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Trauma and Violence in the Wari Empire of the Peruvian Andes: Warfare, Raids, and Ritual Fights

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KEY WORDS conflict; skeletal injury; Huari; imperialism; Peru; bioarchaeology

ABSTRACT This study examines bioarchaeological evidence for violence during the period of Wari imperialism in the Peruvian Andes through analysis of skeletal trauma from three populations dating to AD 650–800. The samples are from contemporaneous archaeological sites: Conchopata, a Wari heartland site in central highland Peru; Beringa, a community of commoners in the Majes valley of the southern Wari hinterland; and La Real, a high status mortuary site, also in the Majes valley. Given the expansionist nature of Wari and its military-related iconography and weaponry, it is hypothesized that Wari imperialism was concomitant with greater levels of violence relative to other prehispanic groups in the Andes. It is also hypothesized that differential articulation with the Wari empire (e.g., heartland vs. hinterland groups) affected the frequency and patterning of trauma. Results show that cranial trauma frequency of the three Wari era samples is significantly greater than several other Andean skeletal populations. This suggests that Wari rule was associated with high levels of violence, though it may not have always been related to militarism. The three adult samples show similar frequencies of cranial trauma (Conchopata = 26%; Beringa = 33%; La Real = 31%). This may suggest that differential positioning in the Wari empire had little effect on exposure to violence. Sex-based differences in cranial trauma frequencies are present only at La Real, but wound patterning differs between the sexes: females display more wounds on the posterior of the cranium, while males show more on the anterior. These data suggest that Wari rule may have contributed to violence. Am J Phys Anthropol 133:941–956, 2007. © 2007 Wiley-Liss, Inc.

Archaic forms of imperialism can adversely or positively affect populations living within an empire's domain, and those effects may vary within and between populations. In particular, periods of imperial domination in peripheral regions may be associated with social and political unrest, partially because of the creation of new political alliances, the extraction of tribute, and a climate of tension with the potential to create or exacerbate violent conflict (Carneiro, 1970; Hassig, 1988; D'Altroy, 1992; Lambert, 1994; Larsen et al., 1996; Earle, 1997) (also see contributors in volume by Ferguson and Whitehead, 1992). Conversely, imperial domination may have had a stabilizing effect as empires asserted authority, quelling tensions and violence in parts of the empire, similar to a *Pax Romana* or *Pax Inkaica* (Earle, 1987, 1991; D'Altroy, 1992; Hastorf, 1993; Macleod, 1998; D'Altroy and Hastorf, 2001). It is also possible that times of imperial rule were not similarly experienced by all segments of a population; one's life conditions may have varied depending on age, sex, and social status, as well as the community's political and economic connections to the imperial power (D'Altroy, 1992; Schreiber, 1992; Hastorf, 1993; D'Altroy, 2002) (also see contributors to volumes by Verano and Ubelaker, 1992; Larsen and Milner, 1994; Larsen, 2001). Given the varied potential strategies and outcomes of imperialism, this Andean case study provides a data point for the debate regarding how imperial expansion may be achieved, and how it may affect the lives of people within an imperial domain. This kind of inquiry requires a bioarchaeology of imperialism; an approach that situates the osteological data firmly in their archaeological context to address issues of anthropological significance (Tung, 2006).

To assess the notion that physical conflict played a role in state expansion, data on settlement patterns, defensible site locations, defensive architecture (e.g., high walls, parapets), and weaponry must be analyzed to elucidate how and to what extent communities were concerned with the issues of defense (Redmond, 1994; Haas, 2001; Walker, 2001; Arkush and Stanish, 2005). However, those data alone do not demonstrate whether violence actually occurred. Skeletal trauma, in contrast, directly illustrates whether a person experienced a violent encounter (Larsen, 1997: 119).

This study documents the frequency and patterning of skeletal trauma among populations that were incorporated into the Wari empire during a period known as the Middle Horizon (AD 600–1000) in the Peruvian Andes. This was a significant time in Andean prehistory because the two earliest states of South America arose nearly simultaneously: Wari and Tiwanaku (Isbell and

