into the data, it is important to mention the sampling challenges in this type of investigation. First, the recovery of osteological material was impacted by intentional postmortem, postdepositional activities including delayed burial and periodic disinterment and reinterment (Isbell 1997; Salomon 1995; Duviols 1986). These mortuary customs caused human remains to become increasingly commingled over time. In other cases, excessive looting of *machays* significantly inhibited the recovery of skeletal material. At the Natividad Museum, the collection is the result of cherry-picking. In instances of biased recovery, postcranial elements are usually lacking or significantly underrepresented. Finally, centuries of animal scavenging, root growth,[7] soil acidity, and temperature and humidity fluctuations compromised the structural integrity of skeletal elements (Paine and Harpending 1998). But these types of limitations are not rare in bioarchaeology, so fear not. We can marshal multifactorial methods applied to multiple lines of data and interpreted in their archaeological and environmental contexts help overcome and avoid pitfalls (Wright and Yoder 2003; Tung 2012; Torres Rouff 2003; Andrushko 2007).

Paleodemographers remind us that skeletal remains represent the dead, and are not necessarily a reflection of the once-living population (Wood et al. 1992; Milner et al. 2008; Sattenspiel and Harpending 1983; Paine and Harpending 1998; Wright and Yoder 2003; Bocquet-Appel and Masset 1982; DeWitte and Wood 2008: 1436). Nevertheless, demographic profiles of skeletal populations can still inform on social structure and community organization. Usually, the force of mortality forms a U-shaped curve (also called a bathtub curve), with the very young and the very old encompassing the majority of the dead. When skeletal populations are further separated into age categories, mortality profiles in healthy populations often form a backwards-J curve (Weiss 1973). In this pattern, there is a high percentage of infants and children in the burial sample, proportionally few juveniles and young adults, and a higher percentage of middle and old adults. These normal *attritional* mortality patterns are common in relatively healthy, peaceful populations. However, catastrophes like sustained violence, war, famine, and disease can change the contours of mortality and demographic profiles. Factors include lowered fertility, higher infant mortality, excess mortality for adults in their prime, and even mass population die-offs.

In Andahuaylas, Wari state collapse may have altered community organization during the subsequent postimperial era. By comparing sex and age-at-death profiles of skeletal populations during the Middle Horizon (the Wari era) and Late Intermediate Period, we can reconstruct a mortuary snapshot of cave populations. Understanding *who* or *what types* of people were buried together can inform on the social rules and social perceptions that governed practices of *machay* interment.

[7] Intriguingly, intact, sealed *machays* could always be located by identifying the bright, yellow buds of the *cruzkitchka* thorn tree. Excavations revealed that the roots of the *cruzkitchka* tended to wrap around bones, and emerge from cave apertures. In some cases, large sections of tree root – up to 8 cm thick – had to be carefully sawed away from cave interiors. Back in the lab, the wood was separated into small sections and delicately removed from the bones.

Table 4.3 Sample sizes based on cranial and postcranial skeletal elements at different sites in Andahuaylas

Site	Era	MNI	# Tombs/caves
Turpo	MH	36	1
Natividad	LIP	27	1
Cachi	LIP	338	14
Ranracancha	LIP	42	1
Pucullu	LIP	34	1
Total		477	18

Because remains are commingled, it was not possible to use multifactorial aging methods on single (articulated) skeletons. Age estimates from different gross morphological features on the same individual would allow for more precise age-at-death estimations than is possible with the current sample. The nature of the skeletal collection thus necessitated the use of broad age categories and separate minimum number of individual (MNI) calculations for cranial and postcranial remains. This allows us to discern the cultural constraints of mortuary collectivity (Table 4.3). Future paleodemographic research might focus on the probability distribution of life spans among this ancient population (Hoppa and Vaupel 2002; Paine and Harpending 1998; Sattenspiel and Harpending 1983; Milner et al. 2008). At this stage, we can draw several initial conclusions from the demography data in order to evaluate how Andahuaylan community organization was impacted by Wari fragmentation.

The Origins and Affinities of Chanka and Quichua People

Evaluating Biological Continuity Amidst State Collapse

Imperial fragmentation can spur widespread population displacement, but was such the case in Andahuaylas? Ethnohistoric accounts regarding the Chanka relate that the cultural group's founders migrated to Andahuaylas after Wari collapse and largely replaced the preexisting Quichua population. This mytho-historic account, with its claims of postimperial biological discontinuity, can be evaluated through the use of cranial nonmetric traits. These phenotypic traits, which have no bearing on the health or well-being of an individual, are thought to reflect inherited characteristics passed from parent to offspring.

Given that the expression of skeletal traits are strongly controlled by genetic factors and are highly heritable, and because there is significant variation in the expression of those traits within a population, the analyses of nonmetric characteristics are mobilized to evaluate *gene flow*, the exchange of genes between populations (Pink 2013: 34; Grüneberg 1952; Cheverud et al. 1979; Falcon 1989). Unlike many traits that have a continuum of expression and may be impacted by both genetic and envi-

Fig. 4.12 The cranium on the *left* displays a metopic suture – a non-metric trait – in the middle of his forehead (frontal bone), which the cranium on the *right* lacks

ronmental factors, nonmetric skeletal traits are only expressed in a few discrete forms and thus appropriate for analysis.

Shared phenotypic characteristics are used as a proxy for shared genotype, and shared genotype is a measure of biological affinity or relatedness (Fig. 4.12). Thus, nonmetric analysis can help clarify migration trends at the population level. For instance, if the Chanka indeed compose a recently arrived population, they will not share the same cluster of inherited nonmetric traits as contemporaneous Quichua population or earlier Wari-era populations. Additionally, a decrease in gene flow between the Wari era and the post-collapse era would indicate that populations become more insulated.

In Andahuaylas, my colleague, Professor Christine Pink, directed a study that recorded 35 traits on 300 crania. To correlate which traits were variable within the sample, she used a Spearman rank order, with $p \geq 0.05$ as a cutoff. Sex, age, and cranial modification were also tested for correlation with nonmetric traits. Finally, Mahalanobous D^2 matrix (using Konigsberg's tdist20 FORTRAN program) and Principal Component Analysis were used to assess the relative genetic distance of different burial populations (Pink and Kurin 2011; Pink 2013: 41). This statistical analytic technique measures the distance, or divergence between two populations based on continuous data (Konigsberg 1990). The resulting distances are conservative in that they represent the minimum possible distance between groups (Blangero and Williams-Blangero 1989). Like all distance measures, Mahalanobis D^2 is sensitive to small sample sizes (Konigsberg et al. 1993), but the significance of the individual distances can be assessed with other statistical measures.

Pink's (2013) analysis of cranial nonmetric data does not show much support for population replacement in Andahuaylas after Wari collapse (Fig. 4.13). The *rate* of gene flow does not change over time, but overall, gene flow decreases and genetic isolation increases among post-collapse populations. River and road distances do

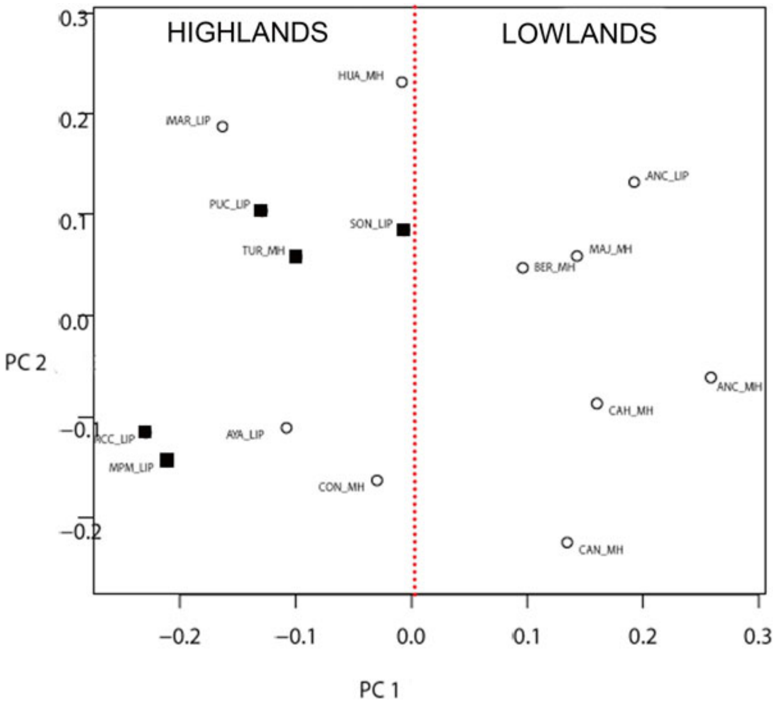

Fig. 4.13 Relative biological distance clusters throughout Middle Horizon and Late Intermediate Period Peru. The Andahuaylas populations are indicated by the *black squares* (Modified from Pink 2013: 134)

not account for genetic distance in Andahuaylas. Rather, the motives are social. And compared to other *sierra* poulations, Andahuaylans were relatively genetically closer. The Wari-era site of Turpo demonstrates the highest rate of gene flow, closer affinity with other highland sites, and stronger ties to the Ayacucho Basin, but there is no evidence that Chanka and Quichua people replaced earlier populations. This is a key contrast from official histories, which relate that the Chanka arrived in Andahuaylas only after Wari collapse, where they subsequently conquered the autochthonous Quichua.

If we focus primarily on the Chanka and Quichua data from Andahuaylas, other important patterns emerge (Fig. 4.14). The Chanka population falls into two groups along PC2 (the y-axis, which represents the trait that controls much of the variation). The upper moiety site of Cachi is on one side of this phenotypic divide, and Ranracancha, the lower moiety site, is on the other. This result follows proposed models of a macro bipartite *ayllu* system, where individuals from the same large community were separated into (at least) two major biological groupings. These results are also consistent with ethnohistoric records from early colonial Andahuaylas, which report the resilience of the *ayllu* systems as a means of ordering social relationships after Wari's decline. Violence also appears to have impacted

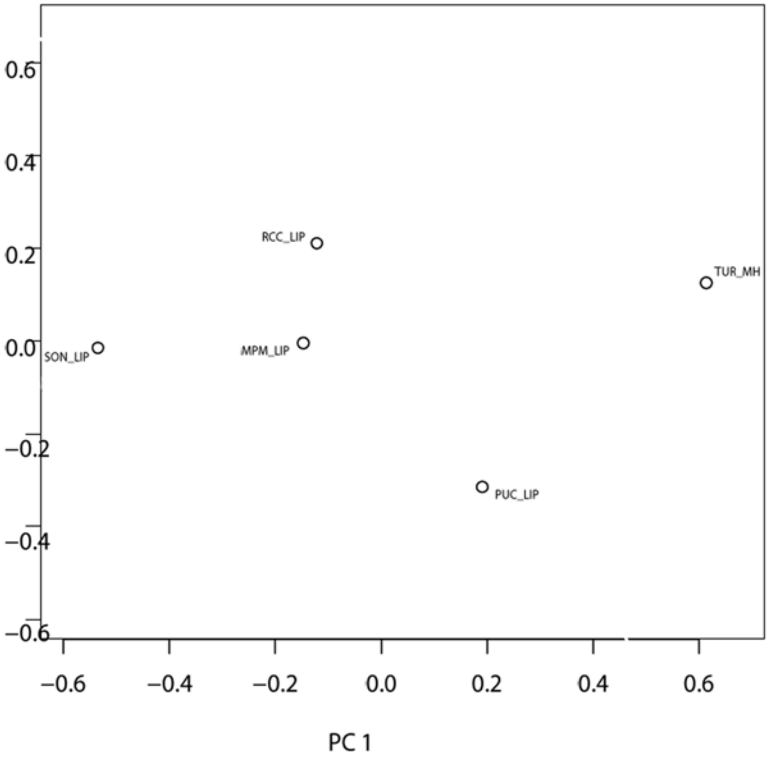

Fig. 4.14 Biological distance clusters in Andahuaylas. Turpo (TUR_MH) represents the Wari-era population; Cachi populations (SON_LIP and MPM_LIP) are upper moiety Chanka; Ranracancha (RCC_LIP) is the lower moiety Chanka population, and Pucullu (PUC_LIP) is the Quichua enclave (Modified from Pink 2013: 139)

gene flow: Fort Sonhuayo, where people amassed inside impressive defense works, has the least amount of gene flow even though it is represented by the largest population.

There is also epigenetic evidence that Pucullu, the Quichua site, is biologically distinct from other groups (Pink 2013). Quichua and Chanka political distinctions apparently have a biogenetic basis. Finally, unlike other sectors, caves near the ancient salt mine at Cachi, appear to be composed of distinct biological groups, albeit with deep historical antecedents in the community (Pink and Kurin 2011). Caves near the mine have a somewhat closer association with the Wari heartland. The large natural caves, like *Pukamachay*, demonstrate the most gene flow and represent an ancestral, multiregional sample. This genetic insularity is best explained by rights of salt extraction. Throughout the historic period, different salt shafts were opened and exploited at the Cachi mine by a different *ayllus*, and later, distinct extended families. The relative genetic isolation of the Mina sector (see Fig. 4.14), combined with the unusually extended period of cave use (revealed through AMS dating), would be expected in a scenero where mining rights trumped other structuring principles of group burials. Given the genetic isolation of the local individuals buried near the mine, the basis of cave collectivity may actually be rooted in imperially directed mining labor policies implemented by Wari upon their arrival in the eighth century, AD.

Tracing First-Generation Migrants Through Strontium Isotope Analysis

Wari collapse did not spur a complete population preplacement in Andahuaylas, but social–political factors appear to have influenced the formation of distinct biological groupings in the region – including those at Turpo and Cachi's Salt Mine. Those folks share phenotypic attributes with the Wari heartland. But were these individuals migrants or colonists? Answering this question becomes easier through the use of Strontium isotope analysis. Isotopic values of relative strontium concentration allow us to determine the mobility and locality of first-generation individuals in relationship to the landscape (Ericson 1985; Knudson et al. 2004; White 2013). ^{86}Sr (strontium) occurs naturally in bedrock while ^{87}Rb (rubidium) decays into ^{87}Sr over time (Faure and Powell 1972; Faure 1986; Bentley 2006). Strontium values thus reflect the relative age of bedrock. As it moves up the trophic chain, from bedrock, to soil, to plants, to animals, and finally humans, strontium substitutes for some of the calcium ions present in developing tooth enamel and bone, becoming embedded in hydroxyapatite (Likins et al. 1960; Bentley 2006) (Fig. 4.15). Although taphonomic processes such as groundwater contamination and diagenesis can impact strontium levels (Jørgensen et al. 1999), the isotopic values of an individual's enamel are thought to reflect the biologically available strontium of the local geology during the formation of those teeth (Price et al. 2002). Adult tooth enamel, the focus of this study, develops during childhood; the first, second, and third molars form during early, middle, and later childhood, respectively (between birth and 12 years) (Dean and Beynon 1991; Reid and Dean 2006).

The Local Strontium Isotope Signature in Andahuaylas

In order to determine the local geomorphology in Andahuaylas, my colleague, Ellen Lofaro, an archaeological chemist, analyzed a sample of rock salt from the mine at Cachi. The $^{87}Sr/^{86}Sr$ ratio was 0.707768. Because the Mina salt mine is not a homogenous geological feature, rock from other veins may encode different strontium isotope values. Nevertheless, the geological baseline is distinct from other areas in the highland Andes (Rodriguez Mejia 2008: 81).

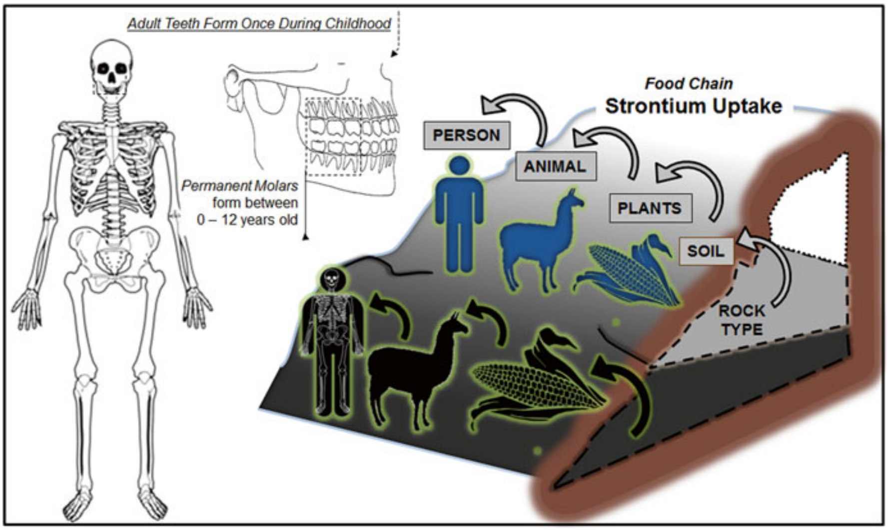

Fig. 4.15 You are [from] what you eat (more or less): strontium replaces calcium in human teeth during childhood

Table 4.4 Strontium isotope values of faunal remains from western Andahuaylas

Era	Affiliation	Site-cave	Skull	Animal	Tooth[a]	$^{87/86}Sr$
MH	Warified	Turpo -1	05.01	Camelid	RMx3	0.707005
LIP	Chanka	Cachi- Son 1	01.01	Camelid	LMx1	0.706679
LIP	Chanka	Cachi- Son 4	04.01	Canid	LMx2	0.7068
LIP	Chanka	Cachi- Son 4	04.01	Canid	LMx2	0.707023

[a]Codes for tooth sampled. *R* right, *L* left, *Mx* maxilla, *1, 2, 3* molar number

Next, we looked at the strontium values in four animals – two dogs and two camelids (probably llama) (Table 4.4). One of the camelids was recovered from Turpo, and the other animals were excavated at Cachi. The two dog skulls, uncovered in the same cave, had an average $^{87}Sr/^{86}Sr$ value of 0.70769115. Dog are reared in the home and follow their masters. They tend to scavenge human waste and table scraps, or steal bounty from tended fields. The $^{87}Sr/^{86}Sr$ ratio for the camelids was 0.70733645. Unlike dogs, llamas are reared on the high *puna* grasslands. As pack animals, they are prone to long-distance travel bearing burdens in long, snaking caravans. This may be why llama strontium isotope values are less similar to each other, and further away from the rock-salt-derived strontium value.

In this case, the faunal data and the singular sample of rock salt from Cachi are not representative of local Andahuaylan geomorphology. There is just too much variability in both animal behavior and in rock salt veins. This conundrum occurs quite a bit in isotopic studies. So, when environmental baseline or faunal data are unavailable, highly variable, or imprecise, locally derived strontium isotopic values can be alternatively calculated using descriptive statistics. Evidence of mobility (or more precisely, nonlocal residential origin) is visible in the biogeochemical record via the presence of outlier strontium isotopic values (Wright 2005).

To understand the vagaries of post-collapse human migration, 42 archaeological human molars were selected for strontium isotope testing. Because individuals consumed locally produced plants and animal sources (Kellett 2010), it can be reasonably assumed that local and nonlocal strontium ratios are reflected accurately in our samples, derived from well preserved enamel apatite. Using descriptive statistics, we determined that the average $^{87}Sr/^{86}Sr$ value for the Andahuaylas study region (which covers some 4500 km^2) is 0.707413, with values ranging from 0.70707 to 0.70826 (excluding the outliers).

Among the nine (of 36) individuals sampled from the Wari-era site of Turpo, none had an outlier strontium value. Despite biological and phenotypic affinities with the Wari imperial core in the Ayacucho Basin, a 2–3 day walk away, there is no evidence (yet) of first-generation Wari colonists in Andahuaylas during the State's twilight. The fancy artifacts and humble emulations of imperial wares associated with the Turpo burial suggest that it was local people, with potential links to the heartland, who willingly embraced Wari ideology (Table 4.5).

Wari collapse appears to have periodically spurred novel migratory configurations, but again, there is no evidence of population replace by first-generation migrants, although some foreign in-migration is certainly taking place (Fig. 4.16; Table 4.6). At death, local and nonlocal people were interred collectively. At the Salt Mine sector in Cachi, none of the seven (of 39 total) crania sampled had outlying strontium values. Those Chanka individuals show relatively more biological affinity with Wari populations, but were still reared on comestibles from Andahuaylas during their formative childhood years. At the Sonhuayo hillfort, the most phenotypically homogenous site, of seven (out of 78) crania sampled from four *machays*, there was one clear outlier, a female. Another female outlier was present at the lower moiety Chanka site of Ranracancha (10 of 32 crania sampled). Similarly, among 10 (of 34) crania sampled from the Quichua enclave at Pucullu, there were two outliers, both male. We will return to these intriguing individuals in the next few chapters given that they demonstrate somewhat unique patterns in trauma and disease.

In sum, while skeletal and artifactual data lend strong support to enduring ties between Andahuaylas and the Wari heartland, this relationship was not characterized by the invasion of people from the Ayacucho Basin. Once Wari collapsed, gene

Table 4.5 $^{87}Sr/^{86}Sr$ ranges and averages by site. The outliers have been trimmed from this data set

Site	(N)	$^{87/86}Sr$ range	$^{87/86}Sr$ average	Standard deviation
Turpo (no outliers)	9	0.70707–0.707442	0.707265	0.000127
Cachi-trimmed	13	0.706865–0.707782	0.707242	0.000267
Ranracancha-trimmed	9	0.707439–0.708259	0.707785	0.000270
Pucullu-trimmed	7	0.707086–0.707615	0.707442	0.000173

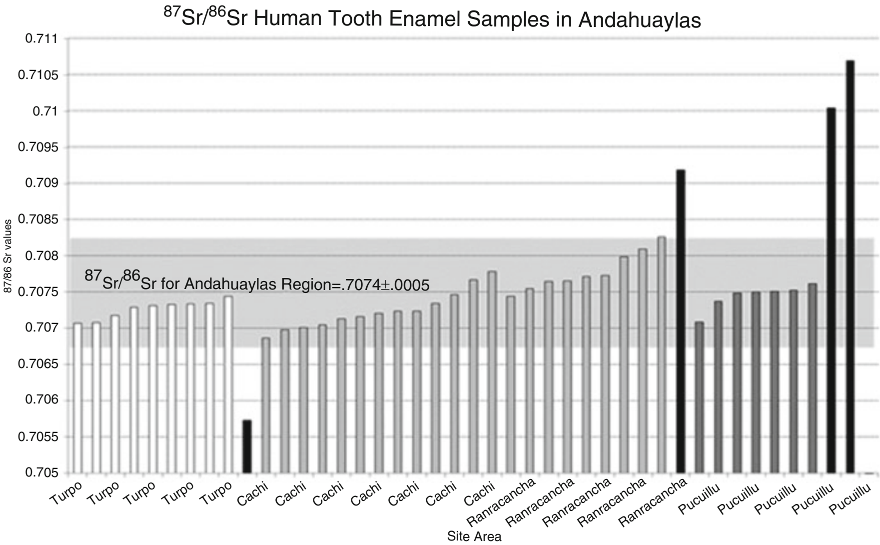

Fig. 4.16 This bar graph shows the strontium values for folks from different Wari, Chanka, and Quichua sites in Andahuaylas. The *black* bars reflect individuals who spent their childhood in a nonlocal (foreign) region

flow decreased within the population. Yet it is only during the LIP that we find evidence for migration of both males and females at Chanka and Quichua sites. This is not an unexpected finding. Because state collapse can both prompt novel migrations, and restrict people's freedom of movement, the Andahuaylas scenario of limited mobility and increasing genetic insulation would be expected.

Age-at-Death and Sex Distribution in Andahuaylas

The age-at-death distribution of individuals entombed in Andahuaylas affords further insight on the nature of populations in the region prior to, and after Wari collapse (Table 4.7). At Turpo, the Wari-affiliated site, 27.7 % (10/36) of individuals are subadults under the age of 15, while at Cachi, 8.4 % (15/177) of the cranial MNI consists of infants and children. At Ranracancha, 11.9 % (5/42) of the crania are subadults. Finally, at Pucullu, the Quichua enclave, 35.3 % (12/34) of individuals were under the age of 15. The change in infant/child to adult cranial representation between eras is not significant ($\chi 2=1.510$, $p=0.1096$ (one-tailed), d.f. $=1$, $N=317$). Also keep in mind that complete crania tend to be underrepresented in these kinds of burial contexts.

Postcranial bones were examined to specifically compare Wari and Chanka mortuary profiles (Fig. 4.17). Ages-at-death were determined by synthesizing data

Table 4.6 Results of strontium isotope analysis of human dentition; values reflect geologic/geographic residence during childhood

Era[a]	Affiliation	Site (sector)	Tooth[b]	87/86 Sr
MH	Warified	Turpo	RMx1	0.70707
MH	Warified	Turpo	RMx2	0.70708
MH	Warified	Turpo	RMx1	0.707177
MH	Warified	Turpo	RMx2	0.707294
MH	Warified	Turpo	LMx3	0.707311
MH	Warified	Turpo	LMd2	0.707332
MH	Warified	Turpo	RMd3	0.707338
MH	Warified	Turpo	LMd2	0.707341
MH	Warified	Turpo	RMx2	0.707442
LIP	Chanka	Cachi – Ft. Sonhuayo	RMx2	0.705731
LIP	Chanka	Cachi-Salt Mine	RMx2	0.706865
LIP	Chanka	Cachi-Salt Mine	LMx2	0.706982
LIP	Chanka	Cachi- Salt Mine	RMd2	0.707009
LIP	Chanka	Cachi-Salt Mine	RMx1	0.70705
LIP	Chanka	Cachi- Salt Mine	RMx2	0.707132
LIP	Chanka	Cachi-Salt Mine	LMx2	0.707163
LIP	Chanka	Cachi – Ft. Sonhuayo	LMx1	0.707208
LIP	Chanka	Cachi – Ft. Sonhuayo	LMd1	0.707239
LIP	Chanka	Cachi – Ft. Sonhuayo	RMd3	0.707241
LIP	Chanka	Cachi – Ft. Sonhuayo	RMx2	0.707343
LIP	Chanka	Cachi – Ft. Sonhuayo	LMx2	0.707467
LIP	Chanka	Cachi-Salt Mine	RMx2	0.707673
LIP	Chanka	Cachi – Ft. Sonhuayo	RMx2	0.707782
LIP	Chanka	Ranracancha	LMx2	0.707439
LIP	Chanka	Ranracancha	LMx1	0.707547
LIP	Chanka	Ranracancha	LMx1	0.70765
LIP	Chanka	Ranracancha	RMx1	0.707653
LIP	Chanka	Ranracancha	LMx2	0.707712
LIP	Chanka	Ranracancha	LMx1	0.707728
LIP	Chanka	Ranracancha	RMx2	0.707987
LIP	Chanka	Ranracancha	LMx1	0.708094
LIP	Chanka	Ranracancha	RMx1	0.708259
LIP	Chanka	Ranracancha	RMx2	0.709186
LIP	Quichua	Pucullu	RMx2	0.707086
LIP	Quichua	Pucullu	RMx2	0.707372
LIP	Quichua	Pucullu	RMx3	0.707488
LIP	Quichua	Pucullu	RMx1	0.707505
LIP	Quichua	Pucullu	RMx3	0.707508
LIP	Quichua	Pucullu	LMx1	0.707523
LIP	Quichua	Pucullu	LMx2	0.707615
LIP	Quichua	Pucullu	LMx1	0.710039
LIP	Quichua	Pucullu	LMx2	0.710691

[a]Time Periods. *MH* later Middle Horizon (ca. AD 700–990), *LIP* early Late Intermediate Period (ca. AD 1080—1260)

[b]Codes for the tooth sampled. *R* right, *L* left, *Mx* maxilla, *Md* mandible, *1, 2, 3* molar number

Table 4.7 Age distribution of crania

Site	Neonate-infant (<0–3)	Child (4–14)	Juvenile (15–19)	Young adult (20–34)	Middle adult (35–49)	Old adult (>50)	Adult (20–50+)	*Total*
Turpo	3 (8.3 %)	7 (19.4 %)	0 (0 %)	11(30.6 %)	6 (16.7 %)	3 (8.3 %)	6 (16.7 %)	36
Cachi	1 (0.6 %)	14 (7.9 %)	9 (5.1 %)	49 (27.7 %)	58 (32.8 %)	18 (10.2 %)	27 (15.3 %)	176
Ranracancha	0 (0 %)	5 (11.9 %)	5 (11.9 %)	14 (33.3 %)	14 (33.3 %)	3 (7.1 %)	1 (2.4 %)	42
Pucullu	0 (0 %)	9 (26.4 %)	3 (8.8 %)	6 (17.6 %)	12 (35.3 %)	4 (11.8 %)	0 (0 %)	34
Total	4	35	17	80	90	28	34	288

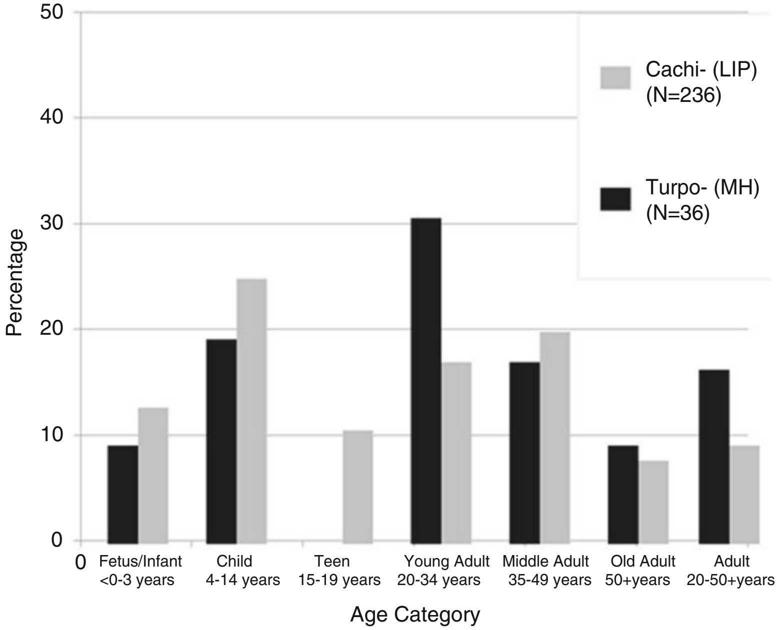

Fig. 4.17 Age-at-death distribution for Turpo and Cachi based on all available diagnostic skeletal elements

gleaned (when possible) from pubic symphyses and auricular surfaces, and stages of epiphyseal union on long bones (see Buikstra and Ubelaker 1994; Brooks and Suchey 1990). Skeletal assemblages from intact contexts demonstrate that peri/neonates, infants, and children make up 27.7 % (10/36) of the skeletal population at Turpo (Wari) and 36.9 % (87/236) at Cachi (Chanka). Notably, the proportion of neonates/infants and children to teens/adults does not change significantly between the late Wari era and the early LIP (Fisher's exact, $p = 0.3522$; d.f. = 1; $N = 272$). This coincides with archaeological settlement data that suggest population sizes did not decline in the post-collapse era.

The large percentage of infants and children in the demographic profile from Cachi is what would be expected in the once-living population. But, in some *machays*, there are relatively few subadults. Why might this be? Perhaps juveniles are surviving into adulthood, taphonomic processes are degrading infant bones, or subadults are being buried elsewhere due to differential mortuary treatment. In other words, the proportion of subadults to adults in the burial sample (Jackes 2011: 111) may be the result of social/cultural biases, which restricted interment in *machays* to specific age classes. It is possible that children afforded burial in *machays* may have completed a rite of passage for entry. Naming ceremonies were an integral rite during childhood in the Andes (see Poma de Ayala ca. 1616), but such rituals would be delayed until practitioners felt that the child would survive past the occasion. Chronicler Arriaga (1968 [1621]) reported that grieving mothers would periodically

Table 4.8 Sex distribution by site

Site	Era	Affiliation	Males	Females	Male:female ratio
Turpo	MH	Wari	11	5	2.2:1
Cachi	LIP	Chanka	65	74	0.9:1
Ranracancha	LIP	Chanka	19	17	1.1:1
Pucullu	LIP	Quichua	15	10	1.5:1
Total			110	106	1.03:1

revisit the mummies of their children buried in caves and take them back home. Juveniles were the only group said to have a specialized mortuary program. These practices of age-restricted interment may account for the observed tomb population profiles in Andahuaylas.

Rather than age-restricted interment, the age-at-death profile for the robust sample from Cachi closely conforms to demographic trends within populations undergoing catastrophic (versus attritional) natural or social disasters (*sensu* Margerison and Knüsel 2002: 139, 141, Fig. 4). The relatively low proportion of fetal, infant, and adolescent skeletal remains could be a consequence of a turbulent social milieu. These threats could have significantly impacted fertility rates and birth spacing intervals, in addition to maternal and infant mortality rates. Social instability could have also spurred out-migrations and displacement among younger, more physically mobile sectors of the population (see for example Cook 1981). For instance, contemporary Andahuaylan juveniles (~15–18 years old) tend to leave local communities to get married and/or participate in labor projects that may take them away from home (Gómez Choque 2015). This out-migration would not be captured by the cranial nonmetric or strontium isotope data.

As would be expected in the once-living population, males and females in Andahuaylas are equally represented over time and at different contemporaneous sites (Table 4.8). Of 15 sexed adults at Turpo, the Warified site, there were 10 males (67 %) and 5 (33 %) females. The over-representation of males may be a result of bias, given that a quarter of the Turpo population could not be sexed. At Cachi (LIP Chanka), 65/139 (47 %) crania were male, and 74/139 (53 %) were female. At Ranracancha (LIP Chanka), 19/36 (53 %) of the sexed adult population was male and 17/36 (47 %) was female. At Pucullu (LIP Quichua), there were 25 adults, composed of 15 (60 %) males and 10 (40 %) females. Burial in a tomb or a *machay* was not confined to members of a certain sex. On a regional scale, mortuary samples from different sites in Andahuaylas do not deviate significantly from the 1:1 expected sex ratio (50 % female, 50 % male). Fisher's exact testing demonstrates that males are not significantly preferred for interment relative to females (two-tailed p value = 0.7161; d.f. = 2; N = 242). The interment of both males and females in *machays* would be expected if cave collectivity is structured by patterns of either agnatic *or* cognatic descent. These results also imply that if males or females are dying away from home, their desiccated bodies could have been returned to, and buried in the local communities.