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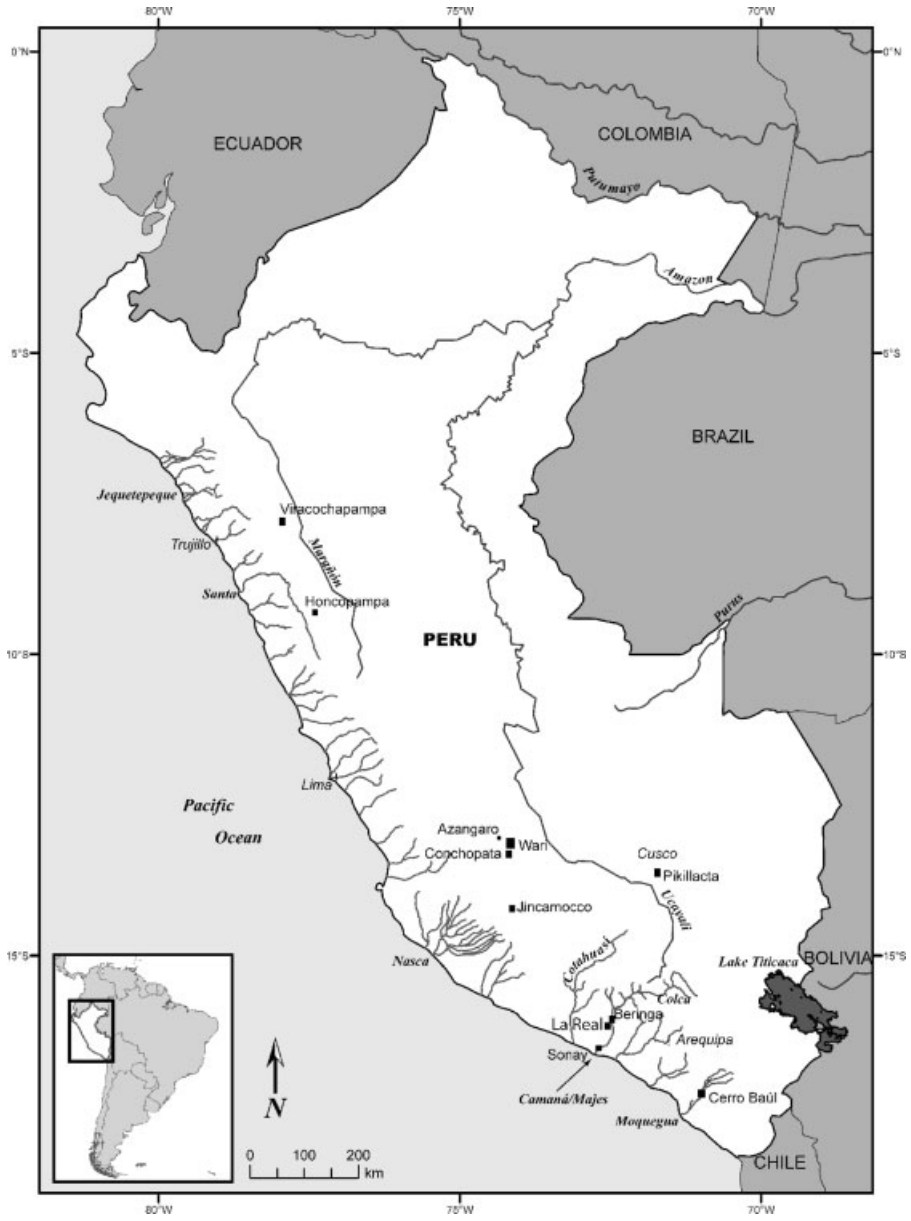

Fig. 1. Map of Peru showing Wari affiliated sites. The skeletal samples derive from Conchopata, Beringa, and La Real.

McEwan, 1991; Schreiber, 1992; Kolata, 1993; Janusek, 2004). Wari developed into an empire, exerting influence over populations in what is now northern and southern Peru, an expanse much larger and diverse than that of the Tiwanaku polity. The expansionist nature of Wari makes it an ideal case study for exploring the role of violence in archaic empires.

Given the expansionist capacity of Wari and the military-related iconography and weaponry, skeletal data are analyzed to test the hypothesis that Wari imperialism was concomitant with higher levels of violence relative to other prehistoric populations in the Andes. Additionally, because certain subgroups may be targeted for violence during periods of imperialism, it is likely that trauma frequencies and wound patterning may differ within and between the skeletal samples. In particular, peripheral populations of the Wari empire may show more skeletal trauma than those in the core because peripheral groups may have been physically subjugated as they were incorporated into the Wari domain. Additionally, as previous studies on trauma have shown, adult males tend to exhibit more head injuries than females, so a similar pattern is expected in these samples (Lahren and Berryman, 1984; Lambert, 1994; Robb, 1997; Verano, 2001; Kellner, 2002; Torres-Rouff and Costa Junqueira, 2006).

The three skeletal samples date to AD 650–800 and include one from the Wari heartland site of Conchopata and two from the southern hinterland sites of Beringa and La Real in the Majes valley (Fig. 1). Because this study provides data on only three skeletal populations affiliated with Wari, the data are necessarily preliminary in providing insights into the relationship between violence and Wari imperialism. Nonetheless, the data illuminate how three Wari communities were affected by violent conflict, providing specific insights into the Wari empire and more general insights into how empires may affect those within their domain, including both the colonizers and the colonized.

TABLE 1. Radiocarbon measurements obtained for this study

Site and sample no.	Lab code	Site provenience	Material	$\delta^{13}C$	^{14}C Age (years BP)	1 sigma range (AD)	2 sigma range (AD)
C-105.01	AA45796	EA105L2095	Wood	−28.2	1245 ± 32	691–855	688–879
B-015	AA45791	U14L1050	Wood	−28.2	1406 ± 53	600–674	540–762
B-013	AA45790	U14L1095	Wood	−22.4	1353 ± 32	651–688	622–767
B-024	Beta-191645	U18L1018	Wood	−24.8	1340 ± 40	654–762	640–774
B-007	AA45789	U21L1075	Carbon	−24.4	1330 ± 31	659–711	651–771
B-021	AA45793	U01L1001	Textile	−23.3	1243 ± 33	692–858	689–879
B-023	AA45794	U11L1011	Textile	−24.1	930 ± 32	1037–1158	1024–1187
B-020	AA45792	U16L1025	Vegetal cord	−8.5	840 ± 42	1163–1256	1044–1278
LR-929.01	Beta-191644	L929	Textile	−17.9	1350 ± 40	650–690	640–760
LR-633.02	Beta-191642	L633	Textile	−15.3	1250 ± 40	700–790	680–880
LR-782.01	Beta-191643	L782	Carbon	−25.4	1220 ± 40	770–880	690–900

C, Conchopata; B, Beringa; LR, La Real.
Human remains associated with samples B-023 and B-020 were excluded from this study because they did not date to the Wari era.

THE ROLE OF VIOLENCE IN ANCIENT EMPIRES

Militarism and the associated threat or actual use of force has often played a key role in the maintenance and expansion of ancient empires (Harris, 1979; Hassig, 1988; Earle, 1997; Webster, 1998; Morrison, 2001). For example, the link between Roman imperial expansion and warfare has been well documented (Harris, 1979; Rich and Shipley, 1993). The rise in militarism for the Roman empire may have resulted from a defensive strategy that stemmed from Rome's fear of being conquered by other groups (Sherwin-White, 1980; Dyson, 1985) or as an aggressive strategy to ensure territory and economic gain (Harris, 1979). The Aztec empire (AD 1427–1521) of Mesoamerica also engaged in warfare (both "real" wars and Flower wars) to conquer neighboring groups, creating a socially valued warrior class in the process (Hassig, 1988), and the Han dynasty (206 BC–AD 220) of China gained supremacy through warfare and maintained it by placing military officers and personnel in distant lands (Hsu, 1965). Similarly, as archaeological and ethnohistorical data reveal, military power was an integral part of Inka imperial expansion in the Andes (AD 1450–1532) (Rowe, 1946; Bauer, 1992; D'Altroy, 1992; Earle, 1997). These examples illustrate some general commonalities between temporally and spatially distinct empires and lead to intriguing expectations about less studied empires, such as the Wari. If empires tend to use violence as a means of expansion and control, at least for some periods of their reign, then skeletal populations associated with times of imperialism should exhibit violence related trauma.

According to Lumbreras (1974), the rise and growth of the Wari empire included militarism and violence, such that Wari conquerors dominated subjects by force. Wari iconography depicting military themes (Ochatoma and Cabrera, 2002), combined with the presence of Wari administrative sites in distant and dispersed locales appear to support this interpretation. In particular, given the provincial administrative sites of Viracochapampa (Topic, 1991) and Honcopampa (Isbell, 1989) in the northern Peruvian Andes, Pikillacta in the central Peruvian Andes (McEwan, 1991), and Cerro Baúl in southern Peru (Moseley et al., 1991; Williams, 2001), it appears that Wari influence was far reaching, at least in geographical terms. This feat may have been accomplished through military means (Lumbreras, 1974; Feldman, 1989; Isbell, 1991), religious indoctrination (Menzel, 1964), economic incentives, a combination of some or all of these, or some other yet unknown method. In particular, skeletal analysis is well suited to evaluate the relationship between violence and imperialism; if the Wari empire used violent means, then evidence for violent injury might be present among Wari affiliated skeletons.

It is also possible that the Wari empire did not use military means to incorporate subject groups. Rather, Wari influence could have intentionally or unintentionally altered social, political, and economic relationships, perhaps creating a climate conducive to violence, either by causing or enhancing indigenous conflict (intraregional violence). This phenomenon, known as the "tribal zone" effect, has been documented among various groups impacted by expanding states (see contributors in Ferguson and Whitehead, 1992). In short, as Wari influence reached new zones, social, political, and economic networks may have been reshuffled, destabilizing regions and creating or exacerbating violence in the process.

ARCHAEOLOGICAL CONTEXT

One of the three skeletal samples derives from the site of Conchopata, the second-most important site in the Wari heartland (Isbell and Cook, 2002). Radiocarbon dates and ceramic associations show that site use began in the latter part of the Early Intermediate Period (i.e., pre-Wari, AD 350–600) and increased in the subsequent Middle Horizon (i.e., time of Wari rule) (Ketteman, 2002 for Conchopata radiocarbon dates and see Table 1 for ^{14}C dates obtained for this study). Wari era site activities included domestic, administrative, and ritual tasks, as well as ceramic production activities and elaborate mortuary rites (Pozzi-Escot, 1991; Cook, 2001; Cook and Benco, 2002; Isbell and Cook, 2002; Cook and Glowacki, 2003; Isbell, 2004; Tung and Cook, 2006). Analysis of Wari era grave goods, iconography, and architecture suggest that Conchopata inhabitants were of relatively high status (e.g., intermediate elites relative to those at the neighboring capital located 10 km away) (Tung and Cook, 2006), though it has been suggested that Conchopata housed royal personages (Isbell, 2001).

The second sample comes from the site of Beringa in southern Peru, where I directed excavations to obtain a sample of contemporaneous skeletons from a Wari hinterland context. Radiocarbon dates show that the site was occupied in the first part of the Middle Horizon (ca. AD 600–800) and again in the initial phase of the Late Intermediate Period (ca. AD 1050–1150) (Table 1 for

TABLE 2. Number of crania observed for trauma in this study

Site	MNI: preWari (Huarpa) period	MNI: Wari period	*Total*
Conchopata	11	27	*38*
Beringa	0	39	*39*
La Real	0	104	*104*
Total	*11*	*170*	*181*

radiocarbon dates). Analysis of the Beringa ceramics corroborates the radiocarbon dates (Owen, 2007). The skeletal data presented in this study include only those from the Middle Horizon. Analysis of artifactual remains suggest that Beringa was home to fisherfolk, agriculturalists, and textile weavers, essentially comprising a community of commoners (Tung, 2003; Gladwell, 2004; Owen, 2007; Tung, 2007). Notably, site location suggests concerns with defense; it is situated atop an alluvial terrace about 50 m above the Majes River, providing excellent views of the north, west, and south parts of the valley. The east side is surrounded by steep, rocky hills that also make site access difficult, though not impossible.