Principles Structuring Internment

During the Middle Horizon, individuals were buried both in *machays* and in fabricated semicircular tombs. However, sometime between AD 1000–1050/1100, *machays* were cleaned out and repurposed, and additional cave tombs were constructed. Only a few isolated skeletal elements and grave goods evaded extirpation. Subsequently, caves were used exclusively to inhume the dead. Overlapping dates from the first- and last-buried individuals in single caves throughout Andahuaylas indicate *machays* had a tightly circumscribed use-life: perhaps up to a century at most, or around five-to-six generations. Neighboring caves, which appear to have been used sequentially, mirror patterns seen in hillfort settlements, where larger sites budded off into smaller hilltop sites in order to accommodate increasing aggregation and growth.

Although there are many issues that prevent us from determining all the constraints that contributed to new forms of community organization following Wari collapse, there are several important lines of evidence that suggest something tumultuous was occurring in the generations after Wari fragmentation. The low proportion of subadults – especially late adolescents in the burial sample from Andahuaylas attests to possible catastrophic circumstances. Individuals from this age group tend to be the most independent and mobile, and may have evaded the circumstances that led to the premature death of other age classes in society (Margerison and Knüsel 2002). Of course, it is also highly likely that adolescents survived into adulthood, only to be cut down in adulthood. The peak in age-at-death occurs among young adult and younger middle adults. Frankly put, people are dying during prime productive and reproductive years, versus old age or infancy. The loss of young adults in Chanka communities would have had significant consequences: valuable human labor would be lost and the next generation of offspring would cease to exist. So, although selective biases were inevitably present, skeletons from Andahuaylas appear to represent the population from which they were drawn. This enables us to evaluate the social and biological factors that may structure the characteristics and composition of the archaeological population.

Several lines of data show that the Andahuaylas population, both during the late Wari era, and after the state's disintegration, was relatively stationary. While there are some in-migrants, there was no major population replacement during the post-imperial era. Relatively speaking, the population was homeostatic (Wood et.al. 1992: 344). So to, diverse population subgroups (males, females, adults, children, locals, and nonlocals) were all interred together. Certain categories of people and certain causes of death apparently did not restrict burials in *machays*.

Artifactual assemblages also attest to the syncretism of new burial traditions with old ones. The inhumation of mostly utilitarian serving wares, small personal objects, and commingled human remains all appear to have antecedents in the pre-collapse era. The introduction of new tropes including llama *conopas*, paired weapons, and distinct technical styles and iconography, point to renewed devotion toward ancestors and corporate groups, instead of hollow-eyed dieties from a widespread state religion. Evidence of feasting and offerings, from intentionally smashed *chicha* vessels to butchered camelid remains attest to the commitment the living maintained with the dead.

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Chapter 5
Reorganizing Society: Cranial Modification and the Creation of Difference

The Wari Empire was concerned with establishing rigid hierarchies and maintaining practices of exclusion, discriminating between their own group and others. These policies were made manifest, for instance, in the construction of administrative centers with patios and high walls. Inside these enclosures, Wari elites would co-opt local leaders and reaffirm alliances through copious amount of fermented *chicha* beer. Besides preoccupations with delimiting boundaries of status and rank, Wari was also concerned with the different types of people it encountered in the course of its imperial expansion. We know the Wari distinguished between different categories of people, because they have been captured on painted ceramics and finely woven tapestries. Professor Patricia Knobloch, an eminent scholar of Wari art and iconography, has identified images of powerful leaders, administrators, and personages, as well as rival or conquered ethnic groups, captives, and other potential antagonists. Consider that as an empire, Wari needed to manage a noncontiguous territory inhabited by groups of people that had to be differentiated. Indeed, empires often impose rigid social categories in order to account for the population under their domain. Empires tend to favor maintaining discrete categories. For one, this system is crucial in order to take an accurate census. This information is used to determine how much to tax the populace, the number of potential military conscripts, and the number of people from a given region that can be sent to participate in corveé labor projects (like the building of roads and huge bastions). Sometimes empires will even mandate what people may and may not do to their bodies. But categorizing people for the purposes of conquest or administration has its consequences. Intentional or not, the creation of new ethnic groups, ethnogenesis, is a common result of imperial programs.

As we saw in Chapter 4, the collapse of the Wari Empire led to dramatic changes for those individuals living in the post-collapse era. Within a few generations, new settlements were established on high-altitude ridges. These settlements were often characterized by defensive features including ditches, lookouts, baffled entries,

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concentric walls, and precipices on three sides. Houses were arranged as haphazard patio groups—circular houses with doors facing in all directions. We also know from multivariate analyses of nonmetric cranial features that populations are becoming more insulated and isolated. Even so, the presence of nonlocal males and females reveal new, albeit limited patterns of mobility.

We also got a better sense of mortuary practices after Wari Collapse, where emphasis shifted from semi-subterranean tombs to cave ossuaries. Yet the tradition of collective burial appears to have survived Wari fragmentation. More importantly, artifact assemblages shift from the Wari to post-Wari era. The dramatic disappearance of art and artifacts crucial to maintaining imperial ideological legitimacy suggests a "crisis of faith." The focus of reverence changes, from pan-Andean deities, to local ancestors buried with small personal goods that could not be directly attributed to any single individual.

Our excavations revealed artifacts that attest to the nature and cultural constraints of burial collectivity. Chroniclers are adamant that burial was restricted to members of the same *ayllu*, and there is some evidence to support that assertion. Many artifacts are gender-specific, while some—like the llama *conopas*—are associated with patrilineal descent, as they are passed from father to son. Our field work also revealed that other people—likely descendants and kin, periodically gathered at caves and feted the remains, offering them camelid and guinea pig meat. They would also smash large vessels of *chicha* corn beer against the *machay* maws so that the liquid would drain in and saturate the crumbling ancestor bundles, contorted mummified tissues, and dry bones within.

Now that we have a sense of how communities were organized and how mortuary practices changed after Wari collapse, we can address how the creation of new communities—and social groups therein—physically and conceptually impacted the bodies of the Chanka and Quichua people in Andahuaylas.

Anthropogenic Modification in the Andes

Nebulous (real and fictive) kin-based groups such as clans, lineages, ethnic groups, *ayllus*, and castes are notoriously difficult to identify in the bioarchaeological record. This is because these groups are multiscalar, can change over generations, cannot be easily or accurately described by trait lists, and are strongly structured by oppositional interactions with other complementary types of groupings. Nevertheless, humans do things to their bodies—intentionally and unintentionally –and in doing so, they signal affiliation with different subsegments of the general population. Usually, people self-identify with all sorts of groups, based on age, gender, status, and political affiliation. However, as we reviewed earlier, state collapse can strongly impact how certain, more singularized, types of affiliations and corresponding identities can come to prominence. And some of these more singularized identities were conspicuously inscribed on the body.

People in the Americas have long appropriated a host of unique cultural customs that left permanent alterations to the body and signaled distinct types of social groupings. Some of the modifications were more permanent than others. Ceramics and textiles throughout the Andes are replete with depictions of potentially mytho-historic heroes and leaders, who are marked by face paint and tattoos, elaborate headdresses, and attire. Well-preserved mummies from the arid southern Peruvian Paracas region still maintain intricate braids and distinctive hairstyles—a testament to their social status or ethnic affiliation. Other modifications were more permanent. The arms—and indeed even fingers—of a Moche priestess known as the Lady of Cao, from the Peruvian North Coast, are covered in intricate, geometric, serpentine inkings, likely associated with her marked status within the society.

Just like skin, hair, and nails, human bones and teeth can be physically remodeled through cultural practice. At a Middle Horizon era oasis in the Atacama Desert of Chile, bioarchaeologists found that the use of labrets—plugs inserted just below the lower lip—permanently altered the anterior dentition. Constant friction (from talking and chewing) with the labret caused a polishing effect on the labial surface of the lower central incisors. Bioarchaeologist Christina Torres-Rouff notes that labret use was likely related to masculine warrior status. Other types of piercings, most notably large ear plugs, are still visible on mummified gaping, puntured earlobes. Spanish and Mestizo chroniclers report that an ear piercing ceremony marked the passage into adulthood, at around age 14. Finally, modification (or perhaps more accurately, mutilation) to living bodies in the ancient Andes was also motivated by punitive factors. Important work by Dr. John Verano documents Moche skeletons on Peru's north coast with signs of amputation; leg bones with blunted, rough-healed, stubby ends attest to the survival of these hobbled individuals. Detailed Moche mold-made pots actually depict forlorn-looking footless individuals with *keru* cup prosthetics on the stumps. Still other individuals are depicted in ceramic form with mutilated lips and noses. While flesh-eating diseases such as leishmaniasis could explain these depictions, several scholars have convincingly argued that these modifications were retributive, and directed toward captives, deviants, or other social outcasts. The transgressions of these individuals were literally marked by their intentional disfigurement.

Dramatic and torturous inflictions aside, the most ubiquitous and persistent form of conspicuous and permanent body modification in the Andes is cranial modification, the permanent reshaping of an infant's malleable skull using bindings, boards, ropes, straps, and pads (O'Brien and Stanley 2011).

Remodeling Heads: Technical Isometric and Cultural Aspects of Child-rearing

A principal expression of group belonging, skull reshaping would have fulfilled a formalized practice on how to raise a child during the infant and toddler years (Tiesler 2014). The physiological limitations of head remodeling necessarily links it with child-rearing practices, and crucially, the aims and intentions of those caregivers who enacted the process on the most vulnerable within the population.

Mestizo chronicler, Guaman Poma de Ayala, described children of this "cradle age" (*kiraw picas*) as young and incomplete (1616: 212). This period of head remodeling is also a time when children learn to sit, crawl, stand, and begin to walk, develop language skills and refine social interactions, and also recognize different genders (Tiesler 2014: 153).

Most bioarchaeologists suggest that modification was done on a daily basis, inside the home, by a mother or close maternal kin. In Andahuaylas, purposefully elongated heads were produced through the continual adjustment and tightening of turban-like wrappings and the use of *kiraw* compression cribs (Cieza de Leon 1553; Kurin 2012). Just days after delivery, newborn babies—heads and all—were swaddled and affixed to the cribs which restricted their movement (Poma de Ayala 1616). Direct pressure from the bindings and the crib constricted the growth of certain skull bones and prompted the expansion of others. Varying the placement and location of the head-wrappings vis-à-vis the crib would establish the permanent form of the reshaped head. This remodeling process continued until a child was at least 2 or 3 years old; by that age, the fontanelles (soft-spots) close, and the remodeled head would be more or less permanent.

Resultant, permanently altered head shapes are dependent on two processes: the way the skull bones were constricted, and the physiological growth of the human brain and cranial elements. Bartolome de las Casas (1967), the Colonial era Defender of the Indians, who lived and worked in the Caribbean and Central America, and was a mindful early ethnographer in his own right, observed that head modeling commenced soon after birth. Remodeling starts early because the skull is most malleable in the first months of life. Later on, the cranium's natural tendency to expand can ameliorate the impacts of head modeling. Parents and caregivers would wrap the soft, infant heads with bindings and paddings into a desired shape. Somewhat further south, contemporaries of Padre de las Casas described modification practices and results with great disdain. For instance, in 1638, Diego de la Calancha describes "Moorish"- styled turbans used to reshape skulls. The "torment" of young children seemed not to bother Andean mothers who bound their young to rigid cribs from the moment of birth; these cradles were carried on the back, and could be slung around to the front when the child required feeding or changing (Calancha 1974 [1638]: 1467). The initial first placement of a newborn into the cradle—called a *kiraw*—was a celebrated affair attended by close kin and affines. The *kiraw* was built of supple wood and sinew, and offered by the mother's brother, and first sanctified by the group's local totemic deity, or *huaca*. This act of consecration was thought to protect the newborn from harm (Latcham 1929: 542; Purizaga Vega 1991: 43–45; Tiesler 2014: 151).

Altering the shape of the skull does not impact cognitive function, as the brain conforms to the new shape without sacrificing growth or volume. As the cranium is compressed by external pressure from bands and pads, the frontal bone is flattened, forcing bregma posterior. The occipital is forced anteriorly and superiorly, and the parietals are pushed superiorly and posteriorly relative to an unmodified cranium. The face becomes more prognathic and outjutting, especially in the buccal area. And extreme modification may cause orbital asymmetry and an increase in orbital height (Tiesler 2014: 47). This would have been extremely conspicuous. Fortunately for the recipient, cranial modification does not seem to significantly change chewing and masticatory functions or dental occlusion. The intensity of modification is a function of how long a skull was bandaged, and how early that process started. Removing bands in late infancy rather than early childhood may have neutralized the intensity of the modification to some extent.

Complications from cranial modification are rare, but poor hygiene and irregular compression can prompt the development of porotic or necrotic bone. Asymmetry in head shape may be a result of practitioner inexperience. It can also be a result of inadvertent cranial modification. Newborns habitually placed face-up to *kiraw* cradles (Poma de Ayala 1616) can have an unintentional flattening in the back of the skull.

Antiquity and Ubiquity of Andean Cranial Modification

The information we have on cranial modification comes from a number of sources. Indirect information comes to us by way of artistic portrayals of individuals with elongated heads. These individuals are primarily depicted in small anthropomorphic statues, in embroidered tapestries, iconographic motifs, and in some examples of mold-made pottery. Through these media, anthropomorphic figures wearing headbands, turbans, and other head-modeling devices have been provisionally identified, but remain difficult to interpret. Moreover, these media do not clearly define the differences between those of different head shapes, and archaeologists and art historians are quick to note that accoutrements like headdresses, uniforms, and body paintings also provide a rich tableaux in which artists (or their patrons) sought to highlight individual or group differences.

Cranial modification was among the customs observed by—or relayed to—the Colonial era chroniclers. In 1573, Viceroy Toledo outlawed the practice. He posited, like many of his contemporaries, that intentional head elongation damaged the head and could lead to the death of the Empire's youngest subjects (Bandelier 1910: 25; Cobó 1964 [1653]).

Chroniclers of the era ruminated on the meaning of modification based on the testimony of informants; their interpretations were colored by their own condemnation of what they perceived to be heretic and dangerous. Nevertheless, those records do hint at the mechanics of head shaping as well as the reason head shaping was re-enacted over generations. For instance, Colonial authors including Cieza de León (1996) [1553], Betanzos (2004) [1557], Garcilaso de la Vega (1966) [1609–1613], Bartolome de Las Casas (1967: 594), and others regularly asserted that head remodeling was the exclusive right of members of the highest social classes. Those gathered at the 1614 Council of Lima (A.G.I. Patronato: 189, R. 40) anxiously observed that local lords had long modeled the heads of their children in a superstitious rite meant to emulate the form of lineage leaders from a given province (Torquemada 1969 [1615], Vol. 2: 583).

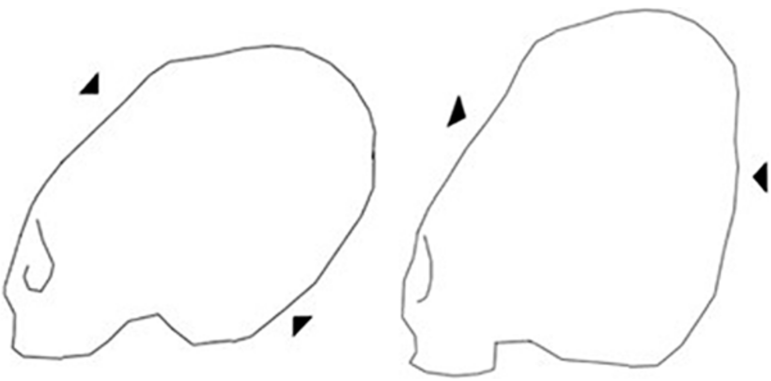

Fig. 5.1 Compression on distinct planes of pressure for different lengths of time will result in either *oblique* (*left*) or *erect* (*right*) head shapes of varying elongation, or *intensity* (Image courtesy Valda Black)

Other interpretations suggest that controlling the body was necessary to subjugate the body politic. Joan Santa Cruz Pachacuti Yupanqui asserted that the Inca Lords Manco Capc and Lloque Yupanqui ordered the heads of newborn subjects bound and styled "long with diminishing foreheads" to make them obedient (Santa Cruz Pachacuti 1995 [1613]). Spaniard Cieza de León concurred, noting that elongated heads were viewed as healthier and encouraged strength to engage in manual labor (1996 [1553]).

The importance of head reshaping as an indexical, or signaling, mechanism was not lost on the Colonial elite, who were well aware that such practices visually conferred and ordered social identity within the former Inca realm. Even from a distance, neighbors who maintained distinct head shapes could recognize one another (Cieza de León [1553] 1996; Cobó [1653] 1964; Garcilaso de la Vega [1609] 1966).

Modification of the human head certainly predates the rise of the Inca Empire (Tiesler 2014; Torres-Rouff 2002). Modified skulls appear at the village of Waywaka in Andahuaylas, perhaps as early as 3–4000 years ago, during an era archaeologists term the Initial Period (Grossman 1972). While there is currently no information about head reshaping in Andahuaylas during the period directly prior to Wari's expansion, this finding shows that cranial remodeling was adopted at least intermittently throughout the time (Fig. 5.1).

But not all Andean societies practiced modifications; its use fell in and out of favor over time, even within a single region. Senior scholar John Verano and colleagues (1999) identified two modified skulls that had been turned into trophies at a Moche site, but this practice was uncommon in Moche society. The tradition was also relatively uncommon among populations in the Wari and Inca imperial heartlands. Further south, in the *altiplano* region around Lake Titicaca, those affiliated with the Tiwanaku State adopted head remodeling techniques, and there it became a distinguished practice. Whether or not mandated by a local chief or some higher authority, local communities seemed to intermittently employ cranial modification over the course of centuries.

Today, most anthropologists interpret cranial modification as a marker of a socially ascribed identity. In the Andes, studies have consistently demonstrated that cranial modification was employed to demarcate different sectors of the population, including occupational status (e.g., fisherfolk or farmers) (Lozada and Buikstra 2002), social or ethnic groups (Torres-Rouff 2008), moiety and residential descent groups (Hoshower et al. 1995), and lineage (Blom 2005). In all these cases, the particular type of group identity and affiliation signaled is largely informed by the archaeological context in which the remains were found.

So, when Professor Maria Cecilia Lozada and her colleagues examined Chiribaya crania of the Late Intermediate Period (AD 900—1350) from coastal Peru, she observed that different head shapes were associated with distinct classes of material correctales. So too, the "wear and tear" on the bodies of those folks was distinct because fisherfolk who paddle boats and cast nets and farmers who till fields engage in distinct patterns of repetitive, occupational body movement. A bit further south, bioarchaeologist Deborah Blom was able to identify highland *altiplano* migrants buried at a distant outpost called Omo, several hundred kilometers from the Tiwanaku capital city. The similarity in cranial modification styles at Omo, combined with the diversity of head shapes at the cosmopolitan Tiwanakau capital, lead Blom to conclude that cranial modification in that instance likely signaled lineage affiliation. Cranial modification in this and other communities indexed a level of shared identity above the household level. Modification styles were most likely structured by residential descent or moiety affiliation (Hoshower et al. 1995). Finally, on the southern fringe of the Andean culture sphere, cranial modification in the Solcor Oasis of the Atacama Desert has also informed on the motivation—and the changing meanings—of cranial modification within one particular area. In this case, bioarchaeologist Christina Torres-Rouff noted that the ubiquity of cranial modification and the range of head shapes within the community were directly related to the presence or absence of imperial oversight within the region. Cranial modification motivations varied based on political and regional contexts. States and empires are known use head shapes as a form of social control, and in those cases, head shapes within a single community tended to be pretty homogeneous. In contrast, when complex societies cease to exist, cranial modification is used to denote lineage or *ayllu* affiliations. The process of modification reflects the conspicuous embodiment of strategic and political action.

Ethnohistoric accounts, anthropogenic artifacts and even well-preserved mummies consistently demonstrate how modification was accompanied—and obscured to some extent—by hair, wigs, turban-like headbands, hats and other types of headgear (Fig. 5.2). The shape of the cranium conformed to the headgear used in remodeling and transmitted a wealth of social information about the wearer (see Cook 1992; Oakland 1992; Wobst 1977). Contemporary rural Andean headgear continues to be recognized as a distinctive marker of social identity. People scrutinize the hats of others to determine regional or ethnic affiliation (Ackerman 1996: 236). Given the extreme form and shape of a remodeled head, the modification instrument used in infancy and the head bindings used in later childhood and adulthood were likely isometric in their design. The fact that cranial modification is retained prominently

Fig. 5.2 Signs of head remodeling in Andahuaylas are apparent through head-wrappings on mummies (**a**), painted bands on ceramics (**b**), and incised caps on mold-made figurines (**c**) (Permission to photograph image c courtesy Lucas Kellett; all other photographs by Danielle Kurin)

and permanently throughout the life of an individual makes it a powerful marker of group affiliation, and a tangible signifier of the production of membership as ascribed by others in the group.

The Abrupt and Widespread Appearance of Cranial Modification in Andahuaylas

During the Wari era, there is no evidence of cranial modification in Andahuaylas. None of the 36 crania examined from that period were reshaped. During the twilight of the empire, the individuals from Turpo all had round, "normal" heads. Yet mere decades later—and for the next two centuries—people in Andahuaylas drastically changed the physical appearance of their offspring through cranial remodeling (Table 5.1). In the generations following Wari collapse, cranial modification use in Andahuaylas significantly increased such that 76 % (208/273) of the population appropriated the custom (Fisher's exact, $p = 0.0001$; $N = 309$). Furthermore,

Table 5.1 Cranial modification rates at different sites in Andahuaylas

Site	Polity/moiety affiliation	Crania observed	Number modified	Modification rate (%)
Turpo	Warified	36	0	0
Cachi	Upper moiety Chanka	171	129	75
Ranracancha	Lower moiety Chanka	41	41	100
Pucullu	Quichua	34	21	62

modification was not practiced by just one moiety or polity in the region: At Cachi, the upper moiety Chanka site, 75 % (129/171) of the observable crania were modified. Rates were similarly high at Ranracancha, the lower moiety Chanka site (41/41 = 100 %), and at Pucullu, the Quichua enclave (21/34 = 62 %). So too, the placement of bindings on the cranium was no different between moieties or between Chanka and Quichua sites. However, there was surprising variability in the rate of cranial modification. While every individual at Ranracancha has undergone cranial modification, every other *machay* in Andahuaylas showed a mix of remodeled and unmodified skulls. And those reshaped crania showed a diversity of head forms of varying intensity.

Characterizing Head Shape after Wari Collapse

In this study, we developed a couple of different methods to quantify and qualify differences in head shape. First, osteometric points were taken with a spreading caliper and measuring tape to inform on the presence, style, and intensity of modification. Next, we characterized head shape based on planes of pressure, which assumes that the placement of bands on the skull ultimately accounts for the shape of the cranium (Fig. 5.3). Our team, led by biological anthropologist Valda Black, decided to interrogate this variability using more sophisticated technology (Black and Kurin 2014). Using 3D scanning and morphometrics allows us to compare and group skulls based on similarity of shape. At the lab in the Andahuaylas Museum, each cranium was turned into a 3D digital model using a Next Engine laser scanner. Eight linear measurements were placed on the crania: nasion-bregma, bregma-lambda, lambda-opisthion, lambda-basion, opisthion-basion, bregma-basion, and nasion-lambda.

From those measures, 3D wireframes of the scanned skulls were extrapolated. These wireframes underwent Generalized Procrustes Analysis and Principal Components Analysis (O'Higgins and Jones 2006). Procrustes Analysis rotates and scales 3D data so that all the crania are aligned to the same size and space. This makes differences in morphology easier to analyze. Principle Component Analysis then identifies the major axes of shape variation among all the specimens. This type of assessment illuminates the measures and features which explain much of the head shape diversity within the sample.

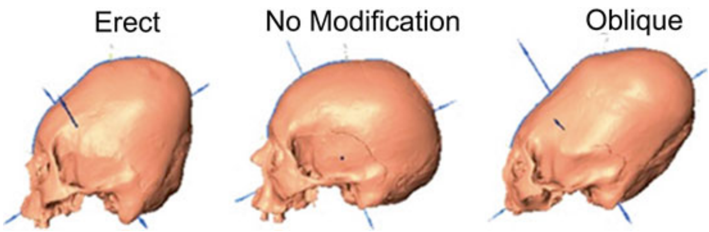

Fig. 5.3 General categories of head shapes in Andahuaylas (Image courtesy of Valda Black)

Trends in Cranial Shape and Intensity

Affixing and adjusting bands on an infant's skull over the course of several years will structure the final petrified shape in adolescence and adulthood. Historical Quechua language idioms describing head shapes are particularly illustrative; several general clases of head shape were recognized. These included *rumpu uma*—round headed, *suito uma*—elongated egg-shaped head and *palta uma*—a squat, avocado-shaped dome. Remodeled head shapes in Andahuaylas are divided into two main sub-types: annular erect and annular oblique (Torres-Rouff 2003: 68; Blom 2005; Hoshower et al. 1995). Circumferential bindings and padding were placed on the frontal bone and around the area of the occipitomastoid suture. The annular bindings prevented parietal expansion, and created an elongated, egg-shaped head. Bands were always placed either above or below the frontal bosses, and pressure was sometimes placed posterior to the coronal suture. On the posterior of the cranium, pressure was centered on lambda, on the squamous portion of the occipital, and sometimes below inion. Variability in binding placement is likely due to relatively unstandardized techniques, and supports the theory that practitioners were familial caregivers. Even if every community had its own official head remodeling specialist, the bindings of a squirming, growing infant would have necessitated readjustment at least several times a week, potentially overwhelming a single expert. Most likely, erect and oblique head shapes are a consequence of whether a baby was carried in the *kiraw* cradle, or was bound and slung in the *manta* mantle. The latter would have afforded an infant relatively more freedom of movement in the head and neck.

In postimperial Andahuaylas, there are significant—and perhaps even meaningful—correlations between band placement and sex (Fig. 5.4). Among the 68 males observed, 14 (20.6 %) have binding impressions below the frontal boss, while only 3 females out of 63 (4.8 %) demonstrate this indicator (Fisher's exact, two-tailed, $p = 0.00780$; $N = 131$). Furthermore, among those 63 females, 13 (20.6 %) have postcoronal depressions, while only 2.9 % (2/68) do (Fisher's exact, two-tailed, $p = 0.0018$; $N = 131$). These results are consistent with a model whereby the placement of bindings and the length of time bindings were left on could have been mediated by sex. Moreover, because variability occured on the anterior of the skull, it would have been even more conspicuous. Binding locations and concomitant morphological changes are more noticeable on the face and forehead than on the back of the skull.

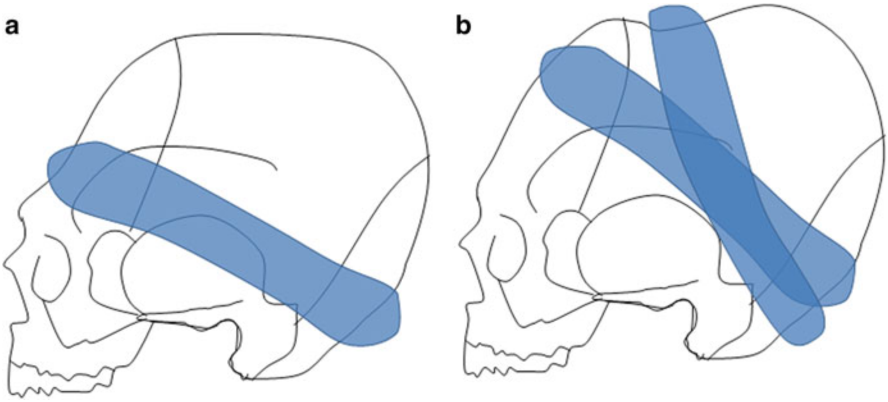

Fig. 5.4 Common head-wrapping patterns among males (**a**) and females (**b**)

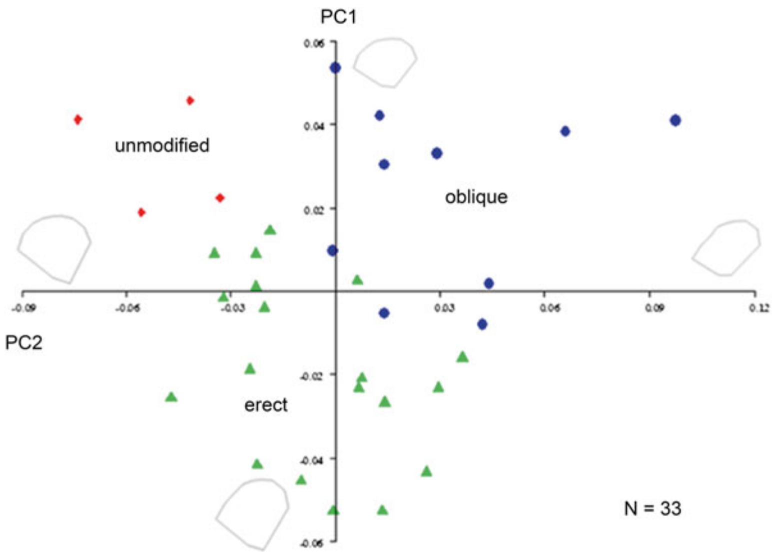

Fig. 5.5 Variations in head shape among the Chanka at Sonhuayo Hillfort (Image courtesy of Valda Black)

Nevertheless, different groups of erect, oblique, and unmodified crania nicely cluster when we quantify and interrogate the 3D morphometric data. Figure 5.5 does a good job highlighting the homogeneity of the unmodified heads compared to the heterogeneity of the remodeled crania. Along the graph's x-axis, cranial shape changes display a range from unmodified (negative) to extremely modified (positive). Placement along this axis thus reflects the degree or *intensity* of modification. Moving positively up the y-axis, the distance decreases between bregma and basion, and increases between nasion and lambda. This change makes the posterior skull look *oblique*; negative y-axes values correspond with *erect* head shapes.

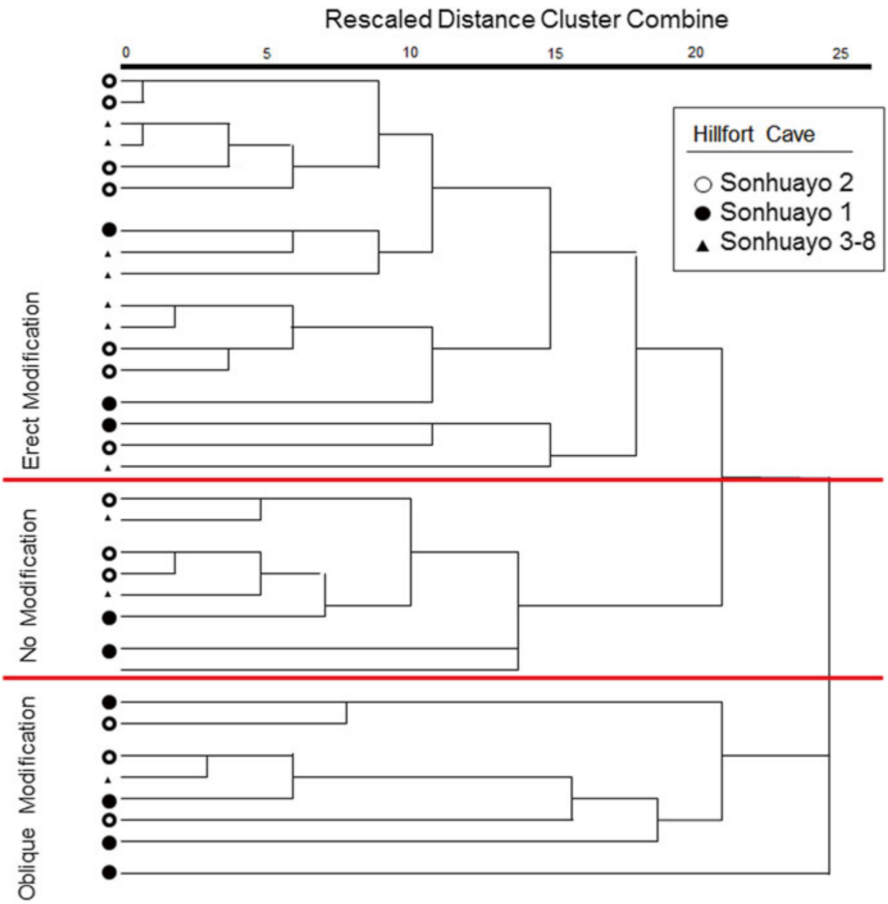

Fig. 5.6 This figure represents relative relatedness in cranial morphology at the Sonhuayo Hillfort. Note the lack of correspondence between head shape and burial location (Image modified with permission from Valda Black)

For our study, Valda, utilized hierarchical cluster analysis to more closely examine shape relationships among skulls (Fig. 5.6). Accounts by the Colonial chroniclers would suggest that people with similar head shapes were "of the same stock," but was this necessarily the case? The results in the dendrogram suggest otherwise. Individuals with similar head shapes were buried in different *machays*, while a single cave can represent the full diversity of skull forms. Standardization in modification practices would suggest that infants' heads are being bound by a single or small group of practitioners using prescribed techniques. Conversely, great because there is great diversity in binding style, modification was a tradition of the home, likely enacted by parents or close kin. These individuals may have had a general knowledge of binding practices, but they may have been performing it infrequently (see Arriaza et al. 1988: 17).

Within the population, males tend to demonstrate greatershape homogeneity. Within Chanka sites, there is twice as much variation in head shape among females. This disparity would be expected if *machays* reflect patterns of patrilocal internment and female in-migration from other lineages or *ayllus* (see Tiesler 2014). The out-migration of local females, and the in-migration of outside females, would create the male-to-female modification disparity observed in Andahuaylas. Alternatively, binding practices for males might have followed more standardized prescribed techniques compared to females. Eitherway, head shape diversity is consist with cases where modification represents corporate cohesion above the descent group level (Hoshower et al. 1995: 160).