In contrast, the site of La Real, located 8 km downriver from Beringa, was a ceremonial site with a mortuary cave for elite burials, also dating to the Middle Horizon (Table 1). They were interred with more and higher quality Wari goods relative to Beringa, including silver and gold embossed plaques, feathered textiles, and wooden snuff tablets (Márquez and Montoro, 1990; de la Vera Cruz Chávez and Yépez Alvarez, 1995). La Real had no associated settlement (de la Vera Cruz Chávez and Yépez Alvarez, 1995), so it is unknown where the interred persons resided when they were alive; the burial sample could derive from a single village or several villages in the area. Although their residence is unknown, their special burial treatment and associated grave goods suggest that they (or their mourners) belonged to a higher status group relative to those at Beringa. Thus, this study includes comparative trauma data from what has been identified as an elite class (La Real) and a commoner class (Beringa) from the same valley in the southern periphery of the Wari empire. These trauma data are not intended to be representative of all populations in the Wari sphere. Rather, the information on violence among particular groups can illustrate how imperial strategies vary from region to region, depending on imperial goals, indigenous actions and reactions, local environment, and historical precedent, among others.

Weapons have been recovered from all three sites. At Conchopata, there are obsidian and chert points and doughnut-shaped stones (Bencic, 2000); these could have been used in hunting or warfare (Proulx, 2001), but Rowe (1946) argues that hunting was of little importance in the late prehispanic period. Although Conchopata iconography depicts males carrying weapons and wearing armor (Ochatoma and Cabrera, 2002), no wood clubs or textile slings (*hondas*) have yet been recovered, except for a poorly preserved wood artifact interpreted as either a bow (Isbell, 2004) or a weaving implement (Goldstein, unpublished report).[1] The dearth of wood and textile artifacts is likely due to the soil conditions that were not conducive to preservation.

[1]Goldstein DB. 2003. Conservators report to the Conchopata archaeological project. Unpublished report.

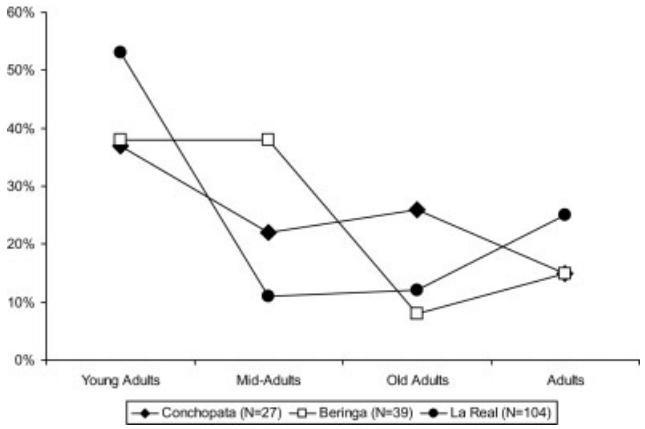

Fig. 2. Percentage of observed crania in each adult age category from all three sites.

In the drier setting of Majes valley, wood clubs, wood clubs with doughnut-shaped stones on the end (maces), slings (*hondas*), and bola stones were recovered from both Beringa (Tung, 2007) and La Real (de la Vera Cruz Chávez and Yépez Alvarez, 1995). While these kinds of weapons could be used for hunting, they could also be used in hand-to-hand combat (Proulx, 2001) that might lead to wounds on the anterior of the skull and parry fractures on the ulna. In particular, the cranial wounds are likely to be round, depression fractures like those observed in other prehispanic Andean skeletal samples (Merbs et al., 1980; Kellner, 2002; Verano, 2003; Torres-Rouff and Costa Junqueira, 2006).

MATERIALS AND METHODS

The current study includes pre-Wari and Wari era individuals from Conchopata, and Wari era individuals from Beringa and La Real. This study excludes analysis of trauma among children, trophy heads (decapitated heads from ritual structures), and poorly preserved crania, so the total number of crania observed equals 181. (Table 2 for sample size at each site).

Age and sex estimations are based on methods outlined by Buikstra and Ubelaker (1994). The age-at-death profile of the observed crania was categorized into Late Adolescent/Young Adult (15–35 years old), Mid-Adult (35–50 years old), Old Adult (50+ years old), and a general category of Adult (15+ years old). Because advanced age can expose a person to more years of risk for trauma, samples with older individuals can bias the sample, leading to higher rates of trauma relative to samples with younger individuals (Glencross and Sawchuk, 2003). Conchopata and Beringa show similar age structures, but La Real differs from those in that more than half of the sample is Young Adults (Fig. 2). Although the La Real sample is not directly comparable to the other two in terms of age structure, documenting the trauma frequency and the patterning of the wounds will still provide crucial insights into the role of violence in the Wari hinterland.

Cranial trauma is observed on individuals 15 years and older, and bone fractures are distinguished as pre- and peri-mortem whenever possible, using evidence for

TABLE 3. Summary of cranial trauma frequencies among males and females for the three Wari era populations in this study

Site	Males affected	Males observed	Male (%)	Females affected	Females observed	Female (%)	Unsexed affected	Unsexed observed	Unsexed (%)	Total affected	Total observed	Total (%)
Conchopata	2	8	25	5	16	31	0	3	0	7	27	26
Beringa	5	10	50	4	13	31	4	16	25	13	39	33
La Real	16	39	41	5	26	19	11	39	28	32	104	31
All sites	*23*	*57*	*40*	*14*	*55*	*25*	*15*	*58*	*26*	*52*	*170*	*31*

TABLE 4. Summary of cranial trauma frequencies for general age categories for the three Wari era populations in this study

Site	Late adol. young adults affected	Late adol. young adults observed	Late adol. young adults (%)	Mid adults affected	Mid adults observed	Mid adults (%)	Old adults affected	Old adults observed	Old adults (%)	Unaged adults affected	Unaged adults observed	Unaged adults (%)	Total (%)
Conchopata	2	10	20	2	6	33	3	7	43	0	4	0	7/27=26
Beringa	2	15	13	6	15	40	2	3	66	6	13	46	13/39=33
La Real	15	55	27	2	11	18	5	12	42	10	26	38	32/104=31
All sites	*19*	*80*	*24*	*10*	*32*	*31*	*10*	*22*	*45*	*16*	*43*	*37*	*52/170=31*

bone healing as the primary criterion for documenting premortem trauma (Lovell, 1997). Radiating fracture lines, taphonomic changes (especially discoloration at the margins), and the "freshness" of the break (i.e., observing for adherent bone fragments or "hinging" at the margins of the fracture) are used to identify perimortem trauma. All examples of perimortem trauma are reported, so other researchers can include or exclude them as necessary for comparisons to other samples.

Cranial trauma that is not randomly distributed may suggest that wounds stemmed from routinized violent encounters (Lambert, 1994; Sauer, 1998; Galloway, 1999a; Walker, 2001). In particular, injuries located on the anterior of the skull may suggest face-to-face fighting (Lambert, 1994; Walker, 1997). Corporal punishment, physical conflict resolution (like that practiced by modern Amazonian groups such as the Yanomami and the Oro-Warí,[2] described below), and ritual battles (akin to *tinku* in the Andes, described below) are also likely to result in a nonrandom distribution of wounds because these violent acts, like warfare, tend to be routinized. However, they often differ from warfare in that they are rarely performed with lethal intent (Lambert, 1994; Orlove, 1994; Bolin, 1998; Conklin, 2001).

Given the importance of wound location for interpreting trauma, wounds are recorded as affecting one of five aspects of the skull: anterior, posterior, superior, left lateral, and right lateral. The 38 observed crania from Conchopata were complete, save for 13 with missing zygomatic arches and nasal bones. Observed crania from Beringa and La Real had at least four of the eight cranial vault portions present (left and right frontal, left and right parietal, left and right temporal, and left and right occipital), though the vast majority were more than half complete (see results for details). Mandibles are excluded because they sometimes could not be associated with their respective crania.

Although many postcranial injuries may result from accidents, parry fractures of the ulna may be indicative of interpersonal violence, demonstrating that a person attempted to parry a blow to the head (Galloway, 1999c). Rib and hand fractures (e.g., "boxer's fractures") are sometimes interpreted as being indicative of interpersonal violence (Angel, 1974; Galloway, 1999b), yet it is recognized that they sometimes result from accidental injuries. Nonetheless, these particular postcranial trauma frequencies are reported in this study as a possible proxy for violent encounters. All ulnae with complete shafts and complete ribs and metacarpals were observed for fractures. Other postcranial trauma data more likely attributable to accidental injury, (e.g., Colles' fractures, broken tibiae, and vertebral compression fractures) are reported elsewhere (Tung, 2003).

When comparing trauma frequencies between two sites or two subgroups (e.g., males vs. females), a Fisher's exact test is used to evaluate if the observations are due to chance, and when three populations are compared, the χ^2 test is used. The P value is reported for all significance tests.

RESULTS

Trauma at Conchopata (Wari heartland)

Among the pre-Wari (Huarpa) sample from Conchopata, one out of 11 complete crania shows a wound (1/11 = 9%). The affected individual was a 45+ year old male with a healed fracture on the left zygomatic. Given the wound location, he may have been struck by a right-handed attacker during a face-to-face conflict. Trauma was absent among the four complete female crania and six unsexed crania. No crania exhibit perimortem fractures.

In the subsequent Wari period, 26% of the adult crania exhibit at least one wound (7/27 = 26%). Nearly one-third of females (5/16 = 31%) and one-quarter of males (2/8 = 25%) are affected; none of the three unsexed skulls show trauma (Table 3). The differences in head trauma between the sexes are not statistically significant ($P = 0.572$, Fisher's exact; $N = 24$).

Given that older adults are exposed to more years of risk for violence (Glencross and Sawchuk, 2003), the age based cranial trauma differences followed an expected pattern: young adults showed less head trauma than middle aged and older adults (Table 4).

[2]The Oro-Warí are a modern population from the southern Brazilian Amazon, not to be confused with the Wari of the Middle Horizon Andes. Although the modern group is typically called Warí, I use the name Oro-Warí, which self-designates the group (Conklin, Pers. Comm., 2006), and makes the distinction more clear.

TABLE 5. Tally of head wounds per adult at the three sites in the study

	1 Head wound	2 Head wounds	3 Head wounds	4 Head wounds	5 Head wounds	6 Head wounds	Total
Conchopata							
No. of adults	4	3	0	0	0	0	*7*
No. of wounds in sample	4	6	0	0	0	0	*10*
Beringa							
No. of adults	10	1	2	0	0	0	*13*
No. of wounds in sample	10	2	6	0	0	0	*18*
La Real							
No. of adults	22	4	3	2	0	1	*32*
No. of wounds in sample	22	8	9	8	0	6	*53*