While the placement of bands or immobilization in a *kiraw* cradle structures the overall shape of the remodeled head, the length of time and the amount of compression decides its intensity—the extent of elongation. When the intensity of modification is compared between males and females, results show that males tend to have slightly more intense (elongated) crania compared to females.

Finally, there appear to have been no osteopathic effects from modification implementation, duration, and intensity. Chanka and Quichua populations were separately categorized based on the severity of vault bone porosities, pin-prick sized holes in that could potentially result from the downstream impacts of head shaping practices. However, there were no significant associations between the severity of cranial porosity and the intensity of head elongation. Indeed, extremely elongated skulls exhibit all degrees of infected bone, from mild to severe. In this population, external pressure from compression forces during the head shaping process did not promote diploe expansion (the process which gives porosities their characteristic shape) (Gadison et al. n.d.).

Post-collapse Ethnogenesis in the Ancient Andes

Despite Wari's borg-like obsession maintaining distinctions in hierarchy, the trappings and markers that signaled status and standing in the Wari Empire appear to have been largely limited to portable luxury goods and trophies, and not manipulation of the body itself. Yet when Wari collapsed, communities necessarily had to reorganize themselves, both practically and conceptually. A wealth of cross-cultural evidence suggests that when imperial powers retract or disengage from an area, the social categories that once existed may also radically reconfigure. Whole categories of people cease to exist. Gone are the bureaucrats, professional soldiers, conscripted artisans, and mid-level administration that ensured the smooth operation of the State. The generations of people that lived through Wari fragmentation underwent a striking transformation in terms of how identities were conceived, perceived, and codified. That is, how people regarded and represented themselves and others. As Wari's ideological and economic influence waned, along with its emphasis on status-based differences and rigid hierarchies, communities had to renegotiate relationships with neighbors. People were still around and tasks need to be completed—tending to crops, mining salt, managing herds, and appeasing ancestors. Among a host of archaeological indicators, Chanka and Quichua people likely reorganized the practice of artificial cranial modification in order to emphasize and manage resource insecurities in the post-collapse era.

It would have been important to demarcate *ayllu*, lineage, social category, and rank in a landscape characterized by crowded hillforts, small outpost, and vast no man's lands. Each of these group affiliations would have afforded the member certain rights, but also reciprocal obligations. More important than material wealth, contours of membership bear on the kin you can mobilize and enter into *ayni* — relationships of reciprocity. And collective action would have been absolutely necessary in Andahuaylas—be it building a defensive wall, cleaning a canal, or organizing war parties. Yet the system is inherently instable. As lineages grow, and ranks proliferate, identification becomes more difficult. In these cases, genealogies may be manipulated. It is also common that lower ranked members defect, destabilize, and wreck war on the group (Chacon 2014: 31). For instance, overlooked but illuminating Quechua nomenclature makes clear distinctions between people from esteemed ancestral lineages (*apukikuna*) or of deprived heritage (*wakcha*) (Holgúin 1901 [1608]).

Such processes are common in cases of state collapse, cross-culturally (see Sen 2008; Taylor 2010). Multi-valent identities (i.e., sex, age, occupation, etc.) could have been easily suppressed during documented episodes of instability and outright violence after ca. AD 1000/1050. In this turbid milieu, cranial modification may have promptly emerged as a new and highly conspicuous means of denoting or embodying a singularized social identity (Joyce 2005; Geller 2014; Tiesler 2014). This is not surprising. In Andean hierarchies of body parts, the head sits at the top (Arnold and Hastorf 2008; Bastien 1978; Tiesler 2014). The head and face are the loci of communication, and a modified head—and its attendant head gear—would have permanently signaled the bearer's affiliations. Individuals were conspicuously differentiated either from manipulation of the head or by letting it retain its natural form. The rigidity and permanence of cranial modification would have made passing between groups impossible. The corporal manifestation of alterity would have permanently signaled the bearer's identity or affiliation. Group members could have thus seen themselves as linked. Shared head shape would have promoted solidarity among in-group members, while simultaneously provoking further balkanization of those outside the group.

Right to land and water would have been a key contention when people were crammed together into hilltop settlements that had to be self-sufficient. In the absence of any formal administrative system, head modification (or the lack thereof) would have been a crucial means of signaling certain inherited, ascribed rights. Great fraternal rivalries can be provoked when parents fail to wisely distribute those resources to potential heirs. It identifies an ephemeral exclusiveness or social position. In Andahuaylas, head remodeling was a novel postimperial phenomenon whose implementation and performance are used to draw distinctions between groups. Tracking descent from progenitors was the basis for social differentiation because ownership is more difficult to dispute when it is conferred through head shape. Head shape heterogeneity would be the logical choice for Chanka and Quichua communities with competeing claims over different types of natural resources and ecological zones.

The postimperial landscape in Andahuaylas was one that appears to have been defined by the creation of novel communities. Within those communities, new social categories and polities began to coalesce. Within a few generations of Wari's collapse, caregivers are binding the heads of most infants in the region. This tradition was consciously repeated for dozens of generations. Cranial modification was one of several innovative adaptations which mediated radically reconstructed interpersonal relationships in the aftermath of Wari collapse.

At a fundamental level, head remodeling is a practice whose reproduction speaks to the creation of intentional cultural distinctions, and thus a proxy of *ethnogenesis*. And perhaps more than any other underlying factor, Wari's fragmentation restructured boundaries that demarcated novel intergroup differences and highlighted distinct cultural identities.

Cranial Modification as Kin Category: The Wakcha and the Piwi Churi

Assuming patrilineal descent usually and ideally structures *machays* collectivity (Baca et al. 2012), head remodeling in Andahuaylas must be governed by some other complementary rule of descent or social categorization. While distinct binding traditions were somewhat mediated by sex, the sheer range of head shapes points to the existence of various lineages (Torres-Rouff 2002; Hoshower et al. 1995). In fact, there is convincing ethnohistoric data which supports a model of head shaping based on matrilineal descent. For instance, it was the maternal uncle who was responsible for fabricating the *kiraw* crib which would compress the neonate head (Latcham 1929; Purizaga Vega 1991). This tradition was ordered by *panacas*, social collectives organized as matrilineal exogamous descent groups, in which a man belongs to his sister's group (Zuidema 1964: 185). Inca *panacas*, the most extensively researched, consisted of all the ruler's descendants, except for the son who succeeded him (*ibid*: 15). Sometimes, this favored son was the first-born, but this was not always the case. An famous example is primogenitor Inca Urco who was superseded and usurped of his hereditary rights by his younger brother, Pachacutic (Urton 1999).

Conceptually and practically, patrilineality was endogamous and matrilineality was exogamous. Sabine Hyland's (2015) extensive ethnohistoric research highlights the strategic importance of female exogamy in Andahuaylas. She notes that during the Colonial Era, a *kuraka* would give a big dowry so that his daughters could get married into the creole elite class. When the *kuraka*'s son became the chief, his creole brothers-in-law would actively help maintain power when challenged by other *ayllus*. In other words, the marriage of the future *kuraka*'s sister is crucial to his power. Thus, although the placement of head-bindings may be mediated by gender,

gender-mediated patterns of female exogamy may account for head shape variability between males and females in Chanka and Quichua communities throughout Andahuaylas.

While head shape has a gendered component, the presence of a remodeled head itself might have served to highlight specific kin categories. Kin are people who have a blood (cognate) relative in common (Goodenough 1955). Kin, or kindred, is a social category that, in Andahuaylas, structures group membership. These kin categories no longer exist today, but were well documented among the late prehispanic groupings in the south-central Peruvian highlands.

The most relevant kin categories for the Chanka and Quichua could have included the *Wakcha* and the *Piwi Churi*. Juan de Betanzos (2004 [1557]: 68–71) provides some of the most vivid descriptions of these groupings. By the time of the Inca Empire, the *Piwi* referred to offspring from a leader's principal wife, who also came from his family and lineage. She was known as the *Piwi Warmi* or the *Maman Warmi* and could not have a trace of ignoble heritage. The sons of these ladies were called the *Piwi Churi*, and the eldest became Lord of the Inca Empire and legitimate heir. Children from secondary wives could never be a *Piwi*.

Piwi was thus the designation afforded to the primogeniture or favored child (Betanzos 2004 [1557]; Flannery et al. 2008; Julien 2009; Yaya 2012). A leader among equals, a *Piwi* was linked through descent to the founders of lineages, and thus represented the household (Silverblatt 1987: 23) and could also make claims for different resources. Yet prior to the Inca era, the *Piwi* did not necessarily enjoy any chiefly veneration, prestige goods, or other items which would indicate an elevated socioeconomic status. We think that in Andahuaylas, the *Piwi* were marked by unmodified, rounded, "normal" heads.

What about the majority group of modified skulls? Here, linguistic evidence is key. In Quechua, the words, *yanca, ccaci,* and *wakcha* were used to describe those from common castes. *Wakcha* is a metaphor of distance and refers to one who is kinless, or lacks kin support, or are relatives of unfortunate people and low offspring (*sensu* Betanzos 2004 [1557]). *Wakcha* was also used to describe middle children, step-children, legitimate children by a secondary wife, illegitimate children, and those children who were simply unfavored for some reason (Julien 2009; Yaya 2012). In Cuzco, *wakcha* also referred to *orejon* warriors who went about with "tapered" heads, signaling their birth from foreign women of low extraction (Betanzos 2004 [1557]).

This group of marked others, identified by their long, tapered heads, may have been bereft of the type of social connections bestowed on the unmodified *Piwi* members of society. This diverse majority included individuals who had lower birth order, or were seen as somehow illegitimate (e.g., the offspring of a principal wife). Among these members of society, group affiliation would have still been crucial. If a remodeled head signals *Wakcha* identity, then this may account for the diversity in head shapes present in Andahuaylas, and even within a single ossuary.

Like other affiliations, these sorts of ranked, heterarchical groupings were used to order and maintain social and economic rights and relationships (Urton 1997). But the system did not last. By the late sixteenth century, the practice of cranial modification was outlawed, and categories including the *Piwi Churi* and *Wakcha* largely collapsed as the Spanish instituted a new system of social ordering and administration (Betanzos 2004 [1557]).

The postimperial era would have been conducive to the formalization of a system which prioritized kin categories and ranking in the creation of new social categories, These groups had caste or ethnic-like qualities. Above all, unlike the fluid and nested nature of the *ayllu*, kin categories were relatively fixed and consistent. For this reason, they were conceived of in ethnic-like terms. Consider that group membership was, for the most part, ascribed before birth, and members saw themselves as linked and related. They also engaged in overt, boundary-marking practices to reify solidarity among in-group members by highlighting contrasts with out-group others.

The integrative work on cranial modification in Andahuaylas helps address outstanding issues concerning Wari collapse. But there are also more general considerations. As imperial hierarchies disintegrate, old political subjectivities dissolve and novel institutions coalesce: new people and new groups are created. Andahuaylas witnessed the crystallization of the *ayllu* and genesis and performance of a new social identity based on kin category, lineage, and gender. Regardless of semantic ambiguities, both modified *and* unmodified heads were emblemic markers that communicated important information about group membership, affiliation, and identity (Tiesler 2014; Torres-Rouff and Yablonsky 2005). So too, the permanence of a remodeled head allows us to reconstruct aspects of child-rearing practices, identify the role caregivers played in social reproduction, and examine the biocultural consequences of perpetual, conspicuous signaling. Cranial reshaping was an innovative process and component of ethnogenesis. However, inherent within the genesis of novel cultural distinctions and identities are seeds of competition, antagonism, and indeed, violence. To physically mark someone is also to make them conspicuous. As we will see in Chapter 6, life for the long-headed *Wakcha* was not easy.

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Chapter 6
Raiding and Ethnic Warfare in the Postimperial Era

Post-imperial eras tend to witness increasing levels of violence. This can happen for a number of reasons. These include the need to renegotiate lands and other resources (mines, grazing lands, water) once they are no longer in state hands. Power vacuums emerge, different warriors and hereditary leaders vie for authority, and scarcity increases competition among those who remain. These types of stressors are closely associated with increases in raiding, ambushes, and violent scuffles.

In many instances, state collapse can—and in this case seems to have—reconfigured social groups. The implementation of intentional distinctions invite contrasts, antagonism, and sometimes even violence. Violent confrontations may thus shape relationships between people, and these social relationships in turn can shape experiences of violence. Over periods as long as centuries or as short as a few weeks, changes ripple through a society and create circumstances that radically redefine how people conceive of one another, and importantly, how people physically interact with one another.

This chapter examines how violent confrontations in Andahuaylas were restructured in the aftermath of the Wari state collapse during the early Late Intermediate Period. Data collection, focused on cranial trauma, directly inform on experiences of violence. Cranial trauma rates are compared between skulls and skeletons from the Wari era, and the Quichua and Chanka populations.

A Bioarchaeological Approach to Evaluate Violence

Generally, manifestations of violence in society have been interpreted by scholars as a potent mechanism of subduing, controlling, or even eliminating subordinate populations (Ferguson and Whitehead 1992; Earle 1991; Walker 2001). For bioarchaeologists, skeletal trauma is a reliable proxy for such violence (Walker 2001).

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Through analysis of injury and fracture patterns, bioarchaeologists can often determine: (1) whether an injury was accidental or intentional, (2) the mechanism of death, (3) the lethality of a sustained injury, and (4) the extent of any healing. While factors like age, sex, and health status (Larsen 1997) affect the biomechanical response of human bone to external force, all bones will eventually break under enough pressure (Galloway 1999). Because bone fracture patterns are finite (Jurmain 1999), diagnostic patterns of intentional trauma from both archaeological and modern forensic cases can help predict and interpret patterns of violent injury on skeletal remains from ancient Andahuaylas.

Populations, or groups therein, may be differentially affected by violence, with distinct, corresponding body parts or regions targeted. Cross-cultural studies consistently demonstrate that variables like age, sex, and ethnicity can be correlated with specific patterns of physical trauma (Walker 1997; Horowitz 1985; Lessa and de Souza 2006). These variations allow bioarchaeologists greater insight into both the motivations of conflict, as well as the biological and cultural responses to force, or the threat of force (Martin and Frayer 1997). From there, we are able to reconstruct patterns of traumatic injury for specific individuals, societal subsegments, and ultimately entire populations.

Based on the trends documented in ancient, historical, and modern case studies (Schwartz and Nichols 2006; Torres-Rouff and Costa 2006; Tung 2008; Chase-Dunn and Taylor 1994), one might reasonably expect that the collapse of the Wari state led to increased social tension and violence among post-imperial populations. Cranial fractures, an indicator of violence, would be expected to increase significantly in frequency and lethality between the Wari and postimperial eras. Furthermore, although conflict may have been endemic, it was probably not haphazard (Taylor 1999; Brubaker and Laitin 1998). The expectation is that different types of violence were enacted against specific social groups. Intervening variables include age, sex, and political affiliation.

Clues from the Neck Down

In assessing skeletal trauma, one needs to distinguish between those caused by violent human interactions and those injuries due to accidents. That is, if we were to find evidence of more trauma in post-imperial populations than in the Wari-era remains, might that just be because the Chanka and the Quichua were a more careless, accident-prone group than their predecessors?

Bioarchaeologists have determined that head wounds are most often the results of intentional violence, while postcranial ("neck down") skeletal injuries are usually caused by accidents (Walker 2001). However, when postcranial fractures are present along with cranial trauma, then this may be interpreted as defensive wounds. These and other configurations inform our understanding of the manifestations of and motivations for attack (Tung 2012). To ensure that we are assessing violent interactions rather than accidents among pre- and post-collapse communities, we

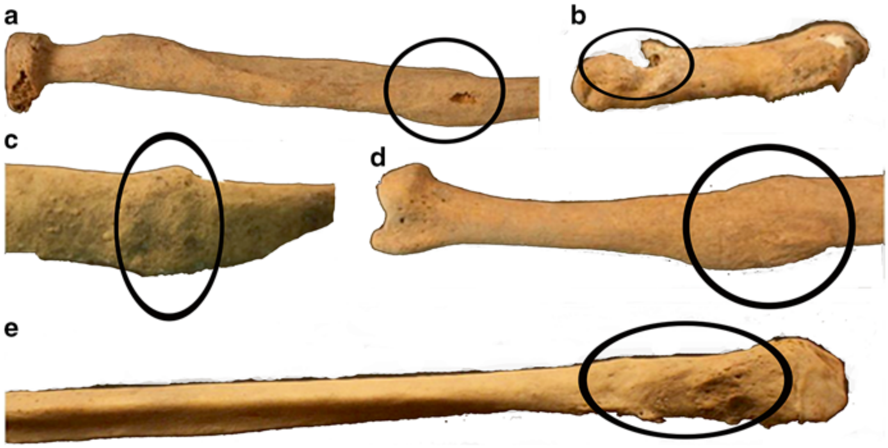

Fig. 6.1 Healed fractures (*circles*) on (**a**) radius (parry fracture), (**b**) metacarpal (boxer's fracture), (**c**) rib, (**d**) ulna (parry fracture), (**e**) fibula

can compare postcranial fractures of Turpo and Cachi. These two mortuary communities—Turpo from the Wari imperial area and Cachi from the post-imperial Chanka era—are located on opposite sides of the same mountain ridge in Andahuaylas. These communities were both exposed to the same potential risks from accidents that arise from walking and working in a difficult topographic environment (Fig. 6.1; Table 6.1).

Broken ankles are primarily caused by accidents among modern populations in Andahuaylas and other similar mountainous societies (see Donaldson et al. 1990: 244). This trauma is the result of unintentional clumsiness or happenstance. With broken ankles, the fibula (the lateral lower leg bone) often fractures. Supination–adduction favors transverse fractures of the fibula below the syndesmosis, and external rotation will cause oblique or spiral fractures. Pronation–abduction forces may lead to transverse or laterally comminuted fractures of the fibula (Marsh and Saltzman 2005). In the Andes mountains, these fractures result from falls. They are biomechanically and morphologically distinct from the crushing fibular fractures and cutmarks that may result from torturous violence (e.g., hobbling; see Martin and Osterholtz 2012).

The rate of ankle fractures in the Wari and Chanka populations—represented by broken fibulas—thus provides a rough proxy for the accident rate in Andahuaylas over time. We observed one fracture among 22 fibulae excavated at Turpo (4.5 %), and 18 fractures among 231 fibulae retrieved from Cachi (a 7.7 % injury rate).

Even though only one fibula from Turpo was broken, the injury rate was comparable between Turpo and Cachi. By this measure, there is no significant difference in the accident rate of the pre- and post-collapse populations. This is to be expected because there is no indication in either archaeological or environmental studies that the challenging topography of Andahuaylas and the quotidian domestic activities of the provinces' inhabitants (the underlying cause of many accidents) changed much

Table 6.1 Postcranial wounds indicative of violence and accidents

	Common etiology																			
	Usually violence												*Sometimes violence*				*Usually accident*			
Bone	Metacarpals (boxer)				Ulnae (Parry)				Radii (Parry)				Ribs				Fibulae			
	# observed	# affected	% affected	*p*-value	# observed	# affected	% affected	*p*-value	# observed	# affected	% affected	*p*-value	# observed	# affected	% affected	*p*-value	# observed	# affected	% affected	*p*-value
Turpo (Wari-era)	25	0	0	.6173	33	0	0	.2064	34	0	0	*.0362*	283	11	3.9	< *.0001*	22	1	4.5	.4915
Cachi (Chanka-era)	614	26	4.2		131	9	6.9		94	11	11.7		1355	172	12.8		231	18	7.8	

in the five-to-six generations that temporally separate people in Wari–era Turpo from the Chanka of Cachi (Gomez 2009; Kellett 2010).

On the other hand, in close-contact violent encounters, injuries to the hands, lower arm bones, and ribs are fairly common. These postcranial wounds tend to occur when victims raise their arms in defense of a blow (producing *parry fractures* of the radius and ulna), throw a punch (*boxer's fractures* of the metacarpals), or receive a beating (rib fractures) (Lovell 1997; Tung 2012: 110). Among bones which may present ambiguous signals of violence, we examined 25 metacarpals (hand bones), 67 radii and ulnae (lower arm bones), and 283 ribs from Turpo, and 614 metacarpals, 225 arm bones, and 1,355 ribs from Cachi.

Potential indicators of violent injury in Andahauylas demonstrate some differences over time. The Chanka population from Cachi has a much higher rate of rib fractures, 12.7 %, than the Wari-era Turpo group (3.9 %). Radial trauma rates are also significantly higher after Wari collapse (from 0% to 11.7 %). While boxer's fractures of the metacarpals increase (from 0% to 4.2 %), and as do possible parry fractures of the ulna (from 0% to 6.8 %), the difference is not significant.

However, the marked increase in ulnar and metacarpal fractures, and the statistically significant increase of radial and rib fractures (defensive injuries), help confirm that violent attacks—and not accidents—were more common among Chanka communities of the postimperial era. Thus far, clues from the neck-down hint at close conflict. Next, data on head wounds are marshaled to further investigate intentional trauma before and after Wari collapse.

Cranial Trauma Before and After Wari Collapse

Comparing rates of cranial trauma during the twilight of the Wari Empire and after Wari's collapse provides a good indication of the ubiquity of violence during a tumultuous period of social change (Table 6.2). We were able to evaluate 26 late adolescent and adult crania from imperial-era Turpo, and 243 skulls from the post-imperial era. Of the diagnostic crania recovered from Turpo, only two (7.7 %) had traumatic injuries.

After Wari's disintegration, rates of violence skyrocketed in Andahuaylas (Fisher's exact, $p<0.0001$; $N=269$). Among this population, 138 or 56.7 % of late adolescent and adult crania have at least one traumatic wound.

Trauma also becomes significantly more lethal after Wari collapse (Fisher's exact, $p=0.0036$, $N=269$). There are no late adolescent/adult individuals with perimortem fractures at Turpo. However, at the post-collapse sites of Pucullu, Natividad, Ranracancha, and Cachi, 53 or 21.8 % of late adolescents and adults have at least one lethal wound (Fig. 6.2). Lethal trauma contributed to the death of over a fifth of all individuals in post-imperial Andahuaylas. This is a dramatic change in trauma frequencies and lethality which occurred within the span of mere generations.

Table 6.2 Total adolescent/adult cranial trauma rates in Andahuaylas

Site	Era	Cultural affiliation	Cranial MNI	(n) Trauma	% Trauma	Total # wounds
Turpo	MH	Warified	26	2	7.7 %	4
Natividad	LIP	Chanka	19	10	52.6	12
Ranracancha	LIP	Chanka	37	23	62.1 %	46
Cachi	LIP	Chanka	162	84	51.9 %	163
Pucullu	LIP	Quichua	25	17	68.0 %	32
Total			269	136	50.6 %	257

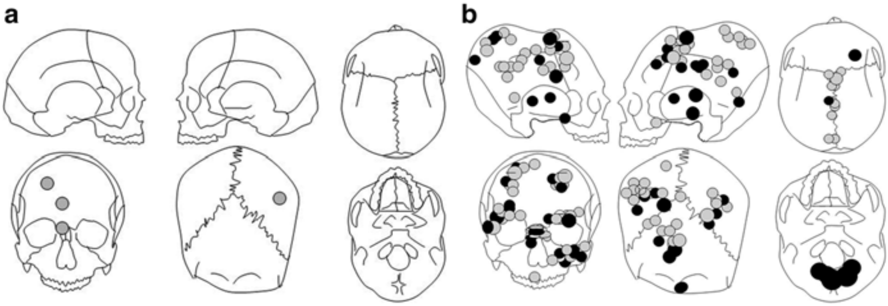

Fig. 6.2 Total cranial trauma lethality and distribution at Turpo during the Wari imperial era (**a**) and during the postimperial era—four sites (**b**). Only males in Turpo evinced head wounds (*gray* = antemortem, *black* = perimortem)

Violence during the Twilight of the Wari Empire

Crania representing at least 36 individuals were recovered from the circular tomb at Qatun Rumi, in Turpo. As noted earlier, of those remains, 26 individuals were adolescents and adults, and only two demonstrated evidence of cranial trauma. Two of eleven males, or 18 %, exhibited evidence of injury, while none of the five females and none of the nine unsexed adults demonstrated evidence of trauma. One of the injured individuals was a middle adult male (35–49 years old), with two very well healed small circular depression fractures on the right frontal bone (above glabella, and on the squamous). The second was a young adult male (20–34 years old) with a well-healed fracture on the right nasal, and a well-healed small circular depression fracture on the posterior right parietal bone.

Compared to other contemporaneous Andean hinterland communities (Tung 2012), violence among Wari-era populations in Andahuaylas was low and nonlethal. The location of wounds on males from Turpo suggests both victims were facing their assailants at the moment of impact, while the wound on the right posterior portion of the cranial vault indicates that the victim was turned away, or not directly facing his opponent when that injury was received (Table 6.3). Sublethality is indicated by bone growth and remodeling—signs of healing. Wound lethality in this

Table 6.3 Summary table of head wound distribution on Wari Era males and females

	Left	Right	Anterior	Posterior	Superior	Inferior	Total
Antemortem	0	0	3	1	0	0	4
Perimortem	0	0	0	0	0	0	0
Total wounded males (*N*=2)	0	0	3	0	0	0	4
Antemortem	0	0	0	0	0	0	0
Perimortem	0	0	0	0	0	0	0
Total wounded females (*N*=0)	0	0	0	0	0	0	0

case suggests assailants may have intended to injure—but not kill—the victim during the assaults. Tung's (2012: 125) research on trauma in the Wari southern hinterlands similarly documented injuries on the frontal bones and facial area of males, likely the result of face-to-face physical conflict. Concomitant parry fractures support a scenario of possible raiding (Tung 2012). However, unlike other Wari hinterland regions, there is no evidence of parry fractures at Turpo. Thus, raiding may not have been the motivation for violence in imperial-era Andahuaylas (at least within this community).

Scuffles and Routinized Conflict during the Wari Era

In the absence of other postcranial wounds, sublethal anterior cranial injuries may sometimes be evidence of ritualized conflict called *tinku* (Tung 2012: 139), also known as *takanakuy* in Andahuaylas. In cases of *takanakuy*, combatants (both men and women) from different *ayllus* or communities meet at a central (neutral) location to face off. During these yearly events, community antagonisms and tensions released as blows are traded. However, fights are quite distinct from western-style bare-knuckle boxing matches. Our ethnographic observations of more than three dozen matches throughout rural Andahuaylas documented common fighting techniques. Crosses and uppercuts—popular boxing moves—were never observed, while hooks and bolo punches were witnessed in a few bouts. In almost all cases, fighters employed wild, uncontrolled, wide-arched, looping roundhouse (*haymaker*) blows. Conversations with local health workers confirmed that this type of fighting mostly impacted the lateral eye orbits, zygomatics, greater wings of the sphenoid, nasals, and temporal bones. Medial areas around the frontal bosses and superior squama tended to evade direct impact. Combatants also tended to display broken hand bones, known colloquially as boxer's fractures (Lovell 1997; Walker 1997). If rural, traditional, bare-knuckle combat styles have remained relatively unchanged over the past several centuries, then the lack of *takanakuy*-type facial and hand fractures at Turpo suggest ritual/routinized fights may not have been the cause of head injuries either.

Ruling out other forms of violence, wound patterning and wound lethality are consistent with those who experience interpersonal conflict resolution, or perhaps some form of community-sanctioned corporal punishment (see Tung's 2012: 144–145). The violence is of low intensity, it is likely community-sanctioned, and it is sublethal—there is no apparent homicidal intent. As a crude analogy, rival fraternity brothers may engage in bar brawls, and broken noses ensue, but life goes on. During the twilight years of the Wari Empire, violence—as indicated at the Turpo site—was neither endemic nor pervasive. Rather, the evidence points to infrequent, local community scuffles that are common in small villages, regardless of era or locale.

Warfare Among the Post-imperial Quichua

The data indicate head trauma in Andahuaylas increased significantly in its ubiquity and lethality after Wari collapse. Yet, disparate experiences of violence characterized the Chanka and Quichua polities.

First, it is instructive to examine violence in the small Quichua enclave community of Pucullu. Colonial chronicles and legal documents highlight enduring animosity between the Quichua—who eventually allied with the Inca—and their Chanka neighbors (Hostnig et al. 2007 [1619–1786]; Julien 2002 [1539]; Cieza de León 1996 [1553]). As a minority enclave, the Quichua living in Pucullu may have faced threats from their rivals and consequently had to rely on alliances with distant communities. This may spur distinct exogamic patterns and social configurations, such as the in-migration of able-bodied males who could till the fields, keep watch over herds, and take up arms in case of attack. An analysis of cranial trauma rates from one burial cave in Pucullu, where members of an unnamed lineage were interred between AD 1160 and 1260, helps inform the nature of conflict within this tiny enclave.

Twenty-five crania of individuals over 15 years old could be observed for evidence of trauma. Of these individuals, 15 or 60 % show at least one head wound. This frequency is exceedingly high and suggests conflict was a constant and very real concern. Moreover, when we examine trauma rates between males and females, a revealing trend emerges. Among 10 females observed, 5 (or half) have at least one wound, while 12 of 15 males, or 80 %, have at least one cranial fracture. The males exhibit significantly more trauma than females (Fisher's exact, $p=0.0344$, $N=25$). None of the 12 subadult skulls evince trauma.

Along with trauma frequency, wound counts and locations are distinct between the sexes (Table 6.4). Among the 15 injured males, there are 20 head wounds. Wounds were most common on the anterior—11 of 20, or 55 % —and indicate that males were often facing opponents at the moment of impact. In contrast, among the five injured females, there are a total of 12 wounds. All wounds were sublethal. Moreover, the majority of wounds on females—8 of 12, or 67 %—were located on the posterior. This patterning shows that most injuries were received when a victim was not facing an assailant, and possibly running away (Tung 2012). Finally, 4 of

Table 6.4 Summary table of head wound distribution on Quichua males and females

	Left	Right	Anterior	Posterior	Superior	Inferior	Total
Antemortem	3	0	11	1	0	0	15
Perimortem	2	2	0	1	0	0	5
Total wounded males ($N=12$)	5	2	11	2	0	0	20
Antemortem	0	0	2	8	2	0	12
Perimortem	0	0	0	0	0	0	0
Total wounded females ($N=5$)	0	0	2	8	2	0	12

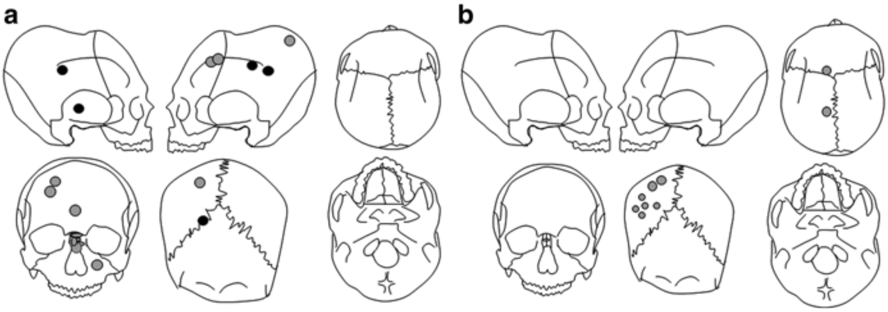

Fig. 6.3 Trauma among Quichua males (**a**) and females (**b**) (*black* perimortem, *gray* antemortem)

12, or a third, of all female head wounds are directed toward the superior and anterior of the skull. This trauma pattern is often witnessed in cases of intracommunity domestic violence at the hands of male partners or female affines who preferentially target these areas for sublethal attack (Alcalde 2003; Van Vleet 2002; Novak 1999).

Evidence for Raiding and Clashes

What does wound location between males and females tell us about violence among the Quichua? The trauma data reveals a palimpsest—a congealed history—of physical encounters (Fig. 6.3). First, the spatial patterning of lethal and sublethal trauma, where males are facing opponents (and sometimes dying) and females are often turned away from assailants (but not dying), is expected in traditional models of raiding and skirmishes (Tung 2012; Arkush and Tung 2013). The concentration of injuries to female faces and crowns are common occurrences in cases of intrafamilial (domestic) violence. Other factors need to be considered too. Given that Pucullu was an isolated Quichua enclave with little grazing and agricultural lands surrounded by some of the largest Chanka settlements in the region (Kellett 2010), it is not too far-fetched to propose that acrimonious confrontations with Chanka neighbors may have taken place. Quichua men may have become the victims of lethal and sublethal trauma while defending their small community, or while raiding nearby Chanka settlements in the pursuit of animals or agricultural bounty. Quichua women on the other hand may have had to escape Chanka raiders while also enduring violence at the hands of kin and affines. All told, Pucullu individuals seem to have experienced the type of violent typified by small-scale peasant societies that flourish in the absence of complex states.

Strategic Alliances in an Enclave Community

Recall from Chapter 4 that there were two nonlocal individuals in the Quichua enclave. Both nonlocal individuals were males. One male, PCU.01.01.08, was an older adult (+50 years), while the other, PCU.01.01.25, died during middle adulthood (35—50 years old). Both males have similar biocultural profiles. They both have slight cranial modification. There are no cranial lesions indicative of disease. The older adult has two well-healed injuries, one on the frontal bone, and one on the right parietal boss. The middle adult does not have any trauma, but evinces a healing trepanation, received sometime in the years before his death.

The presence of two battle-scarred, nonlocal males at Pucullu suggests a distinct pattern of strategic mobility. Their in-migration to the Quichua enclave could have been largely prompted by security concerns. In contexts of external warfare, males are often sought from outside the local community to provide additional security against neighboring rivals. In Andean enclave communities, the in-migration of nonlocal males is especially crucial because clusters of natal wives—including sisters, consanguineal kin, and affines—must watch over livestock in lands that tend to be located far away from home communities. Given the increased risk of ambush in these marginal, isolated subsistence zones, it is important to have a husband (and his kin) who will tend to, and most importantly, defend crops, people, and property (Skar 1982; Gómez 2009).

The Nature of Violence in Chanka Communities

The bellicose nature of the Chanka is the stuff of legend. Feared by the Inca, oral accounts relate that divine intervention was responsible for the defeat of the Chanka in the early fifteenth century. Folktales and chronicles relating the Chankas' brutality toward their enemies and one another is comparable to modern accounts of mass casualties, wars of attrition, and even ethnocide. Skeletal analysis of Chanka victims of violence can help us determine whether this belligerent reputation is actually warranted.