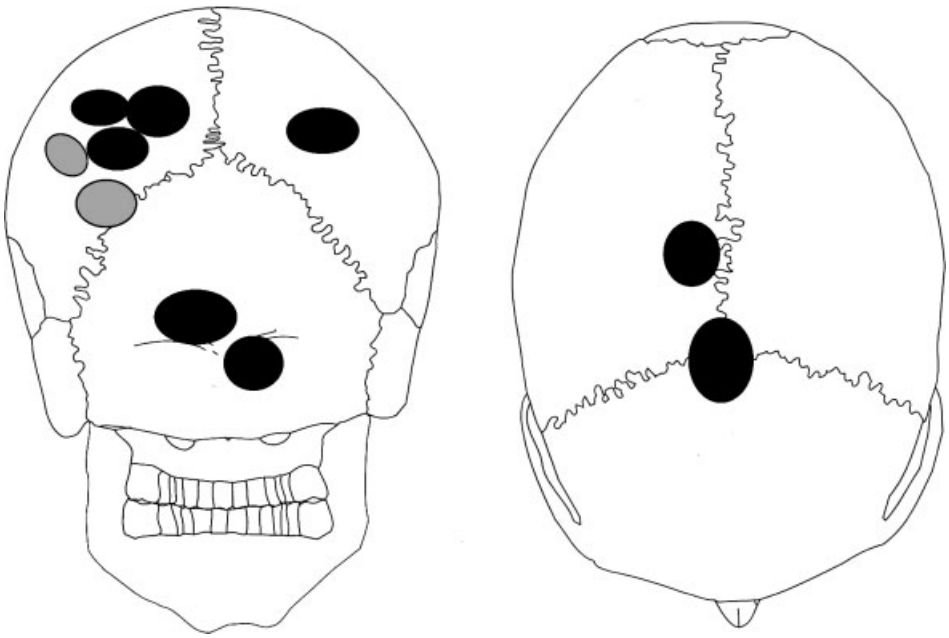

Fig. 3. Wound locations on adult skulls from Conchopata. (Black = female wounds; gray = male wounds).

Among those seven Wari era individuals with head trauma, six exhibit at least one premortem fracture and one (an old female) exhibits a premortem and a perimortem fracture, indicating that she suffered head injuries on two separate occasions. (The perimortem fracture is located near bregma and the healed wound is on the parietal boss.) Of the seven injured adults, two display two well-healed head wounds, so this precluded determining if the injuries were coterminous or sequential. The other four affected adults show well-healed single wounds (Table 5).

Among the 10 total head wounds, eight are on the posterior of the skull (occipital and parietal bosses), and the other two are on the superior (Fig. 3). That 80% of the head wounds are on the posterior suggests that their distribution was not random. Rather, the concentration of wounds suggests specific, almost systematic, physical violence that consistently targeted the posterior of the head relative to other regions. Sex-based comparisons of head wound locations show that both males and females received injuries to the posterior of the skull, while females also exhibit wounds on the superior (Table 6). All cranial wounds are round or oval in shape, as expected given the preponderance of bola stones and maces with round stones in Andean weaponry.

Nine percent of adults ($N = 22$) with at least half of their ribs present show at least one rib fracture. Among 26 adults for which at least half of their metacarpals are observable (176 complete metacarpals in total), three individuals exhibit a healed fracture (i.e., "boxer's fractures") (11.5%). Among 21 left ulnae and 19 right ulnae with a complete shaft, none exhibit a parry fracture.

TABLE 6. Head wound counts for each portion of the skull for sexed and unsexed adults at the three sites in this study

	Anterior	Posterior	Superior	Left lateral	Right lateral	Total no. of head wounds
Conchopata						
Females	0	6	2	0	0	8
Males	0	2	0	0	0	2
Sex?	0	0	0	0	0	0
Total	*0*	*8*	*2*	*0*	*0*	*10*
Beringa						
Females	1	3	0	0	2	6
Males	4	4	0	0	0	8
Sex?	0	4	0	0	0	4
Total	*5*	*11*	*0*	*0*	*2*	*18*
La Real						
Females	1	4	1	0	1	7
Males	17	6	1	3	2	29
Sex?	9	3	1	1	2	16
Total	27	13	3	4	5	52[a]

[a] One La Real head wound was not mapped; for this reason the wound count total in Table 5 differs from that in Table 4.

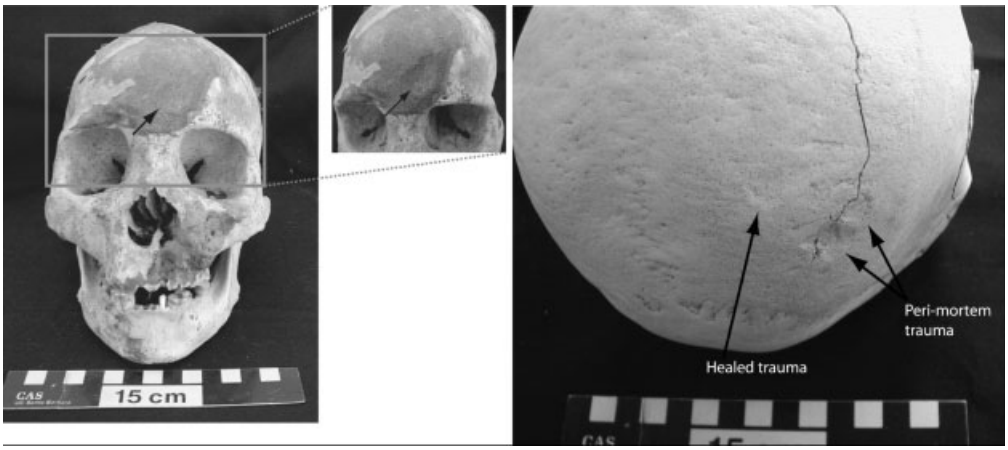

Fig. 4. Healed blunt force trauma on the frontal bone of an adult female from Beringa. Although soft tissue adheres to the surface of the bone, the depression fracture is still visible (left photo). Perimortem and healed trauma on the right parietal of an old adult female from Beringa (right photo).