Table 6.5 Summary table of head wound distribution on Chanka males and females

n	Left	Right	Anterior	Posterior	Superior	Inferior	Total
Males (N = 54)							
Antemortem	11	12	26	17	5	0	71
Perimortem	7	7	13	3	1	2	33
Total wounded	18	19	39	20	6	2	*104*
Females (*N* = 56)							
Antemortem	14	10	17	14	9	0	64
Perimortem	7	8	15	8	0	5	43
Total wounded	21	18	32	22	9	5	*107*

Table 6.6 Tally of head wounds per sexed adult

	1 wound	2 wounds	3 wounds	4 wounds	5 wounds	9 wounds	Total
No. males	54	18	9	4	0	1	86
No. females	34	14	2	5	4	0	59
No. of wounds in sample (Total no. wounds = 250)	88	64	33	36	20	9	

To determine whether Chanka men and women were experiencing violence in concurrent or distinct social encounters, wound counts and overall trauma rates were compared between all late adolescent/adult males and females. More than a third of all injured had more than one wound. Specifically, among males, n = 32 or 37.2 % had more than one wound, while n = 25 or 42.4 % of injured females had more than one trauma (Fisher's exact, $p = 0.6045$; $N = 145$). In other words, both males and females were equally likely to be injured multiple times, either in consecutive or contemporaneous attacks. Moreover, males and females from different Chanka communities all demonstrate consistent patterns of cranial trauma. The majority of wounds for both males and females is concentrated on the anterior. About 40 % of all sublethal wounds and a third of all lethal wounds show up on the anterior of male skulls. Among females, the rate is similar: 40 % of sublethal injuries and 40 % of lethal trauma are present on the face and forehead.

Violence is distinct in Chanka communities (Table 6.5). Unlike the Quichua enclave, there is no significant difference in trauma frequencies between males and females. This evidence suggests that while Quichua males and females were experiencing violence in somewhat disparate contexts (raiding and possibly domestic violence), Chanka males and females were experiencing violence in concert.

Something profound was happening within Chanka communities across Andahuaylas (Table 6.6). Here, we see patterns of violence that are *not* typical of traditional models of raiding, skirmishes, and ambushes. Those types of violence lead to markedly different patterns in trauma frequency and wound locations between males and females (Fig. 6.4). Adolescent females and young adult males

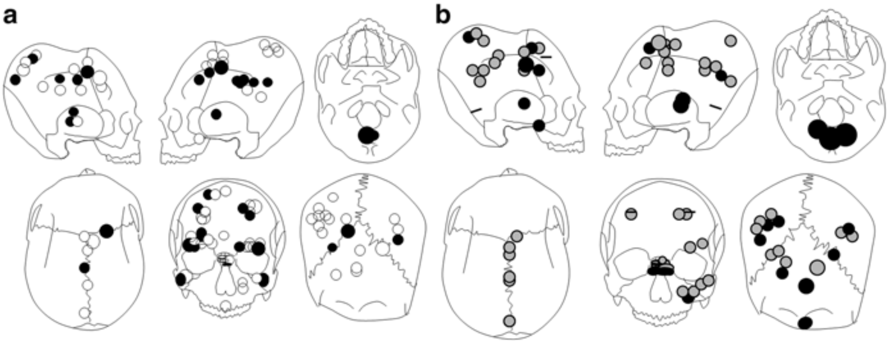

Fig. 6.4 Trauma lethality and distribution of Chanka males (**a**) and females (**b**) (*gray*=antemortem, *black*=perimortem)

were particularly vulnerable to deadly trauma at Cachi. Violence targeted men who were a little older—and had established families and obligations. From this age class comes political leaders, as status was achieved over time. On the other hand, females may have been undergoing a palimpsest of violent encounters. The highest ratio of ante- to perimortem trauma among females was on the face and top of the head. In contrast, the backs of female heads, and the base of the skull show a much higher proportion of deadly wounds. In other words, when violence targeted the back and base of the head, assailants aimed to kill. This type of deadly intent is unique in Andahuaylas. One way to figure out the nature of this peculiar pattern of violence is to see how trauma patterns intersect with age-at-death and cranial modification.

Warrior Women: Combatants, Subversives, and Victims

Given the trauma patterns, girls and women within Chanka society were clearly victims of violence, but did they inflict trauma as well?

To answer this question, it is helpful to examine another era of stunning violence that impacted women: Peru's 1980–2000 internal war between an abusive military and the Shining Path (PCP-SL), a Maoist terrorist group with roots in the circum-Andahuaylas region. Truth Commission Reports (CVR 2003) note that overwhelming majority of the 70,000 killed and disappeared—and one million displaced—in the conflict were rural, poor, indigenous Quechua speakers who were targeted by both the military and PCP-SL. The impacts of violence were widely felt and long-lasting. Communities fragmented, and many remain closed off today. Women and adolescents, in particular, experienced beatings, torture, displacement, sexual abuse, the disappearance and/or death of loved ones, and the wanton destruction of property and livestock. Women (widows, daughters, and mothers) who survived the violence in Peru suffered from psychosomatic sequella, which included headaches, stomach pain, fainting spells, madness, a lack of appetite, and trouble sleeping.

Survivors also suffered from PTSD-like symptoms including persistent fear and mistrust, increasing violence toward family members and neighbors, and a sense of being haunted by acts of abuse.

Insidiously, symbolic violence (e.g., heads smashed with rocks) and acts of "cleansing" were preferred tactics of terror for PCP-SL: Over 20 % of violent attacks involved massacres of over 10 people, and it was in these instances that women and children were more likely to be killed. Given that Chanka male and female trauma patterns are so similar and pervasive, the massacres committed by PCP-SL may help explain the somewhat aberrant manifestation of warfare in ancient Andahuaylas.

In times of war, women were not just victims, but also served as both combatants and support staff. The Shining Path overwhelmingly recruited late adolescent females to join their ranks and take up arms. In rural villages, it was common for widows who lost their loves to join the armed self-defense committees, making rounds to ensure public safety, rifle in hand. Other women aided combatants in more understated ways. For instance, younger women remained vigilant as they herded livestock in high-altitude pastures. *Mamas* also joined patrols as support staff, taking on roles like food preparation for male fighters. These testimonies from recent history inform on how we might interpret the trauma on women from the prehistoric Chanka era.

Age-Graded Trauma in Chanka Communities

There are certain periods in one's life when there is inherently of more risk of death by violence. Those working in public health term this phenomenon *excess* mortality, which serves as a contrast to death by disease, accidents, natural causes, and suicides. To access excess mortality in the past, we can look to lethal versus sublethal violence. Trauma rates directly inform on intent. When correlated with age, these data help illustrate how violence is experienced over a lifetime, and which ages are most impacted by deadly assault. Sublethal injuries (antemortem trauma) tend to accumulate as people age (Glencross 2011), while lethal wounds offer a relatively unambiguous snapshot of an individual at or around the time of death. In most societies, the older an individual is, the more healed wounds they tend to present. However, in catastrophic or extremely violent circumstances, this pattern may deviate from the norm.

Sublethal injuries accumulate over the lifetime of the average individual in post-collapse Andahuaylas (Table 6.7). The number of injuries per person increases directly with their age. Older adults average some 2.2 wounds each, while middle-aged adults average 1.4 wounds, young adults 0.73, and so on. However, the pattern is different for lethal, life-ending trauma. Of 215 crania, 49 or 22.8 % evince perimortem trauma. Intentional, deadly blows to the head were overwhelmingly directed toward adolescents and young adults, relative to other age groups. Violence was cutting short the lives of these productive and reproductive members of Chanka society.

The pattern of excess mortality becomes even more obvious when the age-at-death profiles are compared between lethally wounded individuals and those Chanka

Table 6.7 Sublethal and lethal head trauma by age

Age category	N	Mean no. antemortem wounds ea.	Mean no. perimortem wounds ea.
Infant	2	0	0
Child	22	.25	.75
Adolescent	14	.50	*1.2*
Young adult	69	.73	*.89*
Middle adult	84	*1.4*	.51
Old adult	24	*2.2*	.53

Table 6.8 Excess mortality rates by age category among the Chanka

	MNI	# lethally wounded	% lethally wounded
Infants/children	24	3	12.5 %
Adolescents	14	3	21.4 %
Young adults	69	19	27.5 %
Middle adults	84	19	22.6 %
Old adults	24	5	20.8 %

who were either uninjured or walking wounded (Table 6.8). The group that lacked perimortem cranial trauma forms a typical mortality curve (Jackes 2011), which sees high infant mortality rates, then a drop in mortality during later youth and early adulthood, and finally a rise in old age. Such demographic patterns have been observed in other contemporaneous Andean populations (Andrushko 2007: 99; Tung 2003: 140; Drusini et al. 2001). However, Chanka people with lethal wounds demonstrate an inverse pattern (Fig. 6.5). Deadly trauma was largely associated with young adults. Those in their prime experienced violent excess mortality relative to the other ages. Similar morbidity and mortality profiles have been observed for historical cases of tumultuous social upheaval (i.e., war or genocide) (Burnham et al. 2006; De Walque 2005; De Walque and Verwimp 2009).

Overall, the age-graded mortality profile of lethally wounded Chanka in postimperial Andahuaylas is somewhat similar to kill tallies for noncombatants during the civil war in the late twentieth-century Peru. In that case, violence was most pervasive in regions like modern Andahuaylas that lacked any profound or formal state presence. Subadults were also significantly impacted by violence: more than 7 % of the approximately 74,000 killed and disappeared in late twentieth-century Peru were children under 18 years old (Mealy and Shaw Austad n.d.: 39). In those cases, adolescents were often abducted by Shining Path terrorists and/or the Peruvian military, and children as young as 12 years old participated in armed conflict.

Patterns of violence witnessed in Andahuaylas and other regions of Peru during that country's civil war appear to be tragically similar to patterns observed in the same region some eight to ten centuries earlier. Excess mortality in both ancient and modern Andahuaylas was largely due to violence, apparently more so than any other nonviolent factor and was contributing to premature death among the Chanka. Far from unique, this mortality pattern is commonly observed in cases of civil war, ethnocide, genocide, and other similar social disasters (Fig. 6.6).

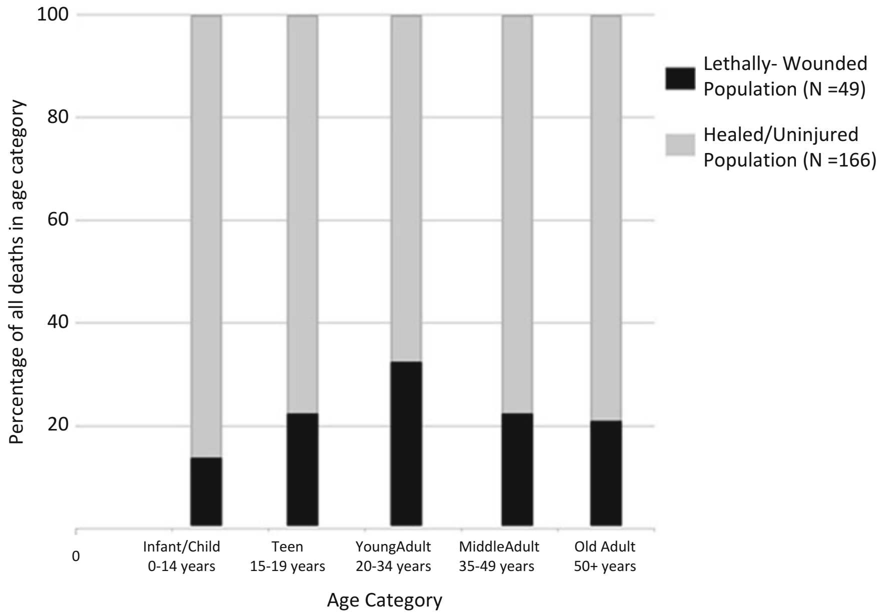

Fig. 6.5 Percentage of death by excess mortality among the Chanka

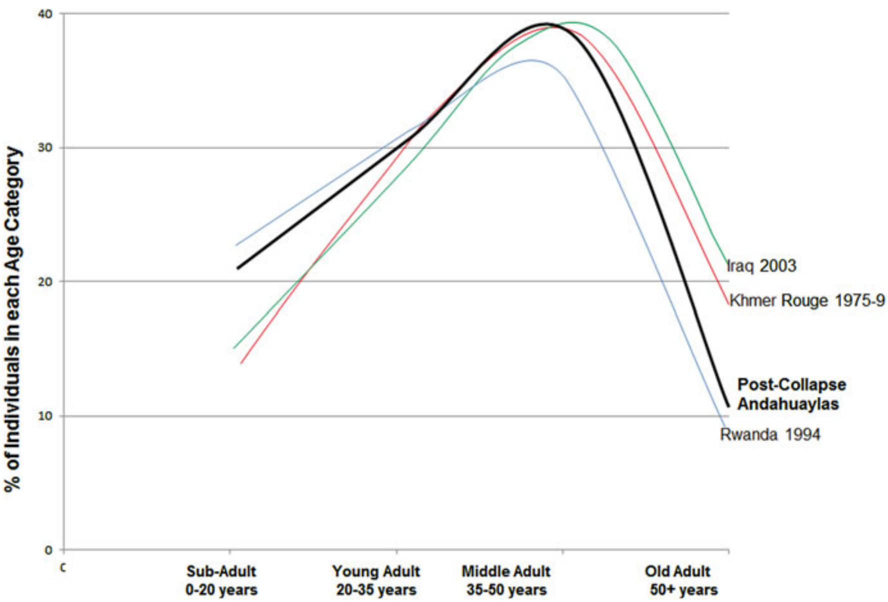

Fig. 6.6 The percent of individuals in each age category who died from lethal trauma during ancient and modern periods of sociopolitical unrest

Signs of Carnage among the Chanka

Chanka individuals were experiencing significantly more violence then their imperial-era ancestors. Furthermore, unlike the Quichua, Chanka males and females were experiencing congruent patterns of physical attack. The demographic and social consequences of this violence would have been significant: generations of new Chanka would cease to exist, and the ability to realize communal labor projects such as canal cleaning, defensive wall-building, etc. would have been greatly hampered; tending to crops and herds in distant fields would have been risky business.

However, not all Chanka late adolescents and young adults were equally affected by violence. While some individuals were singled out for attack, others appear to have lived relatively peaceful lives. In this case, the difference between peaceful life and painful death appears to have been primarily based on whether or not an individual had cranial modification (Fig. 6.7).

Among the *Piwi Churi*, those in Chanka society who lacked cranial modification, violence was less common. Of the 50 individuals observed, only 16 or 32 % exhibit evidence of head trauma. For this group, which comprised about a quarter of the populace, patterns of trauma are similar to those found in the neighboring Quichua polity (Fig. 6.8). Males with head injuries significantly outnumber females. Nineteen of 31 *Piwi Churi* males have at least one head wound, but only 3/13 females evince trauma (Fisher's exact, $p = 0.0452$). Deadly violence was present among the *Piwi Churi* populace too. Nine individuals (20 %) suffered a lethal perimortem head wound.

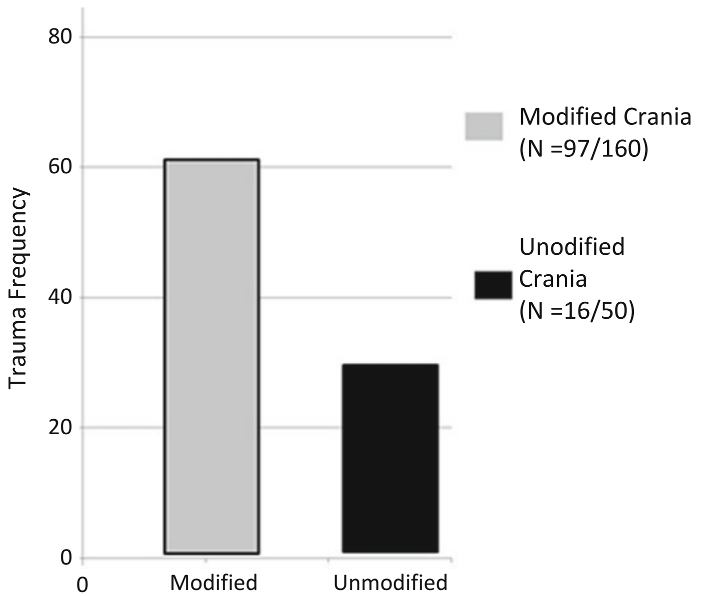

Fig. 6.7 Head trauma frequencies between the Wakcha (*gray*) and the Piwi Churi (*black*)

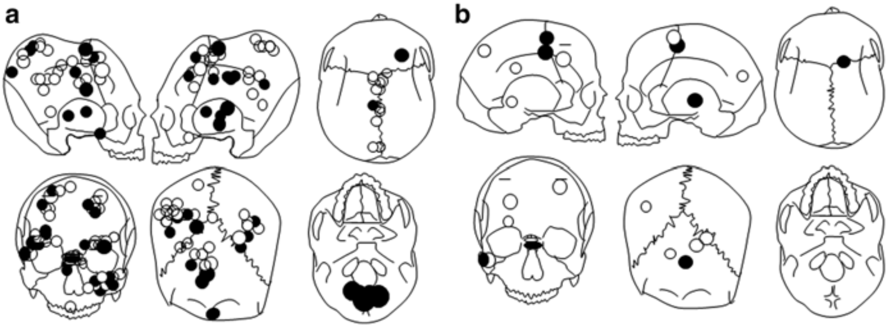

Fig. 6.8 Head trauma lethality and distribution between Chanka *Wakcha* (**a**) and *Piwi Churi* (**b**) groups (*white* = antemortem, *black* = perimortem)

The pattern of violence is significantly different among the *Wakcha*, the group that displayed modified crania (Fisher's exact, $p = 0.0006$; $N = 210$). Of 160 *Wakcha* individuals, 97 or 60.6 % had at least one head wound. Traumatic wounds were not just restricted to late adolescents and adults. Wounded children are only present at Chanka sites. Among the 21 infant/child crania, 14.3 % ($n = 3$) have at least one head wound. These wounds are all higher impact blunt force trauma, which leave depression and radiating fractures on bone, not linear fractures, which are usually caused by lower forces and stem from accidental injury. Moreover, blunt force trauma apparently did not impact all Chanka subadults equally. Unsurprisingly, the three crania with trauma also have cranial modification; none of the Chanka children with unmodified skulls exhibit trauma. Because of the small sample size, this difference is not statistically significant, but the trend is sobering: regardless of age, those with modification—a practice that *must* occur in infancy—were singled out for potentially lethal attacks.

Trauma Recidivism and Lethality

Analysis of injury recidivism can indicate whether individuals were victims of repeated attacks. Although sublethal trauma in different stages of healing may be the result of distinct, consecutive assaults, there are several confounding factors that complicate evaluation of short- and long-term healing as an accurate indicator of recidivism. For instance, the force of impact on the cranium, the area of the skull affected, differential healing and vascularization rates, and the age and health of the victim, among other factors, can all hinder the determination of whether injuries were received at the same time or at different times. Given current scholarship, one of the most reliable and unambiguous ways to identify injury recidivism is the presence of *both* ante- and perimortem fractures. Recall that antemortem injuries show signs of healing, and indicate a wound was received well before the time of death, while perimortem fractures were received at or around the time of death, and may have contributed to the cause of death (Fig. 6.9).

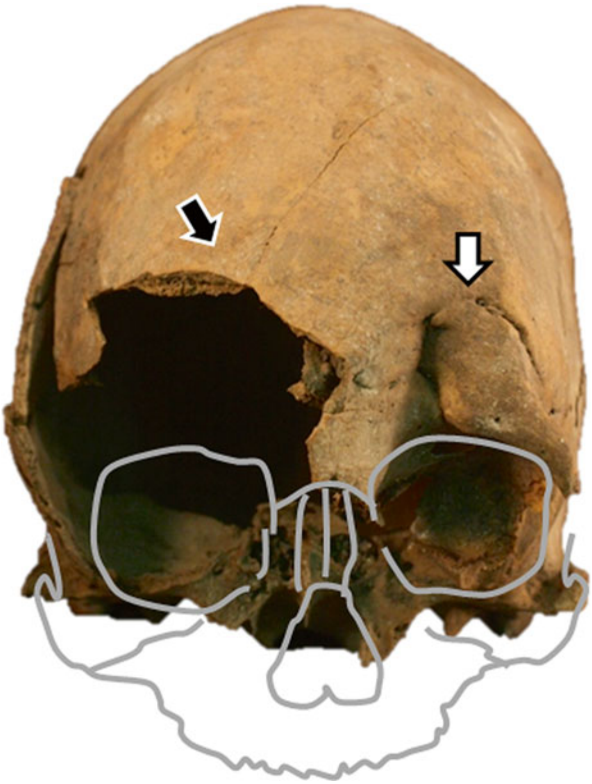

Fig. 6.9 Evidence of injury recidivism. This individual has a blunt force injury above the left eye (*white arrow*) that shows signs of long-term healing. A fatal perimortem wound which occurred at or around the time of death (*black arrow*) destroyed the right side of the face

Table 6.9 Head wound recidivism among the Chanka

Site	Cranial MNI	(n) Wounded individuals	(n) Individual with ante- and perimortem wounds	% Wounded individuals with ante- and perimortem wounds
Modified	160	97	16	16.5
Unmodified	50	16	0	0

When Chanka individuals were targeted for violence, those with modification tended to be the victims of repeated attacks (Table 6.9). Of 97 wounded *Wakcha* individuals, 16 (16.5 %) have both ante- and perimortem trauma, while none of the 16 wounded *Piwi Churi* experienced recidivism (Fisher's exact, $p = 0.0715$; $N = 113$). Finally, there are at least 22 cases of what forensic anthropologists characterize as overkill violence, or excessive violence. Excessive violence can be identified by the presence of multiple perimortem blunt-instrument wounds of such force that the skull is physically shattered. Even one such destructive blow would be sufficient to cause death, several blows are unecessary. This pattern is only present among those with cranial modification.

Wound Distribution among the Piwi Churi and Wakcha

Because trauma location provides information on the social context of violent encounters, we compared the distribution of traumatic wounds between the *Piwi Churi* and the *Wakcha* (Table 6.10). Significant differences are clearly present in the locational patterning of trauma: the *Piwi Churi* have significantly more wounds on the superior and inferior portions of the cranial vault relative to all other areas (Fisher's exact, $p=0.0322$; $N=213$). Crucially, only the *Wakcha* evince wounds—all of which are lethal—on the base of the skull.

These unsurvivable basal skull wounds are called ring fractures. This type of trauma is characterized by radiating fracture lines which split dense features and terminate at the foramen magnum. Impact forces cause the basilar portion of the occipital to break away from the rest of the vault and posterior fracture margins on the occipital squama display internal beveling. With this type of wound, the brain stem is often lacerated, and death is almost always immediate (DiMaio and DiMaio 2001). Biomechanically, ring fractures can be caused by vertical loading and impact forces transmitted up through the cervical spine and occipital condyles (Lovell 1997), as experienced in high falls. But ring fractures from falls are usually associated with cervical vertebrae compression fractures. In Andahuaylas, not a single cervical vertebra of more than 2224 observed had this type of fracture. This suggests that falls off cliffs did not cause ring fractures. Rather, ring fractures in Andahuaylas were likely caused by violence; these blows were homicidal.

Abductions and Post-capture Mistreatment

Recall that strontium isotope analysis identified two Chanka individuals with nonlocal $^{87}Sr/^{86}Sr$ values. The first, RCC.01.01.07, is a female who died when she was 15—18 years old. Because her fully formed second molar was sampled and deemed nonlocal, her arrival in Andahuaylas must have occurred sometime after middle childhood, when this tooth forms. This female has cranial modification and

Table 6.10 Wound tally and distribution among the *Piwi Churi* and *Wakcha*

	Left	Right	Anterior	Posterior	Superior	Inferior	
Antemortem	24	18	40	26	14	0	122
Perimortem	9	12	23	10	2	7	63
Total Wakcha (n) (%)	33 (17.8 %)	30 (16.2 %)	63 (34.1 %)	36 (19.5 %)	16 (8.6 %)	7 (3.8 %)	*185*
Antemortem	2	4	4	5	0	0	15
Perimortem	4	3	5	1	1	0	14
Total Piwi Churi (n) (%)	6 (20.6 %)	7 (24.1 %)	9 (31.0 %)	6 (20.6 %)	0 (3.4 %)	0 (0 %)	*29*

a healed wound on the back of her head. She also had pathological lesions indicative of compromised health present on her cranial vault and on her eye orbits.

The other female, SON.02.03.21, is a young adult (20—35 years old) who also migrated after middle childhood. This female does not have a modified cranium; porotic hyperostosis was present. Importantly, contrary to every other unmodified Chanka individual, this female evinces a lethal penetrating wound on the back of her head, near the left nuchal lines; there is also a possible perimortem wound on the nasal bones.

Internal warfare, like that experienced by the Chanka, is commonly associated with a sobering mobility pattern: female abduction. That both nonlocal Chanka females have wounds directed to the back of the head is noteworthy; trauma in this region often points to attempted flight from captors in cases of abduction (Tung 2012). The age of these females is also significant, as late teens and young adults are most often targeted for abduction (Schott 2011). Both females spent middle childhood in a nonlocal area before dying in Andahuaylas only a few years later. Moreover, one nonlocal female has a modified vault, and the other does not. It could be that captors did not preferentially target a specific social group. Signs of compromised health and lethal injury are also expected in cases of abducted females, and indeed these women, like other captives, show signs of increased morbidity and mistreatment following capture, as well as trauma patterns that are distinct from their peers (Martin et al. 2010).

If female abduction was occurring, it was probably not limited to groups like the Chanka, who were experiencing internal conflict. Warfare in general is often associated with assaults that aim to capture women and other resources. And female mobility itself is structured by many factors—not all of which are violent. Nevertheless, within the turbulent Chanka milieu, the presence of nonlocal females does not appear to have been the fruit of peaceful alliances, but more likely the result of violent abduction from disparate, distant villages (Kurin et al. 2014; Martin and Osterholtz 2012).

Making a Case for Ethnocidal Violence

Chanka communities were engaged in different, unique contexts of violence compared to their contemporaneous Quichua neighbors and earlier Wari-era populations. While the Quichua appear to have survived persistent attacks consistent with raids, Chanka communities were likely experiencing something akin to ethnic violence, characterized by periodic massacres and targeted assaults. Foremost, results indicate that modified and unmodified individuals had dramatically different violent experiences. Individuals with cranial modification present significantly more trauma than unmodified individuals. Furthermore, only individuals with remodeled heads—regardless of shape—demonstrated both ante- and perimortem wounds that are unambiguous evidence of injury recidivism. This pattern suggests that those individuals' encounters with violence were successive and ultimately lethal.

Among the Chanka, victims of violence were primarily and disproportionally singled out for attack based on the recognition of their categorical affiliation, as identified through cranial modification which signaled *Wakcha* affiliation. In sharp contrast, unmodified *Piwi Churi* experienced less violence. This type of asymmetrical assault is common in cases where states have collapsed or are conspicuously absent. For instance, during the period of near stateless civil war in contemporary rural Peru, those who spoke Quechua, and formed the poorest sector of society were victims of violence at significantly higher rates than their wealthier, western-dressed, Spanish-speaking neighbors (CVR 2003).

Trauma enacted against children of a specific group is another key indicator of ethnic violence in contemporary communities (CVR 2003). Within Chanka communities, recall that 14.3 % of infants and children have at least one cranial fracture. The frequency of childhood trauma in postimperial Andahuaylas is high even among contemporary populations (cf. United Nations 2009). Indeed, the fragmentary (and thus undiagnostic) nature of subadult crania in this study sample may mean that rates of trauma are actually *underrepresented* within the general population. Relative to the preceding Wari imperial era when no juveniles exhibited head trauma, this is a striking change that further demonstrates that the postimperial era was a violent and tumultuous time, both for adults and children (Tung 2008).

The presence of wounded children is not consistent with abusive child rearing. Although abuse is a common etiology among subadults (Korbin 2003; Baxter 2005; Scheper-Hughes 1987), only children with modified skulls from Chanka communities demonstrate head wounds. The disparate treatment of children is commonly seen in ethnographic examples of genocidal behavior, where torturous violence becomes normative (Tyner 2009). In cases of genocide and ethnic violence, unlike other wars, children are actually targeted for killing, and this seems to have been the case for Chanka juveniles with modified crania. They, like their adult counterparts, were singled out for violence. In addition, outlying strontium isotope data and healed injuries demonstrates that late adolescent females were being abducted from foreign areas; signs of maltreatment and disease suggest subsequent post-migration mistreatment.

Consider that episodes of ethnic violence often require efficient, yet idiosyncratic means of executing large groups of dehumanized people (Fig. 6.10). Symbolically, unique locations or mechanisms of injury can also become normative for groups of aggressors. The need for efficiency, combined with the symbolic significance of certain body parts and forms of assault, usually results in standardized killing methods, and these methods leave indelible, patterned marks on bone. Wound patterning indicates the victim's position at the moment of impact and provides information about the possible motive. Of all the wounds experienced by the Chanka, ring fractures on the base of the skull are perhaps the most informative. To set the scene: when a human stands upright, the base of his or her skull is enmeshed in soft tissue and obstructed by the mandible and vertebral column. However, if the individual is forced to his knees with his head bowed, the base of the skull is exposed and vulnerable to blunt force trauma. Several club strikes to the base of the skull by a standing assailant would lead to a ring fracture. Most sobering, these exact fractures

Fig. 6.10 Excessive head trauma and ring fractures on modified (*Wakcha*) Chanka crania

are prevalent on crania from the Khmer Rouge killing fields of Cambodia, where incapacitated individuals were the victims of close-range, repeated blunt force trauma (Ta'ala et al. 2006, 2008)—ruthless executions. In Andahuaylas, these execution blows were experienced by only one segment of the general population: *Wakcha* males and females.

Violence of the type experienced by the *Wakcha* is deeply symbolic. Researchers have found that repeated blunt force injury is typically meant to increase the suffering of a victim (Gourevitch 1998; Borgdon et al. 2008; Kimmerle and Baraybar 2008; Skinner et al. 2003), and the intentional fragmentation of the skull suggests destruction and dehumanization (Darling 1999; Willey and Emerson 1993). The type of excessive violence inflicted upon the *Wakcha* shares characteristics of physical assault in the Peruvian sierra at different times. Official historian Betanzos (2004: 244) mentions that battle axes were used to "smash heads to pieces" as the final step in a longer process of torture used to exterminate men, women, and children during the Inca–Chanka war. Witness testimony from contemporary Andahuaylas relates how Shining Path terrorists would almost always smash the faces of victims with large rocks, extirpating their very physical identity (see Theidon 2001). Excessive violence and identity destruction appears to have taken place in Andahuaylas intermittently over centuries. Osteological evidence also appears to confirm Betanzos' account of excessive blunt force head trauma as a common tactic of terror. Within the entire sample, overkill wounds were observed only in Chanka communities and only among the *Wakcha*. In postimperial Chanka communities, the physical, lethal destruction of *Wakcha* men, women, and children would have been a potent method of obliterating one's identity.

Schismogenesis in Post-imperial Andahuaylas

Violence may have been spurred by the failure of social mechanisms to allocate resources following Wari's fragmentation. The Quichua experienced a life where violence was experienced during raids and ambushes. For the attackers (perhaps the Chanka who surrounded them), the head shape of the victim was of little importance. Males appear to have confronted their opponents, while females tended to flee. Among the Chanka, trauma patterns between males and females overall suggest a distinct experience of violence. The situation becomes clearer when we separate groups by age and by modification. First, the unmodified *Piwi Churi* group has trauma patterns strikingly similar to those at the Quichua polity enclave at Pucullu. For the modified *Wakcha* group, the situation is quite distinct. The age at-death for those Chanka modified individuals suggest an excess mortality profile common in cases of modern genocide, with correspondingly high recidivism frequencies. There are also higher rates of both sublethal and lethal trauma. Modified men, women, and children were targeted for violence. The execution blows and excessive violence are also telling in their symbolism.

The ubiquity of modification throughout Andahuaylas indicates that it was a prominent phenotypic signifier which would have legibly transmitted a wealth of social information to both in- and out-group members (Wobst 1977). This salience has its risks. Modified individuals could become drawn into potentially dangerous or violent activities due to the social obligations conferred by head shaping, but consequently singled out for attack or denied resources by rivals.

Given the increased risk of violence, a pressing question remains: Why was cranial modification not wholly adopted (or wholly abandoned) by everyone? Note that despite disproportionate amounts of violence, modification continued as a resilient practice of affiliation until at least the late fourteenth century in Andahuaylas. So, there must have been certain social boundaries marked by modification, which were so deeply instantiated that it motivated some caregivers to bind the heads of their offspring, while at the same time preventing other caregivers from doing so. Ascribing identity through modification was thus a privilege dependent on prediscursive standards that only certain members of the community met. Refraining from modification would have made just as powerful statement about affiliation. And although particular remodeled head shapes are not associated with high trauma rates, modification presence is. This suggests that violence did not single out individuals associated with a specific *ayllu*, lineage, or gender. Rather, violence targeted individuals who used cranial modification to denote their biologically and socially reckoned identity as a relatively privileged *Piwi Churi* or a lowly *Wakcha.*

Major stakes were at play in the frought LIP. When a progenitor died, his *Piwi Churi* might have taken over an authoritative role, but the rest of his descendants still had to maintain and share existing lands. Noncultivation and untilled fields can exacerbate land disputes as boundaries move between *ayllus* and lineages and inheritors. Other siblings could have challenged and usurped power from the designee.

If *Wakchas* were not afforded similar resources by birthright, then they may have had to confront greater competition, and thus a higher probability of resorting to violence with other Chanka groups. The Quichua enclave is distinct; people are not being targeted based on head shape. Within that polity, the stakes are different, and the distinction in head shape must not afford significant social benefits.

Postimperial eras are also prone to violence and novel iterations of conflict. In the post-Wari era, groups in Andahuaylas likely fought not only with people they saw as unrelated, but also with those who shared common ancestry, and "groups with which their wives originated and with whom their daughters lived" (Leblanc 1999: 19). The implementation (or absence) of cranial modification may have been a type of highly visible "special precaution" used to reduce the likelihood of a blood relative living with aggressors getting injured in friendly fire.

More generally, cranial modification was likely used to mediate interpersonal relationships that were radically restructured in the aftermath of Wari collapse. However, inherent within the genesis of novel cultural distinctions and identities are seeds of antagonism, and indeed, violence. Antagonisms created by the cultural counter-positioning processes inherent in ethnogenesis may explain why, despite its abrupt appearance and rapid, widespread adoption, those who marked their identity using cranial modification were overwhelmingly singled out for violence. Selective, targeted, ethnocidal attacks emerged as a direct result of the negotiated processes of ethnogenesis. Crucially, ethnocide and ethnogenesis may be linked processes in postimperial eras.

In sum, cranial trauma patterns among the Quichua appear to suggest raids, ambushed, and intermittent scuffles. This would be expected in an enclave community. The pattern is much different within the Chanka-affiliated communities. There, trauma rates are equal between males and females. However, there is a significant disparity in the rate of cranial trauma between modified and unmodified individuals, regardless of head shape. Violence is targeting those whose heads have been remodeled, who would have been highly conspicuous to other, out-group members. This process of mutually legible, antagonistic differentiation, or the linked process of group identity creation and destruction, is known as schismogenesis, and is a recurrent pattern in groups emerging from the fragmentation of a complex state or empire.

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Chapter 7
Insidious Entanglements: Health, Mobility, and Nutrition

As we saw in Chapter 6, the Chanka and the Quichua demonstrated divergent patterns in cranial trauma and consequently distinct experiences of violence. But imperial collapse also *gets under the skin*, and exacerbates existing inequalities. The inability to access resources related to one's physiological and emotional well-being negatively impacts health.

The chronic and systematic ways in which social structures harm, deprive, or otherwise disadvantage individuals and groups is known as *structural violence*. Entrenched in institutions and practice, structural violence may inhibit access to clean water, diverse and nutrient-dense foods, hygienic living conditions, and mobility and transhumance (Gluckman et al. 2007; Arimond and Ruel 2004; INEI 2010).

This chapter examines how living with warfare reconfigured where people resided and the manner in which they eked out an existence. We also explore the strategies people used to survive a landscape of violence and the costs and benefits of those decisions. Most importantly, we assess how violence was strongly structured by differences in mobility and access to nutritious food and clean water. These factors play a crucial role in health and well-being, and ultimately allow us to reconstruct how violence exacerbated inequalities that directly impacted morbidity (sickness) and mortality (death). Through the lens of *structural violence*, we approach with greater nuance, disparities that transcended, yet were negotiated to some extent, by the *Piwi Churi* and *Wakcha* social categories. Scrutinizing the tangled intersections of these axes allows us to better understand how warfare and deprivation are embodied and experienced in the generations proceeding imperial fragmentation.

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The Link Between State Collapse and Increasing Hardship

As complex political hierarchies and economic institutions crumble or flatten, novel inequalities may still emerge. Following Wari collapse in Andahuaylas, those who were advantaged or were deprived was not based on traditional elite/commoner status distinctions (*sensu* Earle 1991; Hastorf 1990), but rather patterned *heterarchically* according to newly coalescing, bounded, social groupings. Post-collapse Andahuaylas was characterized not only by a spectacular surge in warfare, but also by dramatic changes in the patterns of health, diet, and mobility.[1] The strong association between elevated rates of disease and violent death ultimately attest to profound and systemic differences in human well-being, highlighting the complex articulation of direct and structural forms of violence among populations emerging from the shock of archaic imperial collapse.

Lethal trauma will abruptly end the life of a contributing member of the community. Survivable cranial wounds can nonetheless also physically impair individuals, making it hard to eat, move, maintain hygienic practices, and participate in the social obligations required of *ayllu* membership. Those individuals may also require timely and intensive care from others, at least in the immediate aftermath of injury. Yet, violence can also impact human health in more indirect ways. Accompanied by skeletal fractures indicative of direct, physical conflict, the scars of chronic sickness and deprivation become sedimented into the skeleton; detectable through changes in the shape and elemental composition of bones and teeth. Recent paleodemographic analyses of historic cemeteries have shown that skeletal indicators of morbidity (sickness) early in life are linked to increasing frailty and shortened life spans (DeWitte and Wood 2008; Wood et al 1992). Moreover, research in public health suggests that the same institutional factors which maintain structural inequalities associated with increased morbidity are often linked with a higher risk of *excess* mortality (higher than predicted rates of premature death). (De Walque 2005; De Walque and Verwimp 2009; Horton 2004). The correspondence between increased morbidity and excess mortality is stengthened by enduring and multifarious ripples of sociopolitical and economic insecurity brought about by state collapse (Akresh et al. 2012; Brubaker and Laitin 1998; Le Billon 2001; Rotberg 2003).

While scholars have sought to identify how social inequalities play out among hierarchically oriented groups (Gravlee 2009; Leatherman and Goodman 1997), disparities in health and nutrition can also be variably experienced heterarchically within a society (see Farmer et al. 2004). Horizontal inequalities, such as those that exist between or within different social factions (Farmer 1996, 2003), are concerned with deprivation at the group level, but remain largely unexplored in the prehistoric past (Klaus 2014; Martin and Tegtmeyer 2014). It behooves us as bioarchaeologists to examine how elevated poor health earlier in life may be related to future (life-ending) experiences of violent physical trauma later on.

[1] Following the World Health Organization's Global Burden of Disease, health may be considered the absence of illness, impairments, or other functional limitations; mobility is a core ordering principle. The prevalence of disease is referred to as morbidity.

Insecurity and the Vertical Environment

Among relatively small polities like the Chanka and Quichua, whose settlements were confined to populations in the hundreds to low thousands, outlying and frontier areas are thought to have been permanently occupied (Murra 1972). These outposts were small, perhaps only a few houses inhabited by a few dozen souls (Murra 1985). Given the abrupt topography of the region, these outposts would be located in both low-lying and high-altitude ecological floors. In times of peace and prosperity, these zones would be no further than a 3–4 day walk. Archaeological data (Bauer and Kellett 2010) suggest that during times of incipient polity formation and conflict, that walk was *significantly* shorter—mere hours instead of days.

Nevertheless, those "out-posters" maintained land claims, homes, *ayllu* affiliation, and other rights of their home settlement (see also Skar 1994). Many ethnohistorians and ethnographers have also noted that outlying zones are usually characterized by multi-ethnic settlements. These scattered settlements result in different groups of people living near one another, and separated from nucleated home settlements by large swaths of no-man's lands. Transhumance occurs within families; different members will be sent to manage lands at distinct ecological floors. These members, who may be semi-permanent, or move frequently (Skar 1982), tend their own fields and herds, and those of their kin. Trade and social contact are maintained through the bonds of kinship and reciprocity. Given the geographic isolation, intergroup interactions could have ranged from harmonious to hostile (Van Buren 1996; Stanish 1989). If this model, vertical complementarity, existed in post-imperial Andahuaylas, how might we identify it in the archaeological record? And what were the health consequences of such a strategy? Here, a bioarchaeological approach can help settle the debate (Fig. 7.1). Isotopic data can inform on questions of food and water acquisition and mobility. Skeletal analysis can reveal the health consequences involved in either hunkering down in hill forts versus homesteading in an ecological outpost.

Operationalizing Hardship

Cranial Lesions as a Proxy for Compromised Health

Chronic deprivation within certain social groups usually stem from a host of nutritional inefficiencies which generally fall under the rubric of malnutrition (see Galtung 1969; Baro and Deubel 2006; Bhattacharya et al. 2004; De Meer et al. 1993; Sen 2008). The ravages of such hardship tend to disproportionally affect the most vulnerable in the population: the very young and old, and those who are destitute, displaced, and otherwise marginalized.

Within any matrix of human bone is physical evidence of disease, hunger, and dietary disparity (DeWitte and Wood 2008; Larsen 1997). Macroscopically, we can

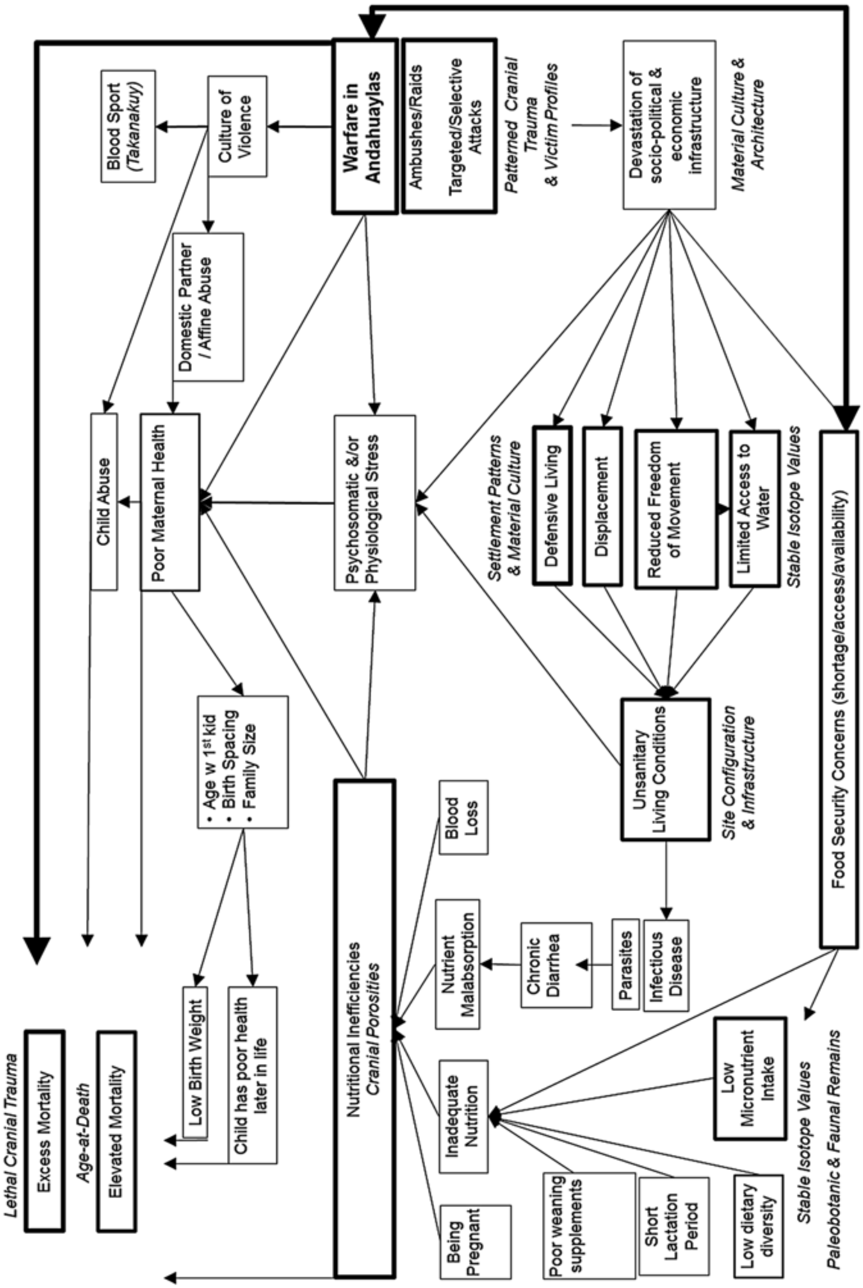

Fig. 7.1 A schema of how warfare impacts diet, mobility, and health in Andahuaylas. *Italics* denote the correlates employed to inform on the aspects of human behavior

identify compromised health from the presence and severity of cranial lesions, pin-prick sized holes on the skull vault and in the upper eye orbits, known as porotic hyperostosis and cribra orbitalia, respectively (El-Najjar et al. 1976; Kent 1986; Stuart-Macadam 1992; Walker et al. 2009; Wapler et al. 2004). Current research suggests that these lesions reflect a combination of both inadequate nutrition which may be caused by low micronutrient intake and little dietary diversity, and nutrient malabsorption brought about by infectious diseases or parasitic worms that inhibit absorption and promote nutrient loss through diarrhea (McIlvaine 2013; Rothschild 2012). Blood loss from trauma is another potential factor (Walker et al. 2009). Finally, although healed lesions observed in late adolescents and adults may reflect health problems during early childhood (Stuart-Macadam 1985), other groups, such as pregnant women and informal miners (usually adult males), are also at increased risk for the types of micronutritional deficits and diseases (e.g., anemia) which actively cause porosities (Bethony et al. 2006).

In total, 259 cranial vaults were examined for evidence of porotic lesions (Table 7.1). While the Wari imperial era witnessed low rates of cranial porosities (13 %, 2/15), the rate of diseased doubled in the post-collapse era to 34.4 % (76/221). About a third of the total Andahuaylan population was impacted. There were no sex-based differences in lesion frequencies either. Thirty-two of 104 males (30.8 %) and 32/90 females (35.6 %) exhibit lesions (Fisher's exact, $p=0.4629$; $N=226$). Males and females were equally likely to exhibit these cranial porosities, and perhaps by extension, equally impacted by physiological stressors that led to pathological changes on the cranial vault. Chanka and Quichua affiliation appeared to play no role in porosity rates as there were no significant differences between polities (Fisher's exact, one-tailed, $p=0.1556$; $N=259$).

The *Piwi Churi* and *Wakcha* groups were compared in order to determine if prominently denoting membership through the manipulation of head shape was correlated with differences in the frequency of cranial porosities (Fig. 7.2). Thirty-nine percent (72/185) of modified men, women, and subadults demonstrate evidence of PH, while 26.5 % (13/49) of all unmodified individuals have porotic hyperostosis (Fisher's exact, one-tailed, $p<0.0738$; $N=234$). Those who demonstrated cranial lesions were just as likely to evince signs of fatal head wounds as their "healthy" counterparts. Of 48 individuals with cranial lesions, 22 (46 %) had at least one lethal, perimortem wound. In other words, about half of all individuals who possessed the scars of a preexisting condition were eventually felled by an intentional, deadly blow to the head later in life.

Table 7.1 Rates of porotic hyperostosis (cranial vault lesions) in Andahuaylas

Site	Era	Crania observed	# Porotic hyperostosis	(%) Porotic hyperostosis
Turpo	MH	15	2	13.3
Natividad	LIP	23	4	17.3
Cachi	LIP	154	46	29.9
Ranracancha	LIP	40	22	55
Pucullu	LIP	27	8	29.6
Total		29	82	29

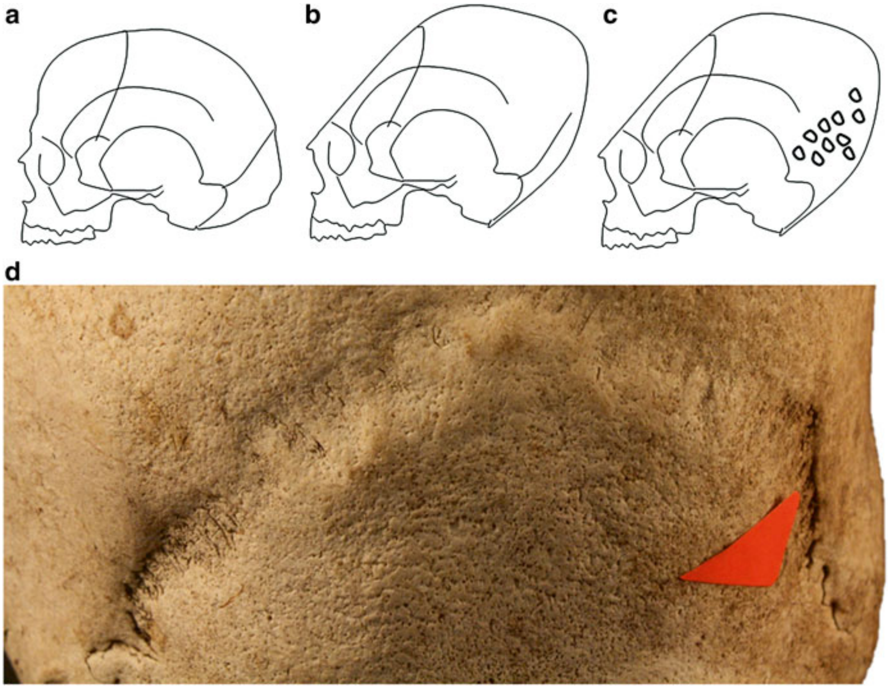

Fig. 7.2 Representation of key categories regarding head shape and cranial porosities. No cranial modification (*Piwi Churi*) (**a**); Cranial Modification (*Wakcha*) with no cranial porosities (**b**); Cranial modification (*Wakcha*) with visible cranial porosities (**c**). Image (**d**) shows healed cranial porosities

While a population perspective would suggest that those with and without signs of chronic stress experienced violence equally, distinct trends among social groups belie this broad characterization. The wounded-to-killed [w:k] ratio (see Kimmerle and Baraybar 2008), or the ratio of antemortem to perimortem wounds, provides a relative index of lethal intent and violent context. In catastrophic contexts, notably massacres, the intent is to kill as many people as possible in a short span of time, or a single event. When lethal wounds far outnumber survivable injuries, we can infer that violence was catastrophic. On the other hand, attritional violence, including intermittent raids and sieges, or periodic scuffles, usually results in more wounded survivors than victims killed; in the skeletal record, this may be conditionally verified when antemortem trauma is more prevalent than lethal, perimortem trauma.

Among those with remodeled heads, cranial lesions are negatively correlated with perimortem trauma (Fisher's exact, $p=0.0032$, $N=78$). In other words, those with signs of a preexisting pathology were significantly less likely to be victims of homicide (lethal trauma rate = 4/30 (13 %); w: k = 6.5). This would appear to indicate that, as a group, *Wakcha* individuals who had survived hardship early on were far less likely to be assassinated later on. However, *Wakcha* individuals with no signs of chronic childhood sickness had a devastating w: k ratio of 1.2, a rate often observed in massacres.

In fact, perimortem trauma rates and wound–kill ratios of the porosity-marked *Wakcha* are more similar to patterns observed among those who retained their natural head shape, members of the *Piwi Churi* group. Among the round heads, 18 % (7/39) experienced perimortem trauma and the wounded outnumbered those killed by 4.6 to 1. These data would suggest that healthy *Wakcha* appear to have suffered from massacres, while the sickly *Wakcha* and the whole *Piwi Churi* group largely escaped deadly violence. Instead, they experienced sustained low-intensity conflict, and based on wound patterning, the contexts of many assaults were consistent with raids.

These results beg the question: what factors may be at play such that the sickly *Wakcha* have wound–kill rates most similar to the *Piwi Churi*? The key between being massacred versus wounded may be structured by *where* people live on the landscape. In this case, people may have hunkered down in hill forts, or staked their claim in ecological outposts in the middle of no man's lands.

Reconstructing Diet and Estimating Water Bioavailability in Andahuaylas

Although individuals were buried in *machays* within and near settlements, they might have spent years hunkered down in hill forts, or eking out an existence in isolated, potentially multi-ethnic, ecological outposts. How can we clarify this issue? The answer may lie in stable isotope analysis, a technique that allows us to reconstruct aspects of ancient diets. Because Andahuaylas is so mountainous, if we can trace what people are eating, we can, by proxy, infer where they likely resided during particular periods in their life. We can marshal isotopic data to trace both mobility *and* diet, because water sources are few and far between, and most food is fixed to specific, vertically stacked ecological zones (Cadwallader et al. 2012; c.f. Murra et al. 1986). So, while maize and quinoa grow between 2000 and 3200 MASL, amaranths and tubers are cultivated upslope between 3200 and 3800 MASL, and camelid herding takes place at 3800–4200 MASL, which also represents the upper limits of human habitation in the Andahuaylas region. High-altitude springs, called *puquios*, are the main source of water for those living in the fortified settlements. Water from river ravine *quebradas* are available to those who cultivate maize, fruit trees, and chili peppers on the valley floor. Up in the high altitude, *puna* grasslands herders derive water from *bofedal* marshes (Fig. 7.3). Therefore, what people eat and the type of water they drink reflect one's ability to actually access that ecological zone and its resources.

Childhood Dietary Reconstruction Using Stable Isotope Analysis

Stable isotope analysis of teeth affords a window onto childhood consumptive practices, and by extension, questions of food insecurity and accessibility.

Fig. 7.3 A man unloads a bushel of corn from an llama's back followed by a scavenging dog (*left*); A young girl tends to potato plants on the high-altitude *puna* grasslands (*right*) (Redrawn from Guman Poma de Ayala 1980[1616] with permission from The Royal Library of Denmark)

Similar to radiogenic strontium isotope analysis, isotopic analysis of light, or stable, isotopes is generally thought to reflect what a person eats—plus or minus a few parts per million (Figs. 7.3 and 7.4). If we analyze the enriched stable isotopes embedded in the inorganic enamel matrix of a tooth, we can infer what the individual ate during the years that tooth crown formed. The inorganic enamel apatite that composes the tooth crown is highly resistant to diagenesis and thought to offer a more accurate account of food proportions in the total diet than other biogeochemical techniques (Lee-Thorpe et al. 2010). In all, we subjected 43 teeth in Andahuaylas to two types of stable isotope analysis: oxygen and carbon[2] (Table 7.2).

Annotated as $\delta^{18}O_{apatite}$, oxygen isotope analysis of human dental enamel follows the premise that values derive from local drinking water sources (Knudson 2009). All drinkable water in Andahuaylas is meteoric (from the ground). While factors

[2] Maxillary molars still in occlusion with intact antimeres were preferentially selected, since those teeth form during childhood. Enamel apatite extraction procedures were based on Lee-Thorp et al. (1989) and analyzed at the University of Florida. Samples were vertically sectioned and cleaned of surface contaminants and dentin using a high-speed Brasseler dental drill with a diamond tip under 10× magnification. Cleaned samples were finely ground with an agate mortar and placed in 5 ml plastic centrifuge tubes with locking lids. To remove organics and humic acids, a 50 % sodium hypochlorite solution was added for 16 h, centrifuged, and decanted. Samples were then rinsed three times in distilled water. To remove exogenous secondary carbonates, a 0.2 M acetic acid solution was left to react for 15 h. Samples were rinsed again several times with distilled water. Finally, the vials of apatite were freeze-dried and subjected to spectroscopic analysis.

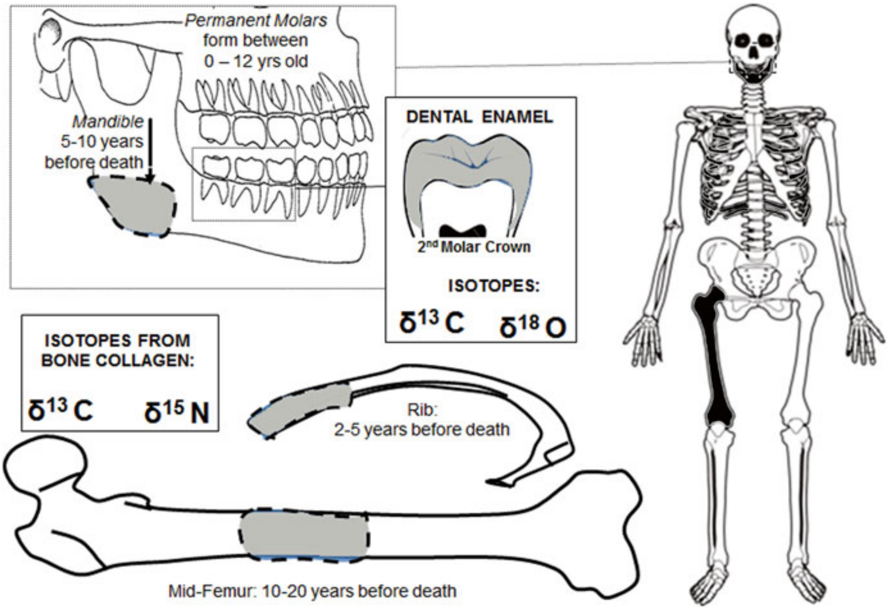

Fig. 7.4 Bone remodels over the life of an individual, but at different rates. In contrast, inorganic apatite in dental enamel does not remodel once it is formed

such as weaning, boiling, and terrestrial vs. meteoric (rain) water can impact $\delta^{18}O_{apatite}$ values, these factors are negligible in Andahuaylas or can be confidently corrected, as they similarly impacted everyone in the population. For instance, all major cultigens (corn, tubers, etc.) need to be boiled before they are consumed, and any liquid, from soup broth to *chicha* beer, is first brewed and boiled.

Ecological research on oxygen isotopes demonstrate that higher, drier elevations and lower temperatures are associated with lower $\delta^{18}O_{apatite}$ values (values that are depleted/more negative) (Knudson 2009; Lambs et al. 2012). In contrast, lower and more humid regions with hotter temperatures yield oxygen isotope values which are enriched (more negative). The direct relationship between elevation, temperature, and aridity is relevant given that Andahuaylas' topography can rise 2000 m over a few kilometers of distance (Baiker 2012). This means that $\delta^{18}O_{apatite}$ values will be significantly different if one is primarily consuming water from the Pampas River, located at 2200 MASL, versus the nearby (10 km) grassland *bofedal* marsh water at 4000 MASL.

For populations in Andahuaylas, who derived most of their calories from plant-based sources, the analysis of carbon isotopes[3] from enamel apatite ($\delta\ ^{13}C_{apatite}$) is crucial. This particular isotopic value reflects the fact that plants synthesize carbon in different ways (Kellner and Shoeninger 2007). Andean comestibles such as potatoes

[3] $\delta^{13}C$ values are reported relative to a reference sample, VPDB, using NBS-19.

Table 7.2 Results of stable isotope analysis of oxygen and carbon which reflect total diet and imbibed water source during childhood

Era[a]	Affiliation	Site— Sector	Tooth[b]	δ[18]O	δ[13]C
MH	Warified	Turpo	RMx1	−10.40	−4.16
MH	Warified	Turpo	RMx2	−10.88	−4.91
MH	Warified	Turpo	RMx1	−8.10	−3.56
MH	Warified	Turpo	RMx2	−9.43	−3.85
MH	Warified	Turpo	LMx3	−10.71	−3.71
MH	Warified	Turpo	LMd2	−12.69	−4.74
MH	Warified	Turpo	RMd3	−9.04	−3.72
MH	Warified	Turpo	LMd2	−10.25	−3.77
MH	Warified	Turpo	RMx2	−10.37	−4.70
LIP	Chanka	Cachi—Ft. Sonhuayo	RMx2	−9.25	−6.08
LIP	Chanka	Cachi— Salt mine	RMx2	−10.79	−8.47
LIP	Chanka	Cachi— Salt mine	LMx2	−9.83	−5.04
LIP	Chanka	Cachi— Salt mine	RMd2	−10.46	−5.93
LIP	Chanka	Cachi— Salt mine	RMx1	−8.65	−5.90
LIP	Chanka	Cachi— Salt mine	RMx2	−10.07	−4.52
LIP	Chanka	Cachi— Salt mine	LMx2	−9.94	−4.97
LIP	Chanka	Cachi—Ft. Sonhuayo	LMx1	−8.62	−3.75
LIP	Chanka	Cachi—Ft. Sonhuayo	LMd1	−8.48	−6.25
LIP	Chanka	Cachi—Ft. Sonhuayo	RMd3	−10.24	−1.55
LIP	Chanka	Cachi—Ft. Sonhuayo	RMx2	−9.10	−4.55
LIP	Chanka	Cachi—Ft. Sonhuayo	LMx2	−9.18	−3.63
LIP	Chanka	Cachi—Ft. Sonhuayo	RMx2	−9.52	−3.46
LIP	Chanka	Ranracancha	LMx2	−11.28	−4.69
LIP	Chanka	Ranracancha	LMx1	−8.73	−7.40
LIP	Chanka	Ranracancha	LMx1	−8.87	−4.61
LIP	Chanka	Ranracancha	RMx1	−8.73	−6.88
LIP	Chanka	Ranracancha	LMx2	−9.12	−6.18
LIP	Chanka	Ranracancha	LMx1	−9.70	−8.05
LIP	Chanka	Ranracancha	RMx2	−9.20	−1.54
LIP	Chanka	Ranracancha	LMx1	−9.68	−4.88
LIP	Chanka	Ranracancha	RMx1	−8.70	−7.53
LIP	Chanka	Ranracancha	RMx2	−9.28	−3.52
LIP	Quichua	Pucullu	RMx2	−9.73	−5.62
LIP	Quichua	Pucullu	RMx3	−9.37	−2.48
LIP	Quichua	Pucullu	RMx1	−10.09	−5.94
LIP	Quichua	Pucullu	RMx3	−9.92	−6.23
LIP	Quichua	Pucullu	LMx1	−9.18	−6.57
LIP	Quichua	Pucullu	LMx2	−10.13	−5.60
LIP	Quichua	Pucullu	RMx2	−9.83	−6.15
LIP	Quichua	Pucullu	LMx1	−8.47	−4.01
LIP	Quichua	Pucullu	LMx2	−9.95	−2.84

[a]Time periods. *MH* later Middle Horizon (ca. AD 700–990), *LIP* early Late Intermediate Period (ca. AD 1080–1260)

[b]Codes for the tooth sampled. *R* right, *L* left, *Mx* maxilla, *Md* mandible, *1, 2, 3* molar number

and quinoa use what is known as the C_3 photosynthetic pathway; resulting $\delta^{13}C_{apatite}$ levels fall between −22‰ and −36‰. In contrast, plants such as maize and amaranth maintain C_4 pathways, with $\delta^{13}C_{apatite}$ values varying from −14‰ to −11‰, (Turner et al. 2010; Van der Merwe 1992). The C_4 values are also enriched by eating terrestrial mammals. Finally, a photosynthetic pathway known as Crassuleacean Acid Metabolism overlaps both C_3 and C_4 ranges (Kellner and Schoeninger 2007; Lee-Thorp et al. 2010), although plants of this sort—succulents like the prickly pear—are not regularly consumed in Andahuaylas (Finucane et al. 2006; Skar 1982).

One can infer the ratio of C_4 and C_3 in human diets based on fractionation rates, or the shift (enrichment) of a plant's isotopic composition as it moves up the trophic chain. In the case of humans, $\delta^{13}C_{apatite}$ values are offset by about +9.5‰ to +12.5‰ (Lee-Thorp et al. 1989, 2010). Thus, a diet comprised almost entirely of C_3 plants would have a $\delta^{13}C_{apatite}$ value of −13‰ to −16‰, while a diet comprised almost entirely of C_4 plants (and/or the animals that ate them) would fall between −2‰ and +1‰ (Loftus and Sealy 2012).

Carbon and Oxygen Isotope Results

Previous strontium isotope analysis revealed four nonlocal individuals who were removed from this part of the analysis. Furthermore, first molars, which begin to form before children are weaned, were removed from some calculations, because they are disproportionally enriched, reflecting breast milk and weaning food supplements rather than normative diets. In other cases, first molars with the corrected values (derived from site-specific average weaning enrichment rates) were included, because they were not significantly enriched—only around +0.6‰.

Current scholarship suggests that $\delta^{18}O_{apatite}$ differences of more than ±2‰ are outside the normal range of human variation, even in highly seasonal environments, and as such may signal imbibed water from nonlocal sources (Wright and Schwarcz 1999). Similarly, for $\delta\ ^{13}C_{apatite}$, differences of more than 3‰ are considered a significant enrichment from comestible to consumer (Turner et al. 2009, 2010). Data were also plotted against one another, as these *mixing models* are thought to more thoroughly inform on the aspects of the total diet during childhood. Finally, mapping isotopic values against known data on local settlements, subsistence, geography, and water consumption allows for more meaningful—albeit somewhat relativistic—analysis of ancient diets in a precipitous region like Andahuaylas.

Foremost, there appears to be a marked shift in dietary trends overall between the Wari era and early post-imperial era (Fig. 7.5). Average $\delta\ ^{13}C_{apatite}$ values do not change significantly[4] over time, but ranges do. During the Wari era, $\delta^{13}C_{apatite}$ values

[4] Dietary outliers were identified stable isotopic values that were enriched/depleted by ±2–3‰ from individual cave means (Turner et al. 2010).

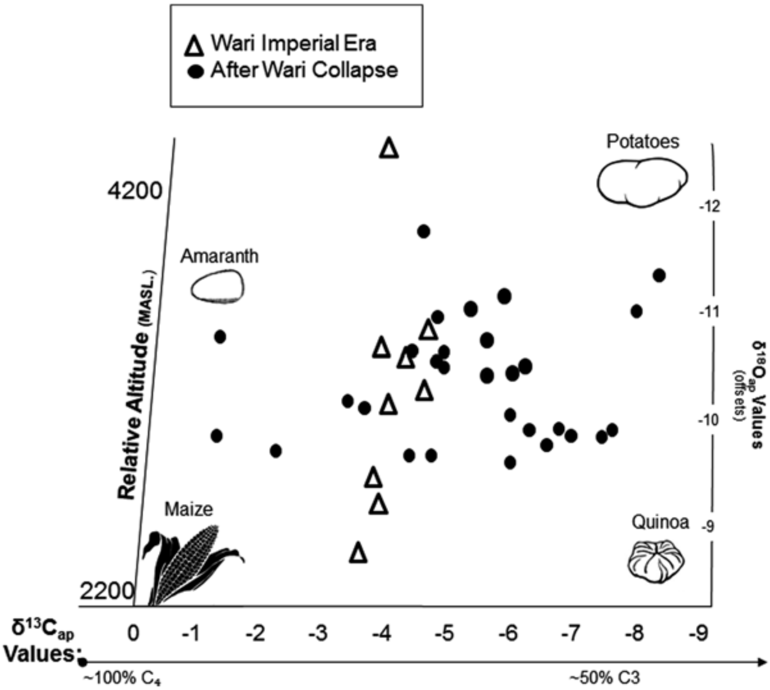

Fig. 7.5 Carbon and oxygen isotope values in Andahuaylas before and after Wari collapse. Wari era individuals as a group had a much more homogeneous diet, but could access water and food sources from the valley floor to the mountain-top grasslands

of local individuals[5] ranged from −4.91‰ to −3.71‰ (mean = −4.2‰; s.d. = 0.55‰), and $\delta^{18}O_{apatite}$ values of all teeth ranged from −12.69‰ to −9.04‰ (mean = −10.48‰; s.d. = 1.17‰). In contrast, after Wari collapse, $\delta^{13}C_{apatite}$ ranges increased (−1.54‰ to −8.47‰; mean = −4.89‰; s.d. = 1.606‰), and $\delta^{18}O_{apatite}$ ranges decreased (to −11.28 ‰ to −8.47 ‰ mean = −9.5 ‰; s.d. = .692‰).