(Tung, 2003 for a detailed description of postcranial trauma.) There are no penetrating wounds from projectiles in this sample.

Trauma at Beringa (Wari hinterland)

Among 39 crania from the site of Beringa, 13 show at least one head wound (13/39 = 33%). Half of the males (5/10 = 50%) and almost one-third of the females are affected (4/13 = 31%), but the difference is not statistically significant ($P = 0.306$, Fisher's exact; $N = 23$). Four out of 16 unsexed crania display trauma (4/16 = 25%) (Table 3). Age-based differences in head trauma revealed an expected trend whereby young adults exhibited fewer head wounds than both middle aged and old adults (Table 4).

Among those 13 adults with head injuries, nine exhibit complete healing at the fracture sites (69%), three display perimortem injuries (23%), and one shows both a healed and perimortem fracture (8%) (Fig. 4). Given that four of the 13 affected individuals (31%) exhibit a perimortem fracture, it appears that nearly one out of three violent encounters was fatal, suggesting that the attacker may have assaulted the victim with what was probably lethal intent (see Lambert, 1994 for similar interpretations).

Ten of the 13 injured adults show one head wound, and three exhibit more than one (Table 5). Of the three with multiple injuries, one—an old female—received wounds in two separate incidents. In the first, she received a nonlethal blow to the posterior of her skull; this injury healed. In the second, two closely placed strikes fractured the right side of her head, apparently contributing to her death (Fig. 4). The radiating fracture line emanating from the wound site is characteristic of perimortem trauma (Courville, 1962; Ortner, 2003).

There are a total of 18 healed and unhealed cranial fractures among the 13 injured adults, and the majority of the wounds are on the posterior (11/18 = 61%). The next most common site for cranial trauma is the anterior where five wounds are located (5/18 = 28%), followed by the right side with two wounds (2/18 = 11%) (Fig. 5). The left side and superior portion of the skull show no head wounds. (Table 6 for a tally of wounds and their locations.) The shapes of all wounds are round or oval.

Two out of 52 adults (4%) with at least half of their metacarpals present (393 metacarpals in total) exhibit a fracture. Parry fractures are present on two out of 51 left ulnae (4%); one shows an incomplete union and the other a nonunion. The ulna with the nonunion at the fracture site is associated with a radial fracture (Fig. 6). Of the 49 right ulnae, none exhibit a parry fracture. Among the 43 individuals with at least half of their ribs present, 12 exhibit healed rib fractures (28%). Among them, two adults display two broken ribs, and one old adult exhibits three, while the other nine show only one rib fracture.[3] There is no evidence for penetrating wounds on Beringa skeletal remains that dated to the Middle Horizon.

Trauma at La Real (Wari hinterland)

At La Real, 32 out of 104 adult crania with at least half of their cranial vault bones present show at least one head wound (31%) (Fig. 7). Among these crania, 16 out of 39 males (41%) and five out of 26 females (19%) exhibit wounds. These differences are statistically significant at the $P = 0.056$ level (Fisher's exact; $N = 65$), suggesting that men engaged in violent acts significantly more than women. There were 39 adults that could not be sexed, and 11 exhibit cranial trauma (11/39 = 28%) (Table 3). Young adults exhibited a higher frequency of head injuries than middle-aged adults, but less than old adults. Thus, the general trend of increasing cranial trauma with increasing age is not as clear with the La Real burial sample as it is with the Conchopata and Beringa samples (Table 4).

To evaluate the reliability of including partially (at least half) complete crania, the trauma frequency of complete and incomplete crania are reported. Among the 104 La Real crania in this study, 58 are complete, and 17 of

[3]It is possible that these nine adults had more than one rib fracture, but some ribs were missing or were not well enough preserved to observe for fractures, so it is unknown if other ribs were affected.