Figure 7.5 shows what the data looks like when plotted out. The carbon isotope values are on the x-axis, and oxygen isotope values are ordered along the y-axis. Previous scholarship on Andean comestibles show that major cultigens—maize, tubers, quinoa, and amaranth are fixed to specific attitudinally-circumscribed ecological floors, and also maintain distinct photosynthetic pathways. By graphing the oxygen and carbon isotopic values derived from human teeth in Andahuaylas, we can better get a sense of *what* people were eating, and, consequently, *which* ecological floors they were able to access.

Wari era $\delta^{13}C_{apatite}$ values show little internal variability, and indicate that those entombed together at death also shared a common diet during early life. This con-

[5] Local residential origin was confirmed through previous strontium isotope analysis (Kurin et al. 2014).

sumptive parity is contrasted by a wide range of $\delta^{18}O_{apatite}$ values which highlight individual freedom of movement and access to the most distant ecological zones. The correspondence between enriched $\delta^{13}C_{apatite}$ values and depleted $\delta^{18}O_{apatite}$ values mean that dietary C_4 is being culled from higher elevation sources such as high-protein amaranths or nutrient-dense camelid meat. Thus, prior to Wari collapse, most individuals were getting adequate calories and micronutrients from both plant and animal sources. Moreover, as illustrated by low rates of disease, Warified local Andahuaylans were living in conditions largely free of hazards that can chronically rob the body of crucial nutrients (but see Klaus 2014).

Compared to the earlier Wari imperial era, $\delta^{13}C_{apatite}$ ranges during the post-collapse era become much greater. This change signals increasing dietary stratification among the Chanka and the Quichua. Ethnohistoric and ethnographic accounts suggest that by middle childhood (roughly 5–9 years old), Andahuaylan youths engaged in many of the same agricultural, pastoral, and domestic activities as older members of the community. Already weaned by that age (Poma de Ayala 1980 [1616]), these *warmas* (kids) also consumed the same types of food and drink as other folks, but in smaller quantities (Arguedas 1956; Poma de Ayala 1980[1616]; Isbell 2005; Orr 2013; Skar 1982). In the post-collapse era, the greater spread of the $\delta^{13}C_{apatite}$ and $\delta^{18}O_{apatite}$ data potentially signal greater intragroup dietary variability. But, what factors may be driving this increasing heterogeneity?

To discern the basis of this disparity, other variables were interrogated. For instance, results show that females and males have similar total dietary profiles (e.g., female $\delta^{13}C_{apatite}$ mean = −4.87‰, range = −1.54‰ to −8.05‰, N = 13; male $\delta^{13}C_{apatite}$ mean = −4.64‰, range −2.48‰ to −8.47‰, N = 11). Cranial modification is not strongly correlated with consumptive patterns either (unmodified $\delta^{13}C_{apatite}$ mean = −4.87‰, range = −1.54‰ to −8.05‰, N = 13; modified $\delta^{13}C_{apatite}$ mean = −4.64‰, range −2.48‰ to −8.47‰, N = 11).

Finally, cranial lesion frequencies were also compared to the isotope data (Fig. 7.6). Intriguingly, lesions were most strongly associated with people who had enriched $\delta^{18}O_{apatite}$ values (with offsets: (cranial lesion $\delta^{18}O_{apatite}$ mean = −4.87‰, range = −1.54‰ to −8.05‰, N = 13; no porosities $\delta^{18}O_{apatite}$ mean = −4.64‰, range −2.48‰ to −8.47‰, N = 11), but not $\delta^{13}C_{apatite}$ values. In other words, regardless of their diet, people getting their drinking water from the same elevations during childhood also tend to display the scars of chronic health problems. This begs the question: might this water source have been contaminated?

Consumptive Outliers: Evidence of Childhood at a Distinct Elevation

Both Ranracancha, a Chanka site, and Pucullu, a Quichua enclave, demonstrate intra-*machay* variability in oxygen and carbon isotope values (Fig. 7.7). People grouped together in death did not share the same consumptive practices during life.

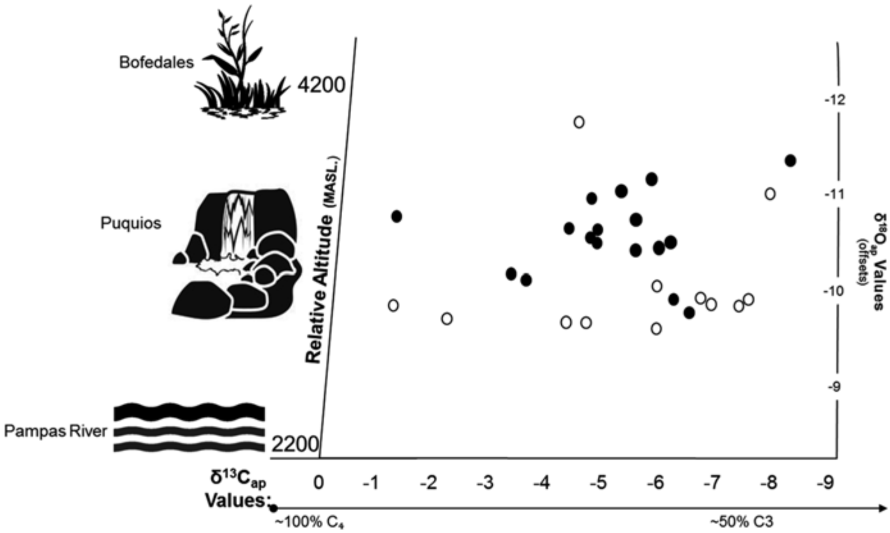

Fig. 7.6 Carbon and oxygen isotope results for post-imperial Andahuaylas. Those with cranial lesions (*white dots*) tend to have similar oxygen isotope values, perhaps indicating that despite dietary diversity, they all consumed water from a lower altitude or similar source

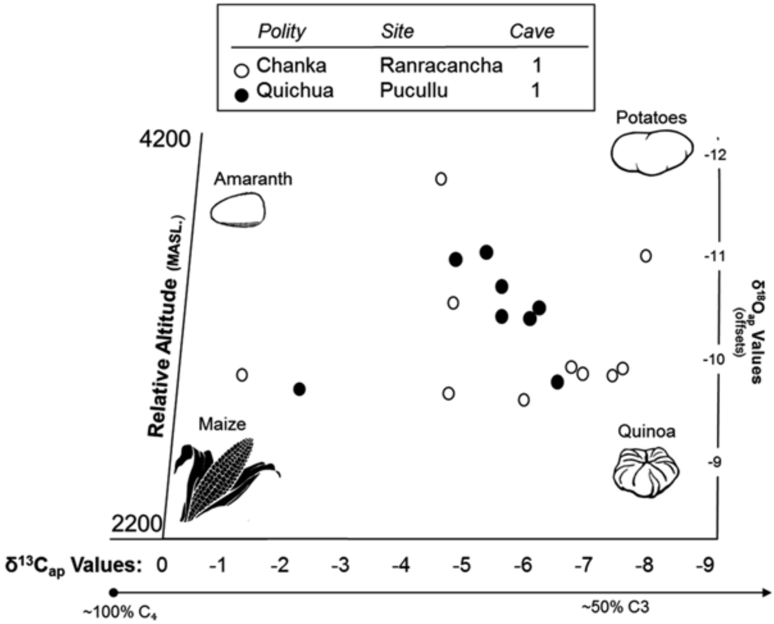

Fig. 7.7 Carbon and oxygen isotope values. Significant variation in childhood food and water consumption exists within a single burial cave among both Chanka and Quichua polities

Both Chanka and Quichua communities had members of the same *ayllu* and (patri) lineage, eating—and living—in distinct ecological floors during childhood. At Cachi (Chanka), a similar pattern emerged. Individuals buried at Ft. Sonhuayo largely consumed a similar diet, and imbibed drinking water from the same elevation—possibly even the same source (Fig. 7.8).

Here, the status of consumptive outliers, those whose food and water intake differed from their burial contemporaries, is particularly revealing. One outlier was a juvenile female with fronto-occipital oblique cranial modification. She demonstrated healing and active cranial lesions and extremely enriched C_4 rates. A lethal execution blow was present at the base of her skull. Another outlier, a late adolescent–young adult female with no cranial modification, also consumed significantly more C_4 in her total diet, but had no cranial porosities. Much of the left side of her head was shattered by at least two lethal blows. Finally, two young adult male outliers are also present. One has frontal–occipital oblique cranial modification, high dietary C_4 rates, mostly healed cranial porosities, both antemortem and perimortem cranial trauma, and an unhealed trepanation. The other male has no modification, no cranial lesions, high dietary C_3 rates, a healed wound on the right parietal, and a healing trepanation. So, while the females consumed significantly more C_4 in their total diet compared to their peers, they both demonstrate lethal, excessive head trauma. With respect to total diet, the males tended toward the margins, consuming significantly significantly more C_4 or C_3 than their peers. Both males have signs of trepanation cranial surgery, an important form of medicocultural intervention that we will discuss in Chapter 8.

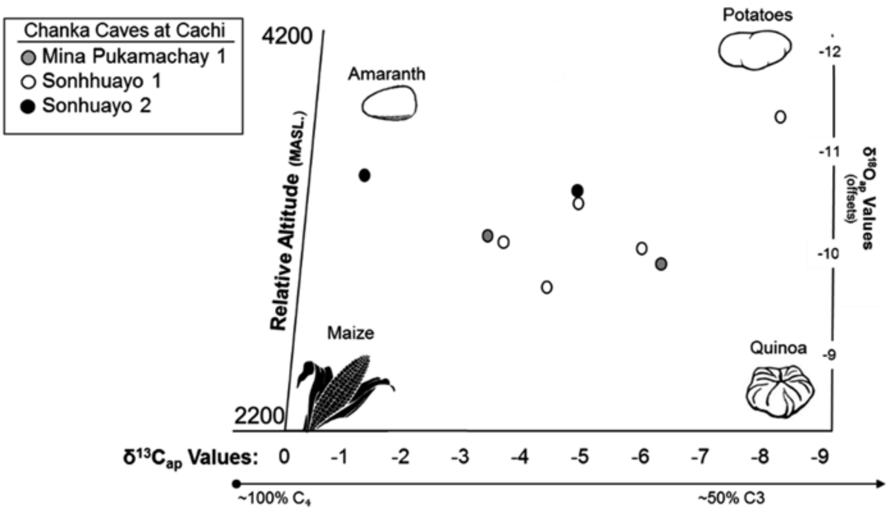

Fig. 7.8 Carbon and oxygen isotope values at Cachi, a Chanka site. Even within the same site, there is notable heterogeneity in childhood consumption patterns at *machays* located next to one another

Carbon and Nitrogen Isotope Results from Bone Collagen

The analysis of bone collagen, the organic protein component that allows for skeletal flexibility, helps us fill in some of the gaps regarding diet (Table 7.3). For one, unlike dental enamel, bone is living tissues and thus continually remodels over time. The speed of this remodeling, known as *turnover*, varies based on a number of intrinsic and extrinsic factors, including the health of an individual, disease burden, diet, and natural human variation among other metabolic and mechanical demands. However, as a rule of thumb (Sealy et al. 1995), spongy trabecular (cancellous) bone turns over faster than hard compact (lamellar) bone, and bony ends—metaphysis—turnover more quickly than bone shafts, or diaphyses. Based on experimental data, the middle of the femur—among the densest bone in the body—is slow to turn over, representing the congealed 10–20 years before death. Mandible bones turnover somewhat faster, perhaps 5–10 years. Smaller and more porous bones such as the ribs turnover every 2–5 years. And within that bony matrix, particular concentrations of stable isotopes are affixed. The ratio of stable carbon to nitrogen in bone collagen is linked to both the photosynthetic pathway of a consumer and its trophic level, or in other words, its a place on the energetic food chain.

The results tentatively demonstrate that any dietary protein humans were consuming came from animals that consumed C_4 plants (Fig. 7.9). This is a key finding and could mean that individuals in ancient Andahuaylas were consuming corn as well as the highland herbivores that consume corn. Next, when we examine the carbon and nitrogen results together, another pattern emerges. The values are consistent with human consumption of animal protein from lower trophic levels; these animals also ate C_4 plants like maize (Fig. 7.10). So which animal was it? The most likely culprit is the guinea pig. Guinea pigs live in hutches within the home and eat

Table 7.3 Carbon and nitrogen isotope pilot study results gleaned from Chanka and Quichua bone collagen. Because different bones remodel at distinct rates, isotopic values correspond to diet at particular times before death

Political affiliation	Site—Sector	Age category	Skeletal element sampled	Years before death represented by sampled skeletal element	$\delta^{15}N$	$\delta^{13}C$
Chanka	Cachi —Salt mine	Adult	Mandible	5–10	8.09	−11.60
Chanka	Cachi —Salt mine	Child	Pelvis	<3	8.18	−9.60
Chanka	Cachi —Ft. Sonhuayo	Adult	Mandible	5–10	7.96	−11.78
Chanka	Cachi —Ft. Sonhuayo	Adult	Rib	2–5	8.50	−12.42
Chanka	Cachi —Ft. Sonhuayo	Adult	Mandible	5–10	9.40	−9.35
Quichua	Pucullu	Adult	Rib with hole	2–5	6.51	−14.88

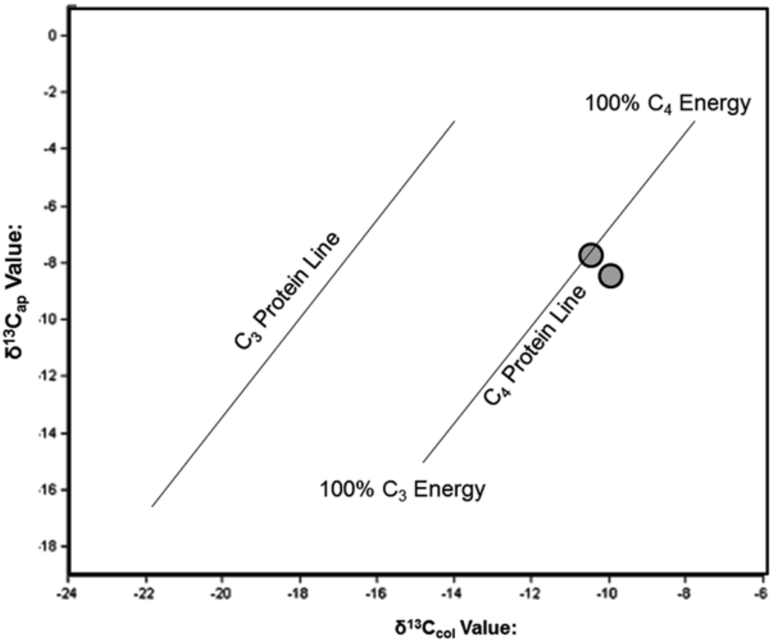

Fig. 7.9 Two of the individuals in the pilot study were subjected to carbon isotope analysis derived from both bone collagen and enamel apatite. When plotted on a simple mixing model, these samples support the hypothesis that protein in Chanka diets derive from animals which consumed lots of C_4 plant comestibles, such as maize

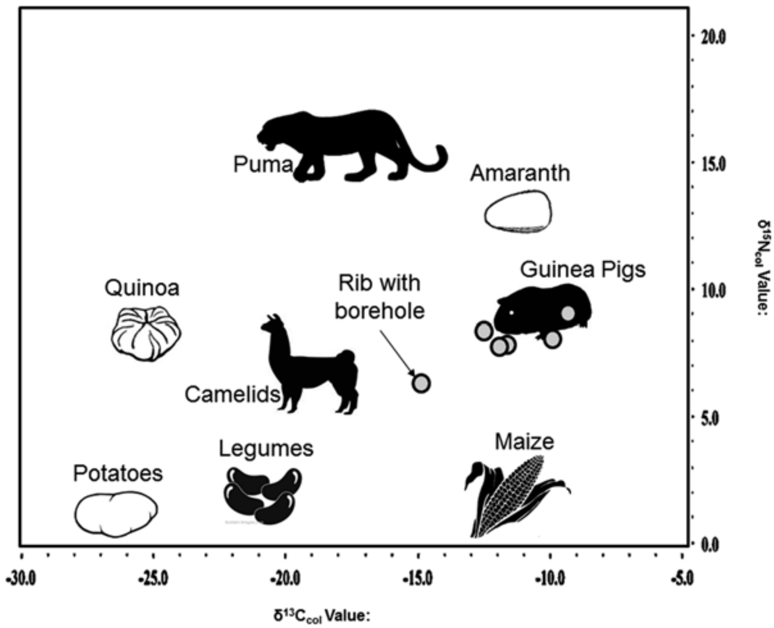

Fig. 7.10 Carbon and nitrogen isotope values derived from bone collagen are mapped against known food sources in the region. Among those sampled from the Chanka site of Cachi, guinea pig appears to be a major source of animal protein

human table scraps and waste. The discard includes the husks, leaves, stalk of the maize plant, as well as tough remains of the kernel not consumed by humans, including the hull, bran, germ, tip cap, and parts of the endosperm. Although we have excavated the remains of butchered llamas, signals for its consumption are not as strong in the isotopic record. Llama are foregut fermenters and tend to have distinct nitrogen levels compared to hindgut fermenters like guinea pig, when fed the same diet. But diets are *not* the same between these animals (Finucane et al. 2006). Guinea pigs are scavengers who consume human-generated plant waste, while camelids graze on C_3 grasses. The fact that we find camelid bones with signs of butchery in mortuary settings would be expected, since gatherings at *machays* were periodic, ritual affairs. But these valuable beasts were not regularly on the menu. Finally, guinea pigs live in the home; herders do not have to travel into forbidden zones to tend and cultivate this food source. At Ft. Sonhuayo, where half the population is experiencing violence—and a third are dying—growing your food in your house makes sense. This is a less risky and less dangerous subsistence plan.

Stable Isotope Analysis of an Artifact Fashioned from Human Bone

One of the most unusual samples assessed was a single curated rib bone from in the Quichua *machay*—although ribs of this sort have also been found at Chanka sites. A hole—now slightly polished on its superior edge—was carefully drilled into the vertebral end, such that it could be hung about the neck and prominently displayed (Fig. 7.11). The rib has carbon and nitrogen levels well outside the bioavailable range in the Andahuaylas region. In the 2–5 years before death, the owner of this rib consumed a diet with more C_3 vegetables, probably from tubers. The dietary protein source was also distinct. It derives from animals with a lower trophic signal—most likely from high-altitude grazers like camelids. These results are tantalizing: the rib did not belong to someone who ate (and thus likely lived) locally. The pendant may not come from the bones of a cherished ancestor—a *memento mori*—but rather someone who lived on the high, desolate planes of south of Andahuaylas, or perhaps from even further away.

Why then a rib? According to Andean body cosmologies, fat and fluids are desired. A visible rib cage is one of the most prominent signs of wasting and death. While ribs may be associated with the dead and the dying, these bones are also associated with fertility. Spanish chronicler Antonio de la Calancha (c. 1639) recounts a Peruvian fable, whereby the god Pachacamac entombs the ribs of a decedent to ensure the growth of tubers; the bones form the roots from which crucial sources of food sprout. More broadly, trophy-taking has a long history in the south central Andes (see Tung 2012). The Wari are known to have curated the heads of captives—men, women, and even children. Heads were defleshed, mandibles were removed from the crania, and holes were drilled on the top of the skull, where carrying cords were attached. The result was a powerful political symbol, employed by

Fig. 7.11 Hole drilled into the ventral side of a rib recovered from the Quichua enclave. This type of worked bone has also been found at Chanka sites

Wari lords, priests, and potentially other elites as a conspicuous and corporeal sign of Wari's dominance and control over the body politic. The specialized curation of Andahuaylan ribs fits within a model of trophy-taking noted in the old chronicles, recounting Chanka and Inka warfare. Indeed, the only way to make a pendant necklace from a human rib is to physically excise the bone from the fleshy matrix that encases the thorax, and this is a bloody, difficult job.

General Patterns in Diet, Health, and Mobility

Stable isotope data from pre- and post-collapse Andahuaylas support the paleoclimatic data from the region. Both lines of evidence demonstrate that the climate changes are not impacting water and food *availability* over time. However, the *accessibility* of food and water is being drastically restructured—likely due to Wari's political fragmentation. This is signaled by increasing heterogeneity in post-collapse isotopic values: differences in $\delta^{13}C_{apatite}$ are the equivalent of up to 30 % of the diet. Average $\delta^{18}O$ values demonstrate that mobility, or access to different vertical ecological floors, was severely reduced in the aftermath of Wari collapse. The rate of disease also doubled in the post-collapse era; over a third of the population suffered from nutritional inefficiencies, which could have been debilitating.

Disparities in diet and food accessibility during the post-collapse period also extended to gender. During childhood, Chanka women were consuming less maize than men. Greater ranges in $\delta^{18}O$ values suggest Chanka and Quichua women might have been more mobile or transhumant, but, on average, were accessing water from high elevations than men. This divergence might be attributed to increasing sex-specific patterns in subsistence. Because females—and their daughters—are charged with herding duties in the high-elevation rolling grasslands at above 3800 MASL, their afternoon lunches are more likely to include C_3 tubers. In contrast, males and their sons till fields at lower elevations, and may have subsisted more heavily on C_4 plants (e.g., maize) (Skar 1982).

Issues of food accessibility could have stoked competition between groups which could have escalated from petty squabbles to all out brawls. Indeed, that half the individuals in Andahuaylas evince cranial fractures demonstrate how pervasive violence was within the Chanka society. When tensions are high and resources few, any type of travel puts a person at risk for ambush. Women with outlier carbon and $\delta^{18}O$

values support this interpretation. Those individuals might have resided in kin and affine-based *choza* (shack) compounds near those fields and/or pastures for months at a time. This "agricultural outposting" hints at very real concerns about defense from thefts and raids.

The collapse of the Wari Empire appears to coincide with dramatic changes in settlement and subsistence practices (and accessibility), and a striking uptick in violence and deprivation. For instance, males and females are being similarly impacted by the types of nutritional inefficiencies that cause cranial lesions. This is expected given that they are living in potentially squalid conditions in overcrowded forts on top of mountains.

Other trends show the impacts of Wari collapse on women's (and children's) bodies with respect to diet and subsistence-related mobility. The fact that female children are consuming more C_3 and are, on average, consuming water from higher altitude—but have highly stratified $\delta^{18}O$ values—points to high-altitude living, but also greater ranges than their male counterparts. Even today, this lifestyle is risky as it predisposes women to ambush, abduction, assaults, and theft of livestock or food.

Causes of Poor Health in Andahuaylas

A prominent nutritional shock in the generations after Wari disintegration is apparent via the significant increase in cranial lesions. These pathologic holes are the result of chronic nutrient inefficiencies caused by factors including blood loss, inadequate nutrition, and nutrient malabsorption. In Andahuaylas, these inefficiencies appear to have been primarily provoked by chronic[6] and subclinically symptomatic micronutrient deprivation and parasitic infections.

Historically, regional diets have been characterized by low protein and micronutrient intake (i.e., iron, Vitamins A, B9, C, D, and folic acid which is almost solely derived from meat) and a general lack of diversity in terms of food types (Larrea and Freire 2002). Even today, during times of growing abundance, only 6 % of the protein intake within rural populations comes from animal sources (The World Bank 2014); over half of all Andahuaylan preschoolers are anemic (INEI) and exhibit high rates of stunted growth (height-for-age). However, by grade school, body mass indices (weight-by-age and weight-by-height) lie several standard deviations above the mean. This pattern confirms that although caloric intake may be adequate, it is of little nutritive value (Oths 1998).

In addition, unhygienic waste disposal, prolonged water storage, cross-contamination, or improper food preparation within a closely quartered host population can all introduce nutrient-depleting parasites into sensitive digestive systems (Araújo et al. 2011; Awasthi and Agarwal 2003; Bhatnagar and Dosajh 1986; Kyobutungi et al. 2008). As one can imagine, the grim realities of persistent warfare

[6] Skeletal lesions may not have time to form in acute, virulent, and fatal infections (Wood et al. 1992).

can exacerbate these hardships for generations (Pedersen et al. 2008). For example, Ministry of Health records compiled during Peru's recent civil war illustrate the pervasiveness of deprivation during troubled times. During the war's worst years in the early 1990s, over three-quarters of children demonstrated significant stunted growth. Chronic or recurring diseases which impacted nutrient absorption were endemic. From 1991 to 1993, 29 % (n=23,858) of 83,219 visits to the central Andahuaylas Hospital involved *only* gastrointestinal infection, diarrhea, amoebas, helminthes, and hookworms among 34 possible maladies (INEI 1994). The situation in prehistoric Andahuaylas may have been just as severe.

The Risks of Vertical Subsistence

Upslope displacement motivated by security (vs. climatic) concerns is supported by significant increases in trauma frequencies in the aftermath of Wari's collapse. Moreover, reduced $\delta^{18}O_{apatite}$ ranges point to greater circumscription and less access to different outlying ecological zones. As freedom of movement decreased, intragroup diets became more variable. Significantly distinct amounts of C_4 are being consumed by people entombed in the same cave, and within a few generations of each another, at most. Wide $\delta^{13}C_{apatite}$ ranges (from 75 % C_4 to 75 % C_3) and outliers highlight the presence of people with vastly different diets than their mortuary counterparts. This diversity may reflect a well-documented practice, where lineages send kin to till fields, exploit natural resources, and manage large herds in distant ecological zones (Murra 1972). As young children, the outliers in this study joined older individuals eating whatever bi-/mono-crop that was being cultivated in either the high or lowlands.

However, unlike an efficient vertical archipelago that facilitates exchange (c.f. Murra 1972; Murra et al. 1986), evidence of trade largely disappears after Wari collapse. Instead, lineage members are probably engaging in semipermanent agricultural outposting to provide greater dietary diversity and thus better nutrition in the face of perceived threats from theft or usurpation (Fig. 7.12). In turn, these concerns could have stoked competition and violence between groups. Indeed, trauma data illustrate a palimpsest of encounters, from raids and ambushes, to selective attacks which targeted specific members of a community.

Given that household survival depends on acquiring food during times of crisis (Sen 2008), and because conflict is also associated with food insecurities, people often revert to risky coping strategies. In Andahuaylas, exposing kin to elevated risks of excess mortality apparently did not outweigh the need to ensure agricultural, herding, and mining activities continue unabated year-round (see Flannery et al. 2008). As such, outlier profiles reveal commonalities—like lethal trauma, particular head shapes, compromised health and well-being, and young ages at death—that attest to the life-long (if not intergenerational) consequences of agricultural outposting in marginal, turbid environments (*sensu* Devakumar et al. 2014).

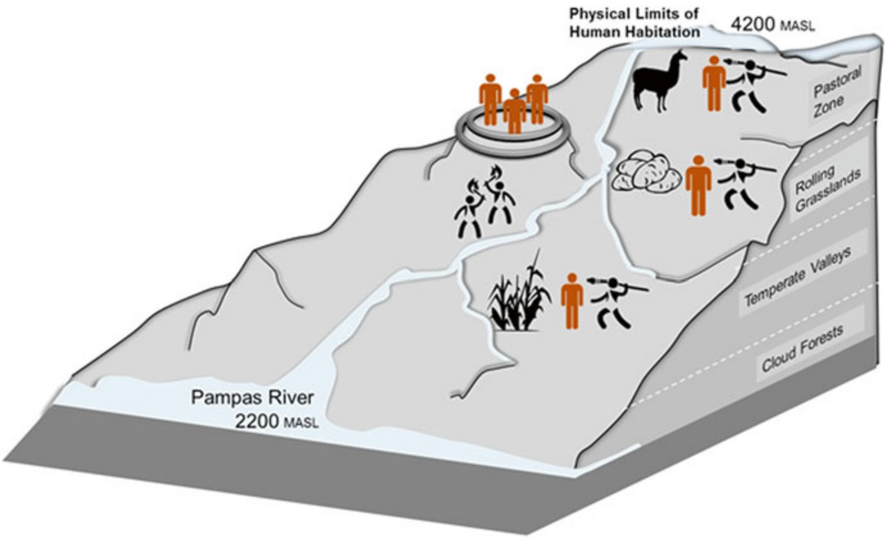

Fig. 7.12 Subsisting in different ecological zones came with its own set of risks. Hillforts may have afforded inhabitant relative safety from massacres, but low-intensity conflict still took place. Living in hillforts made it more difficult to access clean water, and so disease rates increased. These individuals had homogeneous diets, and prompted by security concerns, received most of their dietary animal protein from guinea pigs, which live in home hutches and eat table scraps. In contrast, individuals spending formative years eating—and living—in distinct ecological floors faced distinct challenges. Those individuals showed less evidence of nutrient inefficiencies common in cases of congested, squalid habitation. However, those who eked out an existence in outposts stationed in relative no man's lands were predisposed to becoming the victims of massacres. Regardless of life history, at death, everyone was inhumed in the same *machay*

Furthermore, because cranial modification was likely affixed to certain resource rights and social obligations—and was totally conspicuous—those individuals were overwhelmingly singled out for brutal attack. Yet, significant intragroup heterogeneity exists (Oths 1998): Modified individuals with osseous evidence of disease and deprivation have significantly different wound-to-killed ratios than their unimpaired modified counterparts.

This stark disparity could be explained if hunkering down in fortified settlements is indeed an underlying factor in the expression of cranial lesions. While digging-in would protect people from lethal violence during sieges and multipronged attacks, it would also expose them to multiple and significant risk for elevated morbidity. Importantly, excess mortality rates hint that it was those living far from the claustrophobic confines of the settlement walls who could be picked off. When tensions are high and resources few, even travel time to fields, corrals, and springs would have put a person at risk for ambush (VanDerwarker and Wilson 2016).

Given the evidence, marked increases in nutrient inefficiencies and intragroup dietary heterogeneity in post-collapse Andahuaylas were due to violence and food security concerns, rather than any perceptible environmental changes (Gregory et al. 2005; Messer 1997). Isotope data from this study demonstrate that while climate-sensitive food *availability* is not changing significantly in the tumultuous wake of Wari collapse, socially structured food *accessibility* is. Similar to contemporary and historic societies emerging from state collapse, as competition and conflict disrupted food access in Andahuaylas, insecurities regarding attaining food appear to have simultaneously provoked and sustained devastating warfare and violence.

It is clear from the archaeological record that significant changes in human behavior occurred after Wari's retraction from Andahuaylas. Material correlates signal the abrupt, widespread, and wholesale rejection of Wari's sociopolitical and economic institutions. Burial practices shifted from circular tombs to cave ossuaries. Grave goods bathed in Wari iconography were abandoned in favor of stone weapons. Lastly, a marked shift in settlement patterns from valley hamlets to fortified hill and ridgetop sites indicate concerns about threats of violence or actual attack. Because direct evidence of past life experiences is sedimented into human bones and teeth, the data inform on how the nature of social disparities changed and were made manifest over the span of generations.

A multifocal, well-contextualized bioarchaeological approach allows us to reconstruct the lived experiences of individuals, biological and/or social groups, and entire populations. Scrutinizing the tangled intersections of these axes allows us to better understand how warfare and deprivation get under the skin (*sensu* Clarkin 2010), in the generations proceeding imperial fragmentation. Finally, in Chapter 8, we will examine how folks coped with the hardships and challenges stemming from disparities in health, diet, mobility, and experiences of violence.

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Chapter 8
Medicocultural Innovations to Cope with Collapse

Trepanation, or the surgical removal of part of the cranium, has long fascinated scholars, collectors, medical practitioners, and the interested public alike, as a surprisingly universal form of prehistoric surgery, one that existed in the premodern medical world without anesthesia, antibiotics, or painkillers. Modern observers of trepanned skulls may cringe at the thought of undergoing surgery without these modern advances, yet prehistoric patients often survived, as evidenced by skeletal healing (Weber and Czarnetzki 2001; Andrushko and Verano 2008; Erdal and Erdal 2011). Low mortality rates speak to a complex system of care and medical knowledge attained by ancient practitioners. Bioarchaeological analyses, in particular, can help to reconstruct the experience of trepanation to better understand the development of these culturally contingent, premodern operations.

Although trepanation is not directly mentioned in Colonial texts, nor is it represented iconographically on material culture in the region, ethnohistoric and ethnographic examples from the Andean sierra provide important insights on the conditions that might have structured surgical intervention in the past. During the late prehispanic era, trepanation may have been known by some iteration of the word *sircca* (see Holguín 1952: 160). In its noun form, *sircca* means "a swollen vein or a lancet." As a verb, *sircca* means "to pulsate or beat, to bleed out, bloodlet, or pierce."

Serious physical injury to the skull can create an acute medical crisis necessitating urgent surgical intervention, but social transgressions (Marsteller et al. 2011) or psychosomatic maladies in the late prehispanic Andes may have also prompted trepanation surgery. Several lines of data inform on possible underlying motivations for trepanation use in the protohistoric past. Accounts from Peru (Salomon and Urioste 1991 [c. 1600]; Cobó 1964 [1653]; Bastien 1985) suggest that the physiological impacts of head wounds are not the sole or even primary impetus for medical intervention. Rather, trepanations may have been used to treat psychosomatic and neurological disorders which emerged as a consequence of both physical and emotional trauma. This class of illness is termed *sonqonanay* [animus pain] (Betanzos

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2004 [1557]; Villagomez 1919: 155; Burneo 2003; Pomata and Campos 2008). According to traditional Andean beliefs, any sort of physical or emotional trauma is always dangerous because it can lead to fatal *susto* [fright sickness/animus loss] (Greenway 1998). It is this potentially lethal "fear" which requires medicocultural intervention, and not necessarily the proximate pathology. As an underlying cause for medical intervention, *susto* can emerge in any stressful situation or in any unwell individual.

Ethnohistoric accounts (see Bastien 1985) as well as contemporary Andahuaylans commonly attribute pathological conditions that merit medicocultural intervention to environmental causes (such as excessive cold), supernatural causes (such as malevolent telluric *wayra* winds), and witchcraft. For instance, townsfolk from modern Cachi report that interacting with *machays* exposes the living to a host of maladies: the living may be overcome by *antimonio* (toxic vapors), suffer from *qapiccascca* (being grabbed by the earth), or contract the *ayatullu* (corpse bone). *Ayatullu* is an illness caused by touching *gintilikuna* (prehispanic) bones. The *ayatullu* enters the body and never leaves; most tumors, bunions (*hallus valgus*), cysts, calcifications, and other similar deformities are offered as evidence of *ayatullu* infection.

Physical, emotional, or spiritual trauma can lead to fatal conditions like *susto* or *manchariska* (Greenway 1998). In young children especially, *susto* is often lethal because it causes the animus to escape out of the anterior fontanelle. Fontanelles are thus viewed in Andahuaylas as potentially dangerous, semipermeable apertures, a class of anatomy known in Quechua as *ñupus* (things that are very soft and sink to the touch). While *ñupus* are orifices which expedite animus loss, they are also visible representations of vitality because they pulsate. Vivacity in both young and old is indicated by different onomatopoeic characterizations of *ñupu* pulsations on the head (from the sickly *piti pipitik* and *tanik tanik* versus the healthy *ttic ticc* [Holguín 1952]).

In Andahuaylas today, *susto* is treated using a treatment known as *qarapayle.* A practitioner forcefully massages the cranium and blows on the anterior fontanelle (*sopladas*) until the *ñupu* pulsations subside, and the soul is returned. Healers gauge the vitality of infants affected by *susto* by observing how the fontanelle pulsates. While *ñupu* cranial fontanelles disappear naturally over time, trepanation was a process where artificial *ñupus* would have been created. For stricken adults, trepanation could be conceived of as *ñupus* which were intentionally incised into the skull.

Finally, surgical interventions like trepanation may have been directed toward individuals who have had auspicious experiences, physical deformities, or neurological disorders. Several scholars have proposed that trepanation may have been used to treat epilepsy (Pomata and Campos 2008; Burneo 2003). Those who suffered from seizure disorders, termed *sonqo nanay* (animus pain), were usually held in high esteem, as they had the ability to communicate with *huacas* (shrines/deities) during periodic ecstatic trance-like outbursts (Villagomez 1919: 155; Betanzos 2004 [1557]; see Eliade 1957; Fadiman 1998).[1]

[1] Not every epileptic was treated with such deference: Inca Capac Yupanqui unceremoniously divorced his wife, Chimbo Mama Cava, because of her frequent epileptic attacks (Poma de Ayala 1616).

Given the logic of Andean sickness ideology, it is no surprise that the largest collection of trepanned crania come from Peru. In the south-central Andean highlands, trepanations first appeared during the Early Intermediate Period (ca. AD 200–600) (Verano 2003; Verano and Finger 2010), but the procedure was not universally adopted at that time (see Andrushko 2007: 166). Nevertheless, trepanation surgery was a viable form of intervention until at least the early sixteenth century when the Spanish apparently put an end to the practice. But why did this practice emerge in the first place?

Scholars have long debated the factors that may have spurred this type of surgery. The primary motivation was to alleviate intracranial pressure and remove bone fragments in instances of blunt force trauma (Verano 2003). In one study, Andrushko and Verano (2008) found that trepanations were placed over or alongside depressed or radiating fractures in 29 of 66 (44 %) cases. Rates of trauma may actually be higher but are unobservable because trepanation incisions may obscure the original fracture. Yet head wounds may not be the only, or even the primary cause for cranial surgery. Ethnohistoric data relate that trepanations may have also been used to alleviate pain or distress caused by a number of factors including scalp injuries and infections, neurological disorders, and psychosomatic illnesses (Verano 2003; Andrushko and Verano 2008; Verano and Andrushko 2010; Verano and Finger 2010). Although penetrating the skull for these reasons may seem risky, the perceived benefits of trepanation may have outweighed other concerns. For the practitioner, the proliferation of patients with potentially deadly or disfiguring injuries and diseases provide a chance to innovate and improve upon techniques for treatment (Hughes 2008; Baker and Ausink 1996).

If trepanation is indeed a surgical mechanism intended to cope with a wide variety of physical and psychosomatic trauma, then eras that witness violence, stress, and deprivation should also demonstrate increased rates of trepanation. And perhaps no epoch in Peruvian prehistory evinced higher levels of conflict and hardship in Andahuaylas, following Wari collapse (Tung 2008; Covey 2008; Arkush and Tung 2013).

Violent physical conflict, overcrowded living conditions, resource scarcity, and increasing rates of poor health characterized local populations. And high frequencies of violent injuries and diseases have often accelerated medicocultural advances in surgical techniques and technology (e.g., prosthetics) (see Hughes 2008). Those innovations emerge as a response to novel challenges during troubled times (Baker and Ausink 1996). The tumultuous milieu of early LIP Andahuaylas may have provided a crucible that fomented the development of novel surgical techniques, trepanation being most prominent.

Trepanation in Andahuaylas

The type, size, and shape of a trepanation is largely contingent on the technique used (Fig. 8.1). Correspondingly, each form of trepanation necessitates its own unique tool and manner of incision. For example, scraping involves repeated

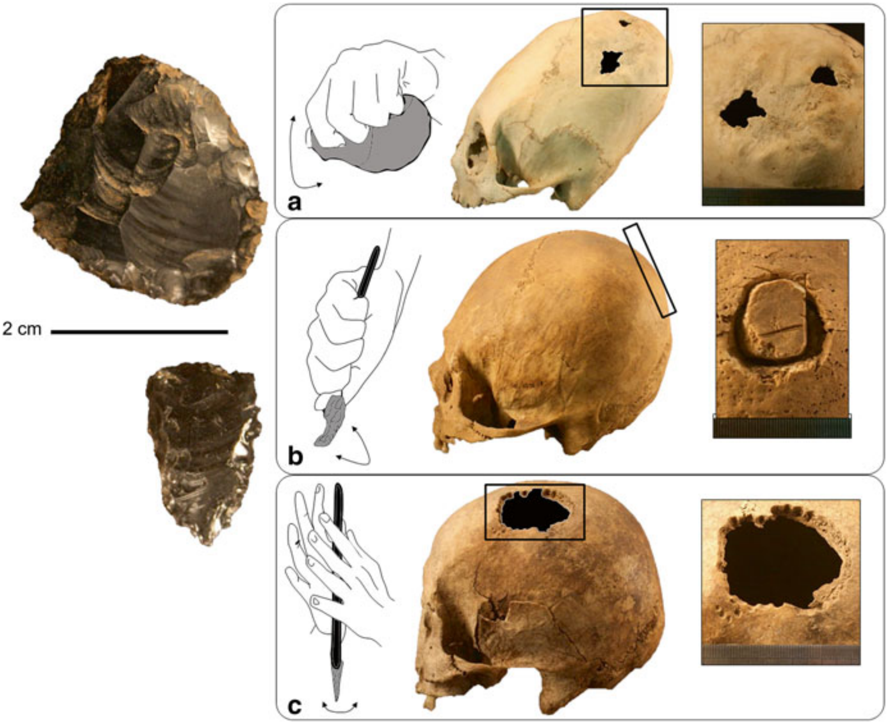


Fig. 8.1 Potential tools (*left*) that would be able to slice through soft tissue, and distinct trepanation methods: (**a**) scraping; (**b**) circular grooving and cutting; (**c**) boring and drilling

abrasion of the ectocranial surface, creating an irregular, beveled area of bone; this technique usually impacts the largest surface area of the cranium (see Andrushko and Verano 2008). Circular grooving and cutting is identified by the presence of a circular furrow, which results in the creation of a round bone plug which can be pried out of the cranium. Boring and drilling uses a bit to abrade the cranium repeatedly, forming a ring of small circular bore holes with overlapping borders. Finally, linear cutting employs a sawing motion to create a cross-hatched square of bone that can be excised.

None of the crania dated to the Wari era evinced a trepanation. After Wari collapse, trepanations' increase dramatically in frequency: 32/256 = 12.5 % (Fisher's exact, $p = 0.0293$; $N = 284$) show evidence of surgery. While knowledge concerning cranial surgery was certainly present in areas under Wari rule (Verano 2003), it was not implemented in Andahuaylas. Also, for many Andahuaylans, trepanation was not a singular event. Among the 32 affected individuals, there were 45 total trepanations. Twenty-eight percent (9/32) of trepanned individuals had more than one perforation. Trepanation rates were similar between Chanka and Quichua sites, where up to four techniques were being used. The most common was scraping: 26 out of

Table 8.1 Borehole diameter by site (in mm) for those individuals who underwent the boring and drilling trepanation technique

Site	Mean	Std Dev	Min	Max
Cachi	4.335	.449	3.49	5.67
Pucullu	5.987	.506	4.52	6.49
Natividad	6.105	.829	4.55	7.01

45 (58 %) trepanations used this technique. Circular grooving was observed in 20 % (9/45) of cases, while boring and drilling was implemented in 24 % (11/45) of cases. Linear cutting was only observed in one instance (2 %).

Trepanations vary by shape. Sixteen out of 45 (35.5 %) trepanations were oval, 21/45 (46.6 %) were circular, and 8/45 (17.7 %) were polygonal (square, triangular, and quadricircular). The shape of a trepanation was contingent for the most part on the tool used and the method of trepanation realized. Trepanation sizes (the area of vault that was impacted by the surgical tool) ranged by method. There are no significant differences between the sizes of scraped or grooved trepanations within or between sites. Nor is there a significant association between trepanation size and degree of healing. However, the size of the drill bit used to make boreholes differs between sites (Table 8.1). We know this because the boring and drilling trepanation technique creates uniform boreholes which are isometric to the drill bit used. Thus, the size and shape of discrete drill holes (as used in cranial surgery or in trophy rib curation) inform on tool kit standardization (see Tung 2012). When borehole diameters were compared within and between sites in Andahuaylas, we found significant size differences. Among the Quichua, average drill hole size was 5.987 mm (s.d. = .506 mm; $n=15$ holes). Chanka sites were distinct. At Natividad, the average borehole size was 6.105 mm (s.d. = .829 mm; $n=143$ holes), while at Cachi, boreholes averaged 4.335 mm (s.d. = .449 mm; $n=60$ holes). Drilling and boring trepanations were not observed at Ranracancha.

Certain regions of the vault exhibit more trepanations than others and were preferentially selected for intervention (Fig. 8.2). In other words, the location of trepanations on the cranium informs on whether certain regions were favored for surgery over others. In Andahuaylas, trepanations were significantly directed to the left parietal boss region, relative to other sides of the cranium ($\chi 2=32.733$, $p=0.0001$; d.f. = 5; $N=45$). Thirty-five percent (13/45) of all trepanations are on this area of the head, notable for its lack of veins, musculature, sinus cavities, and sutures. Yet these anatomical bodies did not evade impact entirely. Overall, 10 of 45 (22.2 %) trepanations on 10 individuals impacted sutures, while 18/45 (40 %) trepanations on 13 individuals likely impacted either facial or temporal musculature. In three cases (3/45 = 6.7 %), trepanations were placed over the frontal sinus cavities. Despite risks to the patient, 10 (31.3 %) of 32 total individuals had trepanations which impacted sutures, while trepanations on 18 (56 %) individuals impacted either facial or temporal musculature. In three cases (9.3 %), trepanations impacted the frontal sinus cavities.

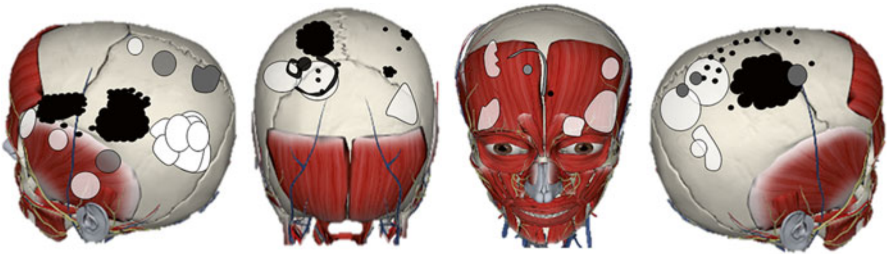


Fig. 8.2 Trepanations from Andahuaylas on the homunculus cranium are mapped out by shape, method, and site. Of 37 plotted trepanations, 13 were present on the left side of the cranium, two on the right, nine on the superior, seven on the anterior, and six on the posterior

Of the 45 trepanations on the 32 affected individuals, 30 (66.6 %) operations demonstrated either short-term or long-term healing. Yet despite high survival rates overall, some trepanation methods were more successful than others. Scraped trepanations were universally successful. One hundred percent (26/26) of the scraping trepanations had at least some healing. Other methods had significantly lower healing rates. Linear cutting was never successful (0/1). Circular grooving was successful in 5/9 (55.6 %) cases, while drilling and boring was highly unsuccessful: of 11 drilling/boring trepanations (made from at least 218 separate perforations), only one—composed of a single perforation—showed some evidence of short-term healing. Overall, trepanation by scraping method was significantly more successful than both circular grooving (Fisher's exact, $p = 0.0031$; $N = 45$), and boring and drilling (Fisher's exact, $p < 0.0001$; $N = 45$).

When multiple trepanations are present, the technique and success of an earlier trepanation seem to structure subsequent interventions. For instance, of the five multitrepanned individuals with boring and drilling perforations, four (80 %) also have scraped trepanations. While the scraped trepanations were all well healed, the drilling and boring trepanations were not healed. The boreholes were made months to years after the scraped trepanations, and around (or after) the time of death.

Practitioners in Andahuaylas developed fairly standardized surgical techniques and toolkits. Borehole dimensions show that Chanka and Quichua sites were using drill bits of different gauges (sizes) but of similar shapes. Borehole diameters suggest one bit was used on two different crania at Cachi, a different bit used on one cranium at Pucullu, and at least two distinct-sized bits were used on four crania from Natividad.

As in other areas of the Andes, trepanations in Andahuaylas are most commonly found on the left side of the head (Verano 2003: 233; Verano and Finger 2010), possibly due to traumatic assault by mostly right-handed opponents (Stewart 1958). However, surgical techniques were more nuanced than simply intervening at the point of violent impact. In Andahauylas, trepanations overwhelmingly directed to the left parietal are not associated with increased injury to that region of the skull. Because crania do not evince correspondingly high concentrations of head wounds on the left parietal, the decision to intervene in that area was probably not predicated on the location of acute injury. Rather, practitioners likely took into account that surgery on areas like the parietal bosses was less risky than other regions. Correspondingly, incisions were placed on predetermined regions of the vault.

Nevertheless, in some cases, the motivation for surgery apparently outweighed the risk of impacting delicate areas. Trepanations which encroached on meningeal arteries or dural sinuses could have led to epidural hematomas, infections, and death. Their presence in these regions may thus reflect a sense of urgency.

What might have happened to the excised bone and tissue in a trepanation procedure? Cobó (1964 [1653]) observed that maladies removed in operations were often destroyed, noting, "the sorcerers pretended to cut his body up the middle with crystal knives, and out of his abdomen they took snakes, toads, and other filthy things, burning them all in a fire that they had there." Dispatching auspicious materials is a resilient tradition. Rural Andahuaylans still take loose hair and throw it in the fire to prevent it from being confiscated by *leiccas* (witches). Artifactual evidence from ancient Cachi shows other disposable body parts like locks of braided hair were used as part of offering assemblages.

Keeping in line with these practices, the bone abraded out of the cranium during a trepanation may have been ritually dispatched (see Greenway 1998). Testimony relates that, when someone caught a disease, the healer placed a live, white guinea pig over the sick person's belly and rubbed it furiously. The healer squeezed some guinea pig blood between his hands with maize flour and chili pepper, and then took the animal to the road and slaughtered it. The healer threw the blood, chanting *nanay puric yaya quisiacpuric yaya caiahuantac ayhuaycuy* [Sickness, take this offering and walk away]. Afterwards, the liver and guts from that guinea pig were observed carefully; if they were tight, it was a sign that the patient would die, but if they were fleshy, then the patient would heal (Duviols 1986: 8). If bone plugs from skull surgeries were viewed as auspicious, then it may explain its conspicuous absence in the skeletal record.

Patient Profiles

In Andahuaylas, only adults over around 20 years old evince trepanations. Among 52 sub-adults examined, none showed signs of cranial surgery. Trepanation also appears to have been significantly directed toward males. Of those 32 individuals in Andahuaylas with trepanations, 25 are males, three are females, and four are unsexed adults. Biosocial factors appear to have constrained its use within the injured and ailing population. Cranial surgery in Andahuaylas was significantly structured by sex and age. Male to female trepanation rates are 8:1. Other studies in the Andes show less of a skew in adult sex ratios where trepanned males tend to outnumber females by only about 2:1 (Andrushko 2007: 163; Verano 2003: 227, Table 2). Trepanned males are significantly overrepresented relative to the general population (Fisher's exact $p<0.0001$; $N=184$). Of 90 male crania observed, 27 % ($n=25$) evince trepanation, while only 3.1 % ($n=3$) of 94 females demonstrate surgical perforations. This disparity is particularly striking given that women—especially Chanka women—are likely to be victims of violence as often as their male counterparts. If surgeries were reserved solely for victims of traumatic cranial injury, then males and females would be expected to show similar trepanation rates, but this is not the case. These data suggest that the procedure was either mediated by gender, or highly correlated to sex-specific activities which could predicate the need for surgery (Larme 1998).

Trepanation rates were also compared between those with and without cranial modification, a prominent signifier of group affiliation in Andahuaylas (Kurin 2012). Twenty-seven of 187 (14.4 %) modified crania had evidence of trepanation, while 8.2 % (5/51) of unmodified individuals had trepanation. The difference is not significant (Fisher's exact, $p=0.4913$; $N=249$). This is another notable disparity, considering that modified *Wakcha* people are experiencing significantly more violence than the round-headed *Piwi Churi*.

Similar to females, the absence of sub-adults among the trepanned population is distinct from other regions in the Andes, where juveniles make up between 6 % and 8 % of trepanned individuals (Finger and Fernando 2001: 380; Verano 2003: 227, Table 2; Andrushko 2007: 164). Even though subadults in LIP Andahuaylas were impacted by violence and suffered from diseases at a considerable rate (Kurin 2012), trepanation does not appear to have been a viable form of intervention for the younger members of that society. The absence of trepanned subadults and the underrepresentation of females imply that these members of society were not viewed as appropriate patients for trepanation.

Also noteworthy, individuals with cranial modification are not undergoing trepanation at a significantly higher rate than unmodified individuals. This trend is important given that individuals with cranial modification experience significantly higher rates of violence than unmodified individuals. Although individuals with cranial modification are being wounded more often, they are not receiving proportionally more surgeries, as inferred by trepanation presence. If trepanations were reactively employed in all cases of traumatic injury, the sub-population with cranial modification should exhibit proportionally more trepanations because they have substantially higher rates of injury and stress, yet this is not the case.

All told, these results insinuate that trepanation may have been withheld as a viable intervention in cases of trauma toward members of Andahuaylan society with cranial modification. Curtailing "necessary" medical treatments within a subpopulation group is a sign of deep social inequality and fits into the model of selective and structural violence that appears to have characterized the *Wakcha* population.

Finally, medical histories appear to have been important as well; individuals who were "fit" enough to survive one intervention were perhaps deemed appropriate patients for subsequent (ultimately unsuccessful) surgeries or postmortem experimentation. This is evinced by the prevalence of individuals with both healing scraped trepanations and unhealed drilling and boring trepanations. After death, people who had been trepanned were interred collectively with individuals who lacked the surgery; they did not get specialized mortuary treatment.

Trepanations in Andahuaylas are not just about a therapeutic intervention targeting those who have been victims of traumatic cranial injury. Rather, interventions were directed toward a certain *kind* of unwell body. Before an incision was ever attempted, there appear to have been certain factors which structured the rules regarding who could receive treatment.

A Case Study in Care and Convalescence

Explicitly defining trepanation as a form of care (Tilley and Oxenham 2011; Tilley 2015) refines our understanding of how and why these techniques developed and illuminates the prehistoric logic of healing. Furthermore, by using direct evidence of care for trauma, we can test this framework's suitability for theorizing care for both deadly and nonlife-threatening injuries among ancient people.

One informative case study concerns an 18–22 year old male with cranial modification, termed ACH3 (Fig. 8.3). This individual is the only complete skeleton with trepanation thus far excavated in Andahuaylas, recovered from the Chanka hillfort of Achanchi. The body was placed in flexed position, with his knees tucked into the thoracic cavity. The only grave good he was associated with was a worked human rib, with a hole drilled for suspension about his neck.

Despite the young age at death, bioarchaeologist Sarah Jolly found that this skeleton evinces cranial and postcranial fractures, impaired mobility, and multiple

Fig. 8.3 Chanka individual ACH3 healed trepanation above the *left* orbit and healing radiating fracture (*left*); healing trepanation over star-mace wound (*right*). *Arrows* indicate radiating fractures (Image modified from photos courtesy of Sarah Jolly)

trepanations. Firstly, there are four healing blunt force cranial defects. A healing scraped trepanation sits above the supraorbital ridge (11 × 13 mm), and a healing radiating fracture extends posteriorly from the aperture's superior margin. The coincidence of the radiating fracture and the trepanation implicates that surgery was motivated by trauma. A star-headed mace wound on the left parietal is partially superposed with another scraped trepanation. This trepanation is larger (28 × 48 mm). From it, a major healing radiating fracture extends anteriorly, terminating at the fracture line from the frontal bone wound. Another fracture radiates through the sagittal suture. The extent of the radiating fracture is consistent with the high-velocity weapon blows. A third blunt force impact on the right parietal is also associated with the scraped trepanation. A fourth blunt force wound, on the zygomatic process of the right temporal bone, shows long-term healing. But the bone did not fuse correctly, a condition known as malunion. Due to the differential degrees of healing, these wounds were received at different times. ACH3 was a victim of violence—and intervention—several times in his short life.

Recovery and side effects from high-velocity cranial wounds and invasive, prehistoric neurosurgery could have had wide-ranging impacts on activities, potentially affecting all facets of daily life. Multiple head wound and repeated surgical operations likely slowed recovery times and compounded any negative side effects. The risks of cranial trauma and surgery are difficult to predict even given modern medical advances. Head trauma sequela can last from days to months to even years. Side effects include headache, dizziness, concussions, amnesia, unusual behavior, seizures, nerve damage, loss of motor skills, and failing mental functions.

In addition to head wounds, Sarah Jolly's exhaustive work also documented multiple sublethal postcranial pathologies and injuries. The most noteworthy is osteoarthritis on the fifth and sixth cervical vertebrae, a condition which can impact flexibility and movement. Neck injuries are associated with 10 % of severe head injuries (Karrar et al. 2011).

In contexts with high rates of violence, the effects of cranial trauma should be considered both in terms of how they affect the individual and larger community. Cranial trauma can have significant physical, emotional, and economic effects on an individual, family, and community. Even though ACH 3's cranial injuries are severe, such wounds were relatively common in the region. Nevertheless the functional impacts of these injuries placed a strain on the population over time.

Even in modern populations, head trauma has high emotional, psychosocial, and economic tolls, with comparatively long hospital stays and convalescence in long-term care facilities (Karrar et al. 2011). Cranial injuries impact motor, sensory, and reflex abilities. Complications are frequent, and long-term care usually requires rehabilitation by physical, occupational, vocational, speech, and recreational therapies. The outcome of head trauma is related to the initial level of injury, and can greatly decrease life expectancy. In Chanka and Quichua communities, cranial trauma would have become increasingly familiar, and ancillary effects would have had long-lasting consequences.

Another common complication from skull fractures and trepanation is traumatic brain injury [TBI] (Corrigan et al. 2010; Jolly and Kurin i.p.). TBI impacts an individuals' physical, emotional, and economic capacities and lessens their quality of life. Patients with TBI from physical assault often demonstrate poorer community integration (Kim et al. 2013). Almost half of those with TBI develop long-term disabilities. The impact of nontreatment can cause permanent brain damage. Psychosocial problems, such as mood disorders, contribute to longer recovery periods and poor outcomes. Bouts of anger and anxiety, physical violence, and sexually offensive or risky behavior are common (Valente and Fisher 2011). Family histories of abuse may predispose patients with TBI to violence (Linton 2015; Silver 2012). It is plausible that the high rates of violence in Andahuaylas lead to an increasing awareness regarding the symptoms and side effects of cranial trauma.

Despite ACH3's numerous ailments and injuries, there is no skeletally apparent cause of death. This young man's bones present the image of an athletic youth who was targeted for violence that left him with permanent bodily and possibly mental damage. Even if this combatant status was temporary, injury recidivism from weapons-based trauma suggests that he engaged in multiple violent encounters, as a raider, a defender, or noncombatant. His *Wakcha* identity may have predisposed him to violence, but group solidarity also structured his access to surgical treatment and care. His impairments would have required involvement in the Chanka's complex sociomedical system.

The relationship between the afflicted individual and his caretakers would have been dynamic, imbued with all the subtleties of human interaction. Emotional support from caregivers would have been key (Karrar et al. 2011). But the task of caregiving has its own challenges. In the Andes, it is a form of unpaid, domestic labor, usually assigned on a gender basis. Women are typically assigned duties of caregiving for elderly parents, disabled adults, or the chronically ill (Friedemann-Sánchez 2012). The burden of care may have fallen on the women of ancient Andahuaylas as well. In clinical settings, patient care is associated with depression and anxiety in the short term, and hypertension and cardiovascular disease in the long term (Klimo and Couldwell 2008; Klimo et al. 2013). The increased need for care in Andahuaylas may have placed additional stressors on caretakers.

In sum, while it is impossible to precisely reconstruct the symptoms and side effects of cranial trauma and cranial surgery in the past, even mild injuries are likely to have caused brain damage or affected motor skills. All wounds and interventions would have necessitated recovery time. The indirect impacts of head wounds and sustained threats of conflict likely affected community mental health, and would have created a dynamic relationship between afflicted individuals and the broader population.

Perioperative Procedures

For those deemed fit for surgery, such as ACH3 and others, trepanations may have been executed along with other ancillary practices. The surgical perforation of the skull represents just one step in a lengthier operation. In Andahuaylas, there is

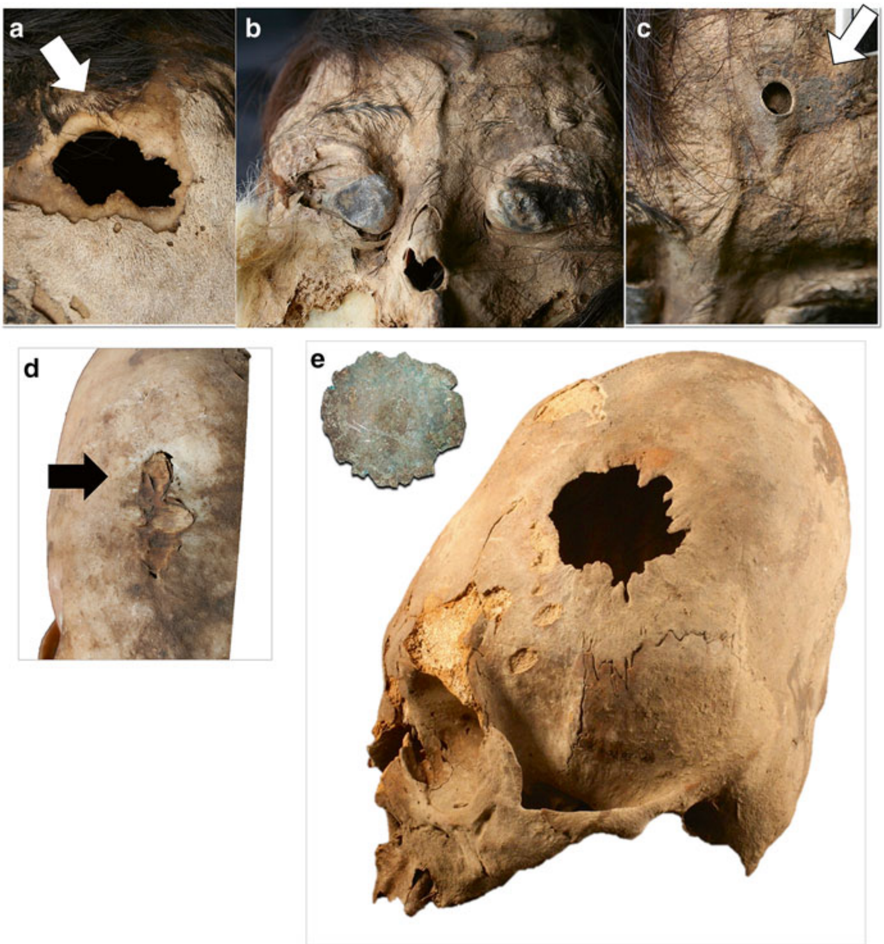


Fig. 8.4 Evidence of perioperative procedures. Preserved scalp tissue near a healing trepanation (**d**) evince intentionally short hair (**a**). An incomplete borehole is located in the middle of the forehead (**b**) covered by a poultice (**c**). The trepanation with long-term healing (**e**) was found in association with the metal plaque (*upper left*)

provocative evidence that patients were prepped for surgery and attended to after the operation concluded (Fig. 8.4).

For instance, the well-preserved, mummified head of a long-haired young adult male from Natividad, catalogued as Hry.23, demonstrates two distinct trepanations, each associated with a different perioperative procedure. First, the scalp tissue surrounding a healing scraped trepanation on the posterior section of the right parietal is conspicuously devoid of long hair. At 60× magnification, the hair on the scalp immediately surrounding the trepanation appeared sharp and cleanly cut, very similar to microscopic images of modern shaved hair; follicle tips around the trepanation did not have a "buffed down" appearance of hair which had sloughed off due to decomposition and post-depositional activity. Given the difficulty of realizing a successful surgery, hair around trepanations might have been kept very short in case further intervention was required.

This same individual also has a small borehole on the forehead, over the sagittal sinus vein and angular artery. These veins and arteries are associated with trauma-induced migraine pain (Shevel 2007; Pathak et al. 2009). The lack of healing around the borehole on Hry.23 suggests that it was drilled around (or after) the time of death, and may represent a failed attempt to alleviate venal pressure. Over the wound, there is a smudge of a dark substance—with finger print ridges still preserved—characteristic of a herbal poultice.

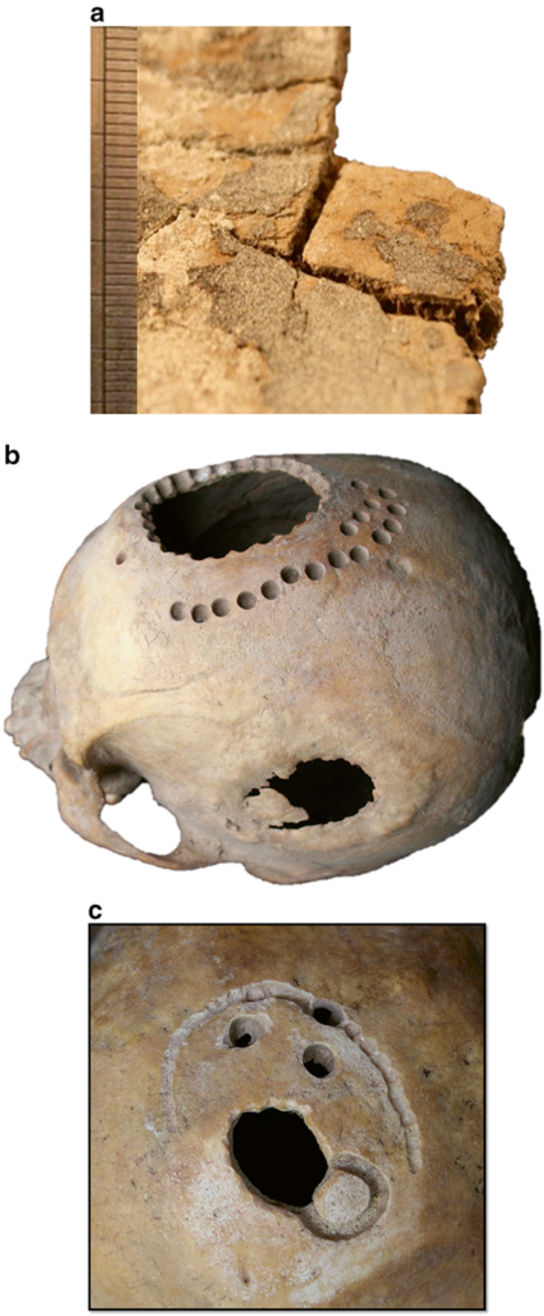
Another type of perioperative procedure is cranioplasty, a repair made to a cranial defect. In Andahuaylas, there is one possible case of a cranioplasty—a metal plaque—associated with a trepanation. The affected cranium, Son.02.02.12, was directly AMS radiocarbon dated to AD 1160–1260 (2σ). A scraped trepanation spans the left frontal and parietal bones. The perforation shows signs of long-term healing, with smooth, dendritic bone growth forming an undulating, roughly circular margin.

Cranium Son.02.02.12 was found lying on its left side; the thin (.47 mm) metal plaque was immediately below the trepanation, suggesting a very close, if not direct, association. At 214 mm^2, it conforms almost precisely in size and shape with the trepanation aperture, and there is no evidence of a hole or metal process, which would have suggested that it was a *tupu* shawl pin. The absence of hammered relief work means it was not used as an armband, breastplate, or similarly fashioned ornament. There were no signs of metal transfer on the bone around the trepanation aperture. This indicates that the plaque was not placed directly on the bony vault (but could have been secured to the scalp prior to death) (Duday 2009). Given the paucity of other examples of metal cranioplasties, the therapeutic attribution of the plaque remains circumstantial.

Postmortem Trepanations

Trepanations in Andahuaylas show evidence of technical refinement as practitioners presumably worked to ensure that their iatric interventions did not cause the death of the patient. Trial-and-error experimentation may be evinced in the bioarchaeological record through repeated attempts until success is achieved. Unfortunately, most methods of trepanation surgery cannot speak directly to technical acumen. Both scraping and circular cutting and grooving, for instance, are reductive practices, and with every repetitive abrasion, the previous indenture is erased. However, changes in discrete penetrations caused by boring and drilling are amenable to such analysis. This section will present evidence of trepanations from Andahuaylas which show clear, unambiguous signs of experimentation (Fig. 8.5).

Fig. 8.5 Practice postmortem trepanations; (**a**) Endocranial trepanation; (**b**) Experimenting with boreholes of distinct depths; (**c**) The use of variously sized drill bits and bone polishing



First, Son.02.02.100 is a 628 mm^2 piece of an adult left parietal bone. The highly brittle fragment has two clear, sharp v-shaped incisions, which form a right angle and a square plug of bone 32 mm^2. Importantly, the incision was made on the *endocranial* surface of the parietal; the incisions do not penetrate the external table. Due to its location, the only way this trepanation could have been attempted was if an individual was already dead, and if their cranium was broken or fragmentary.

Other probable cases of postmortem trepanations are present in Andahuaylas. For instance, cranium Hry.01, from Natividad, is an adult male recipient of at least three operations. The individual has a scraped trepanation on the right parietal–occipital region which shows signs of long-term healing. Also present are 63 discrete boreholes on the squamous portion of the right occipital; none show signs of healing. Long sequences of overlapping bit indentations form parabolic and oval shapes. Some of these shapes overlap, and only 17 (27 %) boreholes actually penetrated the internal table; the rest just pierced the external table.

Borehole diameters were measured and indicate that at least two different drill bits were used. Initially, a smaller bit was used in three trepanation events. A complete trepanation consisting of 13 boreholes produced cavities with an average diameter of 5.06 mm each. Just lateral to this complete trepanation is an attempted trepanation consisting of 12 boreholes with an average diameter of 4.55 mm. An attempted parabolic-shaped trepanation made from at least 28 boreholes covers an area of 161.6 mm^2. Sometime later, a drill bit twice as large (7.01 mm) was used to make three complete boreholes. One of the boreholes was made directly over the parabolic trepanation. Color differences around the margins of the three large boreholes indicate they were drilled postmortem. Finally, bone polishing on the occipital and basicranium suggests considerable handling well after the time of death.

Strong evidence for perimortem experimentation is also present on cranium Hry.11, a middle adult male also from Natividad. This individual has a well-healed scraped trepanation which spans the left parietal and temporal bones. This individual also has a complete trepanation made from 74 boreholes, covering 571.7 mm^2 on the right frontal and parietal bones. An additional 19 discrete bore holes only penetrated the external table. These attempted perforations form a parabolic shape whose placement follows the medial and posterior edge of the complete trepanation. Notably, the parabola of attempted boreholes all display consecutively deeper perforations. The shallowest perforation measures 3.4 mm, but holes increase in depth by about 0.2 mm as one moves posteriorly. Borehole size and color continuity suggest that all the perforations were received in a single event after death.

Surgical Experimentation

Practitioners in Andahuaylas engaged in several mechanisms to ensure the survival of patients including head shaving, poultice use, and possible cranioplasties on living patients. Poultices may have been especially common in the late prehispanic Andes (see Verano and Andrushko). For instance, colonial chronicler Cieza de Leon (1996

[1553]) wrote that locals living in the Andahuaylas region used poultices derived from, "a yellow flower," to cure sickness. This flower is most likely *Oenothera rosea*, locally known as *Yahuar Sua* (blood thief). Informants have reported that this blood thief is still used today to treat head and scalp wounds (and even modern craniotomies) because of its prized analgesic, anti-inflammatory, and antiseptic properties.

In contrast, repairs to the cranial vault, like that associated with Son.02.02.12, are rare in the Andean highlands (Andrushko 2007; Verano and Andrushko 2010), and previous reports of metal cranioplasties, specifically, have proven unreliable (Tello 1913). In Cuzco, Verano and Andrushko (2010) report that an excised bone was secured back in place following a trepanation, but evidence of cranioplasty use in Andahuaylas remains circumstantial. Nevertheless, Andahuaylans understood that patients required intervention beyond a hole in the head; ephemeral therapeutic poultices were employed temporarily, while possible cranioplasty uses signal attempts to cope with trepanations in the long term.

Most significantly, postmortem trepanations appear to confirm that practitioners were experimenting on corpses. Crania were abraded with different drill bits, intentionally corroded into prodigious shapes, and polished by frequent handling. Unambiguous cases of postmortem intervention as well as the concurrence of several different trepanation types suggest that Andahuaylans were engaging in different experimental techniques as a means of improving both operating procedures as well as knowledge concerning cranial anatomy, in a society where no such template existed previously.

While trepanation certainly has health benefits to patients with these traumatic conditions, it also posed dangers to patients. Injuries to the underlying dura or venous sinuses would have been catastrophic, as would have hitting major blood vessels. The patient could have easily gone into shock or faced further edema, or swelling, of the brain. Reducing the risk of these consequences would have been especially critical to the success of trepanation in the past. Furthermore, while bioarchaeologists cannot pinpoint exactly when trepanation occurred relative to the moment of injury, early or immediate responses would support better patient outcomes. The pain of cutting through the scalp and periosteum would have been intense (Liu and Apuzzo 2003). If not already unconscious, a patient could pass out in agony. Maintaining a stable, motionless operating surface would be necessary to reduce the risk of error, and the medical practitioner would need assistance holding the un-anesthetized patient down. This context could have provided an opportunity for training new practitioners.

It is likely that stone tools and metal spatulas were used to cut and elevate bone and soft tissue. Freshly knapped stone proves a precise and sterile surgical instrument. Modern neurosurgeons clip the scalp back and cauterize major blood vessels to avoid excessive bleeding (Weber and Wahl 2006). Fast operating times would have been critical. To limit blood loss and minimize pain, smaller trepanations might have been preferred.

Even if no underlying tissues were affected, the risk of infection would have been a particular danger. Poultice use and bandaging would keep the wounds from being left open to contaminants. Indirectly, they hint at close monitoring for signs of infection. Assuming that practitioners performed trepanations with such frequency as to hone their craft, it seems likely that communities would have systems in place to assist those in recovery. Even in the face of resource constraints, trepanned individuals would have required intensive convalescence and care.

Coping with Fractures and Disease

Throughout the Andes, trepanations were often made to alleviate intracranial pressure brought about by acute traumatic injury (Verano 2003; Andrushko 2007; Andrushko and Verano 2008; Verano and Finger 2010). Indeed, results from Andahuaylas suggest some association between trauma and trepanations. Eighteen out of 31 (58 %) trepanned individuals also evince head wounds. For seven of those 31 individuals (22 %), trepanations were placed on or alongside an existing fracture, and 11/31 had a trepanation present on the cranium, but it was not directly over, or alongside, a head wound. The association of trauma and trepanation in Andahuaylas may actually be much stronger, but remains unobservable because trepanation apertures can obliterate signs of fracture (Fig. 8.6).

Data also suggests that not all manners of traumatic injury merited intervention. For instance, among the seven individuals where trepanations were on or adjacent to head trauma, all wounds were either linear or depressed fractures. Linear fractures are fissures that occur at the point of impact and follow a path of least resistance as a result of the bones' failure to rebound from generalized force. Depression fractures, on the other hand, occur as a result of direct, localized impact (Lovell 1997). Depending on the force of impact and location of injury, the resulting fracture pattern varies from a relatively mild hinged, shallow, pond shape, to a lethal web of concentric rings that radiate across the vault (Novak 1999: 57). The latter class of severe trauma, common in Andahuaylas, is not associated with trepanations. Unsurprisingly, facial wounds (e.g., broken nasal bones), although frequent, were not associated with trepanations either.

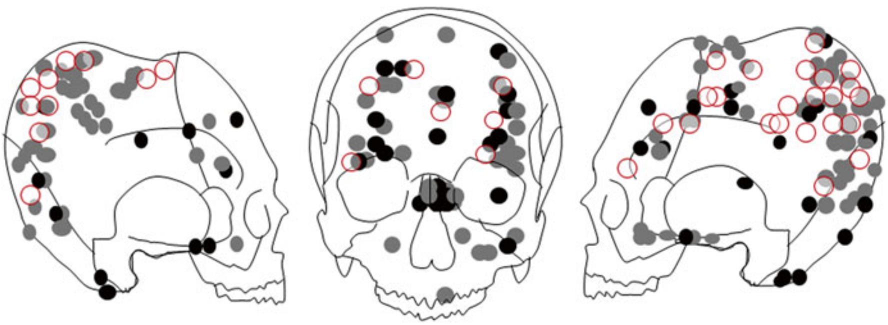


Fig. 8.6 The *white dots* represent trepanations, while the *black* and *gray dots* indicated loci of perimortem and antemortem trauma, respectively

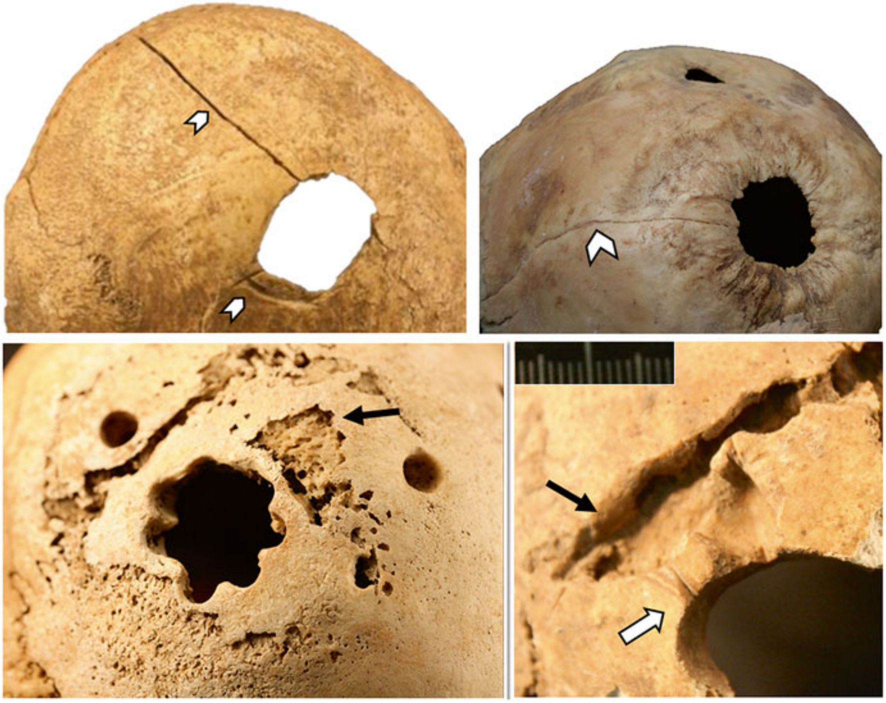


Fig. 8.7 Trepanations associated with blunt for trauma (**a** and **b**; chevrons); Unhealed trepanations associated with healing cranial pathologies (**c** and **d**; *arrows*)

Yet blunt force trauma was not the only motivation for trepanation (Fig. 8.7). In at least three cases (3/31 = 6.7 %), individuals had trepanations placed over areas of inflammatory, porotic bones that had undergone significant remodeling. Despite long-term healing, trepanations were still warranted. However, none of the three patients survived the operation. Nevertheless, the cases demonstrate that trepanations were not exclusively reserved for urgent intervention on acute, traumatic injuries, but might have also been used to treat the swelling and pain associated with long-term infections of the scalp, epicranial aponeurosis, or the ectocranial surface itself.

Novel Challenges and Innovative Practices

Compared to other Andean regions, trepanation appears relatively late in Andahuaylas (see Verano 2003). Radiocarbon dates confirm that the practice exists only after Wari's collapse in the eleventh century. However, within a few generations, trepanation was widely adopted. By the early twelfth century, at least four distinct surgical techniques were being practiced contemporaneously.

Trepanation in Andahuaylas was an innovative practice. Its emergence coincides with the collapse of the Wari Empire, a time of increasing violence and deprivation. Like other innovations, trepanations were quickly adopted and widespread, but not highly standardized. Basic precepts including where to place an incision, as well as the profile of suitable patient, seem to have been shared across Andahuaylas. A mosaic of perioperative practices confirms practitioners were trying different approaches to ensure the survival of the patient. Signs of postmortem experimentation imply that cranial surgery was viewed as a practical skill which called for increasing standardization and proven methods (Graham 2003).

Trepanation procedures were pragmatic, problem-specific, and praxis-oriented. Ubiquity in technique suggests that practitioners throughout Andahuaylas shared a common understanding of how and where to perform cranial surgery, and likely employed roughly similar toolkits. While trepanation by scraping was overwhelmingly successful and directly associated with cranial trauma, the boring and drilling method was almost universally unsuccessful. Instead, this type of trepanation might have been intentionally practiced on corpses as a means of better understanding cranial anatomy and improving techniques.

The act of cranial surgery and the long-term survival of physically impaired persons show an investment in care among the Chanka. These data speak to the value of an individual's life, even the ailing, regardless of resource constraints or fear of attack (Fig. 8.8). We still do not know exactly how the care afforded to trepanned individuals extends to other types of injuries, or whether war wounds from violent injury versus other types of medical crises were were perceived differently. The necessary recovery and convalescence period for head trauma and cranial surgery would neverthelesss require a social organization designed for intensive care.

Although physical trauma seems to be the impetus for intervention in many cases of trepanation, other motivations may have included physiological or psychosomatic factors. Surgical intervention in Andahuaylas was also mediated by age, gender, and ethnicity. Despite the fact that stress and violence impacted much of the post-collapse population, trepanations were primarily reserved for adult men; surgery was proportionally withheld from women, youths, and groups who practiced cranial modification.

A couple of different factors may account for the extensive and pervasive dispersal of a new surgical technique such as trepanation. As a practical skill, the circumstances that predicated the need for trepanation (e.g., violent trauma, other stressful or fear-inducing circumstances) may not have been present during the Wari imperial era in the Andahuaylan hinterlands. However, once Wari collapsed, a milieu emerged wherein the proximal causes which motivated surgery became prevalent and widespread. The physiological and psychosocial stressors which necessitated therapeutic trepanations (i.e., infections and *susto*) might have been heightened due to endemic violence and a decreased quality of life, evinced by high rates of cranial trauma and increasing signs of disease. Because trepanation patterns were largely shared across the region, the proximate and underlying factors which motivated this procedure were most likely well established and far-flung. All told, these results signal innovative technical developments in the

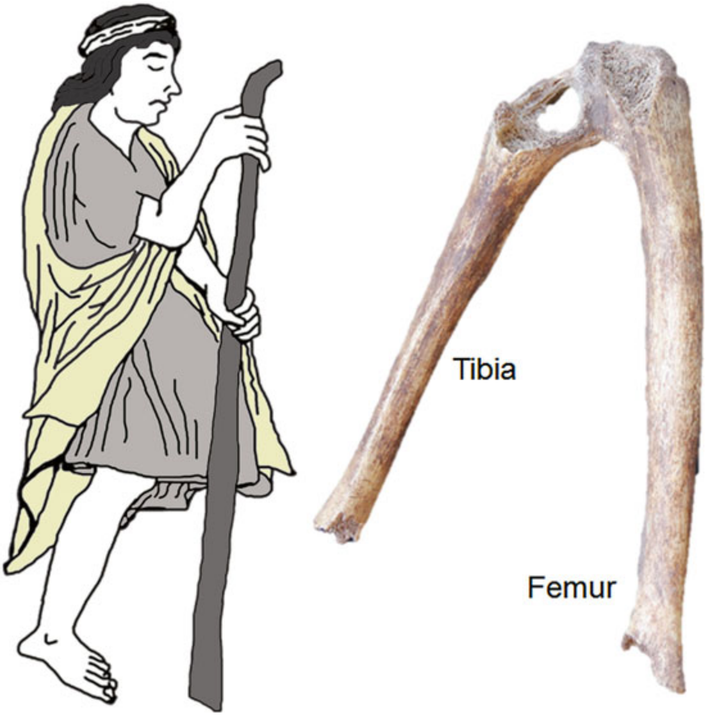


Fig. 8.8 *Uncocruna* (the sick people). Regardless of sex or age, the sick and invalid had their own distinct social category during the Late Horizon (Image redrawn from Poma de Ayala [ca. 1616] with permission from The Royal Danish Library). *Right*: U-shape ankyloses (total fusion) of the tibia and femur. The destruction of the knee joint from septic arthritis is potentially a result of secondary tuberculosis

aftermath of the Wari Empire, and speak to the maturation of distinct (though not intractable), culturally informed understandings of how to heal an unwell body in the ancient past.

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Chapter 9
Conclusions: Social Fragmentation and Reorganization

This study investigated what happens to people when societies collapse. Ancient skeletons were used to directly reconstruct the lived experiences of people undergoing dramatic societal reorganization. In Andahuaylas, state collapse and societal restructuring variably impacted sub-population groups. While post-imperial times were largely fraught with want, and deprivation, it was also a crucible for regeneration, innovation, and resilience. Using a comprehensive social bioarchaeological approach based on both lab work and fieldwork, skeletal, artifactual, biogeochemical, ethnohistoric, and ethnographic data were incorporated within a social and environmental archaeological context. Patterns of migration, health, gender, biological affinity, body modification, and mortuary practices were assessed to better understand how they factor into the reformulation of novel social identities and variable experiences of violence. These data were then used to inform on how ancient life ways and social organizations were renegotiated in eras emerging from tempestuous sociopolitical transformations.

The Effusive Nature of Wari Imperial Control in Andahuaylas

Our primary units of analysis in the study were human skeletal remains excavated and systematically recovered from Middle Horizon and Late Intermediate Period burials in Andahuaylas. AMS radiocarbon dates and artifactual evidence confirmed that Wari's imperial presence radiated into western Andahuaylas after ca. AD 700–750. During that time, Wari directed the construction of infrastructure including agricultural terraces, imperial highways, and high-altitude outposts used to manage huge camelid herds. They also oversaw copper extraction from nearby veins. At nearby sites like Cachi and Turpo, results showed that Wari's presence was largely indirect. Salt mining at Cachi and agricultural intensification in Turpo were

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managed by local-born individuals who were buried with the trappings of the empire. Imported pottery, as well as locally fabricated ceramics, which emulated Viñaque and Wamanga stylistic tropes, attests to the entrenchment of Wari ideology and political economy in the region.

By all indicators, Andahuaylas remained an important near-hinterland imperial province for at least 250–300 years, until the empire disintegrated. Wari's demise was most likely experienced over several generations, from ca. 1000/1050 until ca. 1100/1150. The cause of collapse remains unclear, but the state's withdrawal from Andahuaylas was probably not due to local rebellions or uprising. Trauma rates remain low in the region throughout the late tenth century; violence escalated in the region only after Wari disappearance.

Post-Imperial Shifts in Mortuary Practices

During the Middle Horizon, aspects of Wari ideology were incorporated into the local mortuary arena. Emblems of elite imperial status found with locally born individuals who were thoroughly Warified demonstrate that some Andahuaylans were co-opted by the state. Wari collapse instigated changes in burial customs. *Machays,* cave tombs, functioned as collective repositories for segmentary groups in postimperial Andahuaylas. Wari-affiliated burial customs were abandoned in favor of new, emergent traditions. At Cachi, *machays* were cleaned out and repurposed at the end of the Middle Horizon, sometime after the eleventh century AD. The disposal of human remains and artifacts indicates a rejection of Wari ideology, as it related to the politics of the dead. While Chanka and Quichua interments continued the precollapse tradition of collective burial rooted to a single articulated, apical ancestor, artifactual assemblages changed dramatically. Luxurious Wari goods were abandoned in favor of small, paired personal items and miniature totems. Smashed drinking vessels and butchered animal remains provide strong evidence of feasting, and suggest continued post-depositional interaction with the dead. These *machay* traditions continued unabated in Andahuaylas until at least the Late Horizon. Classes of corporate heirlooms (like *conopas*), and the collective inclusion of males, females, and sub-adults in caves that were used for only a few generations, strongly insinuate that *machays* were used to inhume members of patrilineal lineages.

Population Continuity and Bipartite Divisions

Wari imperial collapse also impacted larger scale shifts in community composition. Nonmetric trait analysis illuminates patterns of biological affinity, mobility, and diet in ancient Andahuaylas. Because shared phenotypic characteristics are a proxy for biological affinity, this analysis was employed to clarify migration trends at a macro level and determine if populations became more insulated in Andahuaylas after Wari collapse.

Three hundred crania were examined, and ten traits were used for subsequent statistical analysis. Multivariate analysis and cluster analysis of amalgamated nonmetric trait data were used to assess the relative biological distance of different burial populations.

Results revealed reduced gene flow in the aftermath of Wari collapse, but no evidence of population replacement in Andahuaylas. Chanka populations at Cachi and Ranracancha appear to represent two endogamous moieties, while the Quichua enclave at Pucullu was genetically distinct from its neighbors. Finally, nonmetric analysis revealed that the Mina Cachihuancaray salt mine in Cachi was impregnated by *machays* filled with biologically disparate groups. This result, along with a unique demographic and radiocarbon profile, further supports a distinct model of *machay* collectivity at Mina, which might have been based on competing rights of salt extraction instead of lineage or *ayllu* affiliation.

Revealing Migration Through Strontium Isotope

Strontium isotope analysis further clarified patterns of migration in Andahuaylas. This approach was used to illuminate patterns of paleomobility on the level of individuals and address questions of displacement and transhumance in post-imperial Andahuaylas.

Despite the influx of Wari infrastructure, artifacts, and ideas, we found no evidence of foreign-born individuals in Andahuaylas during the Middle Horizon. After Wari collapse, distinct migratory configurations developed within Chanka and Quichua society. Two nonlocal females were present at the Chanka sites. Both females had signs that they may have been captured in raids and subject to subsequent maltreatment. Strontium signatures also informed on economic organization. Results demonstrated that the salt mine at Cachi was strictly managed by the local community: there is no isotopic evidence of foreign migrant mine workers.

At Pucullu, the Quichua enclave, the presence of two nonlocal able-bodied males suggests an alternate strategy of exogamous male immigration to reify labor obligations and social bonds. The in-migration of foreign-born males may have been a tactic used to maintain allegiances distant, allied groups. Quichua community members would have benefited from the influx of manpower for labor projects and defense.

Novel Juxtapositions: Cranial Modification and Ethnogenesis

State collapse can spur novel reformulations of identity; this research determined that cranial modification emerged as a means of social differentiation. After the demise of long-standing Wari-instituted socio-political hierarchies, new boundary-marking practices, like cranial modification, would have been crucial in the reorganization of communities. Conspicuousness is crucial to ensure the successful renegotiation of contested territories and resources over succeeding generations.

Cranial modification ubiquity, head shape, intensity, and heterogeneity were compared between groups based on sex, era, cave, site, moiety, and political affiliation. Results revealed that modification use became widespread only after Wari collapse. Because it is a practice whose reproduction speaks to the creation of intentional cultural distinctions, head remodeling is a reliable proxy for ethnogenesis. This dynamic process consists of the imbrication of innovative and vestigial traditions to draw new cultural distinctions between groups of people.

Significant variations in head shape within distinct groupings in Andahuaylas indicated that head-binding customs were mediated, minimally, by sex, lineage, and perhaps matriline. Greater homogeneity in head-shape among males within sites supports the hypothesis that *machay* interment was structured by patterns of patrilocality and patrilineality. Because burial caves contain both modified and unmodified crania, complementary rules of agnatic and cognatic descent likely structured cranial modification and cave collectivity. While people buried within the same *machay* probably belonged to the same lineage or *ayllu*, cranial modification implementation marked a supra-*ayllu* kinship category—an ethnic-like identity.

Iterations of Violence: Cranial Trauma and Ethnocide

This research investigated whether violence increased as a result of the collapse of the Wari Empire. Groups competing for agricultural fields, pastoral lands, or sacred sites in the absence of any sort of regional hierarchy, coupled with generalized social and economic deprivation are thought to have spurred violence. Novel hilltop settlement construction and occupation around AD 1000–1100 may have further stoked antagonisms and reified social balkanization and regional hostilities.

Hundreds of crania from Andahuaylas were examined for evidence of trauma. Patterns in trauma frequency, lethality, and craniospatial distribution were calculated for different subpopulation groups based on era, age-at-death, sex, site, polity affiliation, and cranial modification.

Violence was more frequent and more deadly in the postimperial era. The rate of deadly wounds increased significantly as well. Reconstructed mortuary demographic profiles point to violence as a prime cause of excess mortality in the postimperial era. Lethal cranial fractures are concentrated on older juveniles and young adults, arguably the most productive members of society. Age-at-death curves in wounded populations follow an inverted-U mortality curve, common in cases of state collapse and genocide cross-culturally.

Trauma analysis further supports the hypothesis that Wari imperial collapse caused a political vacuum that aggravated and ultimately transformed local intergroup relationships through violence. Results show that violence was not experienced equally in the aftermath of Wari collapse; trauma patterns varied significantly between contemporaneous postimperial Chanka and Quichua communities. At the

Quichua enclave, males were experiencing significantly more trauma than females, a common pattern in traditional cases of raiding and ambushes. Patterns in wound frequency, lethality, and location indicated that males were participating in potentially deadly encounters, while females experienced a palimpsest of violent events, including affinal or domestic abuse, interpersonal conflict resolution, ambushes, abductions, and raids.

Violence in contemporaneous Chanka communities differed significantly. There, lethal-to-sublethal trauma ratios and wound counts demonstrated that violence was significantly more deadly, and that victims were more likely to be the recipients of multiple attacks. Similar injury location, lethality, and distribution between Chanka males and females indicated that violence was being experienced in similar social contexts.

Several lines of evidence culled from this research support the hypothesis that postimperial violence targeted members of distinct kin categories. Principally, physical attacks were directed toward people who utilized cranial modification. Among subadults, the trauma pattern is similar: violence was directed only toward youths with modified crania. Because calibrated radiocarbon tests securely demonstrate that modified and unmodified individuals lived contemporaneously during the Late Intermediate Period, the disproportionate number of *Wakcha* with fractures (versus *Piwi Churi* without fractures) revealed that violence was variably experienced by different groups of people; those with modified crania were targeted for violence, while individuals who maintained the natural shape of the cranium lead relatively more peaceful lives. This pattern in asymmetric violence can be described as *ethnocide*, the directed, attempted, and intentional extermination of a group identified on the base of *perceived* difference.

Wound distribution analysis further confirms a unique form of violence. In postimperial Andahuaylas, only modified individuals from the Chanka sites have deadly ring fractures on the base of the skull. This osseous evidence indicates that those individuals were incapacitated and killed using close-range, repeated blunt force trauma; destructive, high-impact, overkill blows to the face were intended to obliterate a victim's identity. Taken together, these data point to distinct forms of violence enacted against Chanka groups that marked ethnic-like affiliation through head shape.

Daedalian Social Symbioses

This research demonstrated that in the aftermath of Wari collapse, ethnogenesis and ethnocide were linked processes. In Andahuaylas, human heads were permanently modified to demarcate within-group affiliation and between-group boundaries, but this practice of affiliation had consequences. Cranial modification fomented intragroup solidarity while simultaneously contributing to intergroup antagonism and violence. During charged experiences of intergroup counterpositioning and conflict, the attributes that defined these groups were brought into greater congruence with each other. The seemingly intractable boundedness of ethnic-like groups, wary of others, created an environment conducive to ethnocidal violence. For the postimperial Chanka, the capacity to perform violent acts both defined and reinforced group identities.

There were likely several factors at play in the post-collapse era which precipitated this type of violence, apart from the social and economic deprivation described earlier. In the aftermath of Wari, there was no longer an imperial army, nor the personnel and infrastructure to support legions of fighters. In the absence of the state, warfare downshifted in scale. Because people could no longer define friend and foe vis-à-vis the state, the motivation and target of violence changed. Groups united by common bonds of descent, residence and ethnic-like kin categories, became the linchpins of alliance and sowed the seeds of competition and antagonism.

Given these patterns in ethnocidal violence, the resilience of cranial modification as a conspicuous means of social boundary marking is truly profound, and serves as a potent testament to the consummate fortitude and vitality of shared identity.

Inaccessible Food and Water

Consumptive practices and health status were also sensitive to socio-political fragmentation. These issues were interrogated using skeletal analysis and stable isotope analysis. Oxygen isotopes were marshaled as proxies for climate, water sources, and by extension, residential mobility. Data from Andahuaylas revealed that individuals during the Middle Horizon had access to a greater range of water sources than subsequent postimperial populations. Increasing homogeneity in oxygen values at postimperial sites indicated that access to water might have been more limited for Chanka and Quichua people. Importantly, oxygen isotope data do not reveal evidence of striking climate changes during the era of Wari fragmentation. These results conform to geological and paleo-ecological studies in the area.

We also examined what people ate using carbon and nitrogen isotope analyses. In mountainous Andahuaylas, food sources are fixed to distinct elevations and these data inform on access to different foodstuffs during childhood and adulthood. Carbon isotope analysis of dentition was conducted to help reconstruct ancient diets. Results revealed that the quotidian consumption of environmentally sensitive staples like maize did not significantly diminish between Wari and postimperial times. These results further indicate relative climactic stasis between the later Middle Horizon and early Late Intermediate Period. However, the postimperial era did witness increasing stratification with respect to food access, reflected through wide ranges of $\delta^{13}C$ at Chanka and Quichua sites. Moreover, the covariance of $\delta^{13}C$ and $\delta^{18}O$ values suggest that after Wari's retraction from Andahuaylas, Chanka and Quichua groups maintained differential access to water and plant food sources from different ecological zones. Nitrogen isotopic results further suggest that dietary protein was derived from guinea pigs which live in the safety of the home, rather than camelids, which are taken to pasture in potentially dangerous no man's lands. Harvesting food from far-flung ecological zones was risky business during the violent postimperial era.

Compromised Health

A wealth of archaeological evidence demonstrates that postimperial settlements in Andahuaylas provided natural vectors for disease. First, ridge-top settlements were overcrowded; the living, the dead, their animals, and their waste were compressed into small patio groups. This type of living arrangement could lead to a host of communicable infectious diseases like tuberculosis, chronic illnesses, and zoonotic pathogens. Furthermore, hillforts generally lacked water sources, and the use of brackish water could have led to frequent viral or bacterial outbreaks.

Increasingly stratified and restricted access to certain foodstuffs, clean water sources, and settlement in either hillforts or ecological outposts also appears to have impacted the health profiles of particular groups. Cranial vault lesions called porotic hyperostosis were evaluated to determine how Wari collapse might have impacted health profiles. Results revealed that the physical compression from cranial modification bindings did not cause vault porosities. Rather, the most likely etiology of disease in Andahuaylas was megaloblastic anemia caused by nutrient malabsorption. This was was ultimately due to bacterial infections, and/or communicable diseases contracted from unhygienic living conditions. Within the population, modified individuals had much higher rates of cranial lesions than unmodified individuals. Because dietary and health inequalities cannot be attributed to macro environmental changes, it appears that the social repercussions of Wari collapse instigated fundamental disparities in the life ways of emerging groups.

Coping with Casualties

Rather than a time of creative and abstruse stagnation, this study concluded that the postimperial era was one of innovation and information exchange. This study investigated individuals with trepanations—ancient cranial surgery. Given the riskiness of the procedure, this unique medicocultural intervention was considered a proxy for technical innovation. The complete absence of trepanations during the Middle Horizon suggests that the procedure was unknown or unnecessary during the imperial era. Emerging in the wake of Wari fragmentation, trepanation was meant to cope with emergent challenges, and its use increased significantly during the postimperial era.

Two-thirds of trepanation patients in Andahuaylas demonstrate evidence of at least short-term healing and survival. Standardization in trepanation techniques indicate that practitioners throughout the region employed normative procedures, directing incisions on predetermined regions of the vault. Although trepanations using the scraping method were ultimately most successful, different trepanation methods were being attempted contemporaneously. Distinct standard toolkits were utilized within different communities. Finally, unambiguous evidence of perimortem boreholes, endocranial incisions, and praxis marks on Andahuaylan crania are a result of trial-and-error experimentation. Taken together, this evidence signals attempts by practitioners to improve techniques and become more familiar with cranial anatomy.

Given the similarities in trepanation techniques across Andahuaylas, the social and/or biophysical factors that motivated trepanations must have been similar throughout the region. Those factors may have included trauma, disease, and possibly psychosomatic illness. However, the surgical procedures were mediated by sex, and perhaps constrained by kin category. Treatment was conspicuously and significantly withheld from specific segments of Chanka and Quichua society. The apparent restriction of trepanation among injured modified individuals and women, suggest shared beliefs about who merited iatric intervention in the postimperial era. Thus, more than just illustrating technical innovation, trepanation in this case provided a lens to observe how culturally informed therapeutic interventions were transformed and experienced in the aftermath of the empire.

The Future Is at Our Back

The aim of this study was to investigate how state collapse restructured subsequent Andahuaylan society, both biologically, and sociocorporally. Far from unique, collapse is a recurring phenomenon that often causes people to redefine who they are, and how they interact with others. Sometimes, in the midst of political instability, resource stress, and/or worsening environmental conditions, these interactions can become violent. Yet, violence may not be experienced equally by everyone in the society; indeed, some groups may be more vulnerable than others. While scholars are beginning to examine how violence and novel identities emerge in the wake of "failed" states in contemporary societies, this study contributes to debates about how these processes may work in ancient, nonwestern, nonstate societies. Future research of this sort has the potential to further elucidate mechanisms for violence and identity formation in both modern and ancient contexts of state disintegration. By clarifying the nature of violence in Andahuaylas over time, it may be possible one day to address broader issues of polity emergence, transformation, and demise in general. My hope is that results of these analyses will generate new hypotheses for studies of violence and identity formation in marginal societies, cross-culturally.

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