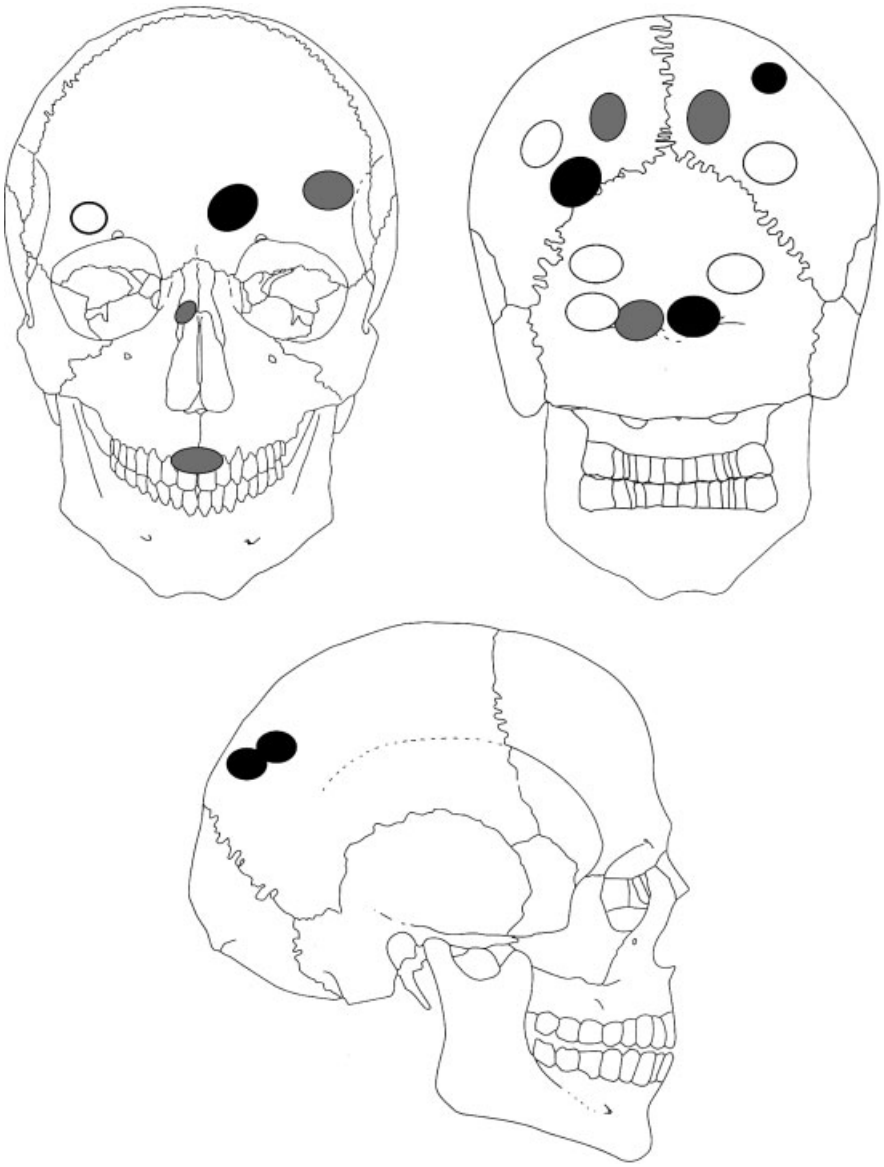

Fig. 5. Wound locations on adult skulls from Beringa, Majes valley. (Black = female wounds; gray = male wounds; white = wounds of unsexed adults).

them show at least one head injury (17/58 = 29.3%). This frequency is not statistically significantly different than the trauma frequency of crania that were at least half complete (15/46 = 32.6%) ($P = 0.440$, Fisher's exact; $N = 104$). Thus, it appears reasonable to maintain the criterion of including crania with at least half of the cranial vault bones present.

Among the 32 individuals with head trauma, 27 exhibit premortem fractures (27/32 = 84.5%) and only three display perimortem fractures (3/32 = 9.5%). Two others display both pre- and perimortem cranial wounds (2/32 = 6%), indicating that they were in two separate violent encounters.

Among the 32 injured adults, 22 have only one head wound, and 10 display more than one, including one with six healed skull fractures. This suggests that nearly one-third of the injured population engaged in conflicts where an opponent could have delivered several blows to the head. Alternatively, they could have been in several violent incidents. Counting the number of head wounds among all injured persons results in a total of 53 cranial wounds (Table 5). If each cranial wound is taken as a case of violence, only five of the 53 cases contributed to the death of the victim. (Five of the cranial wounds are perimortem and 48 are premortem.)

The wounds are not randomly distributed on the skull, but are concentrated on the anterior and posterior. Among the 52 mapped wounds,[4] 27 wounds are on the anterior (27/52 = 52%), 13 wounds are on the posterior (13/52 = 25%), and the remaining 12 wounds (12/52 = 23%) are dispersed among the superior and left and right sides of the head (Fig. 8). Seventy-seven percent of head wounds are concentrated on the anterior and posterior; thus, it appears that violent acts targeted these two portions of the head. Specifically, among the fractures on the anterior of the skull, 70% are on the left and 30% are on the right

[4]Although there are a total of 53 cranial wounds, the location of one wound is unknown because some La Real skeletons were removed for museum display in Arequipa, Peru before data collection was completed.

Fig. 6. Parry fracture that affected the radius and ulna, leading to a non-union on the ulna fracture (top photos). Parry fracture on left ulna with incomplete union (bottom photos). Both are from Beringa.

($N = 27$), suggesting that the majority of frontal wounds were inflicted by a right-handed attacker.

The locational distribution of head wounds differs between the sexes, such that the preponderance of male wounds is on the anterior of the skull, while females exhibit a majority of wounds on the posterior (Fig. 9 and Table 6). Among males, 59% of wounds are on the frontal, 20.5% are on the posterior, and 20.5% are on all other areas combined ($N = 29$ wounds). In contrast, 57% of wounds on females are on the posterior, while the other 53% of wounds are on three other areas ($N = 7$ wounds). For the unsexed crania, 56% are on the anterior, 19% are on the posterior, and the remaining 25% are on the superior and lateral sides ($N = 16$ wounds) (One wound is not mapped, so total equals 52.) All but one of the cranial wounds are round or oval.

Of the 77 well-preserved left ribs representing at least 12 individuals, two adults exhibit healed rib fractures (2/12 = 16.6%); one adult has two broken ribs and the other exhibits one. No boxer's fractures are present on the 30 metacarpals, and among the 34 left ulnae, none showed a parry fracture. There is no evidence for projectile point injuries on any bones from the La Real sample.

DISCUSSION

Comparing trauma frequencies between the sites

Cranial trauma frequencies among the three populations are similar; there is no statistically significant difference ($P = 0.684$; df = 2; $N = 170$). Neither is the Conchopata head wound frequency (7/27 = 26%) statistically significantly different from the combined frequency of the two Majes valley populations (45/143 = 31%) ($P = 0.345$, Fisher's exact; $N = 170$). In short, it appears that individuals in both areas of the Wari empire experienced similar levels of violence.

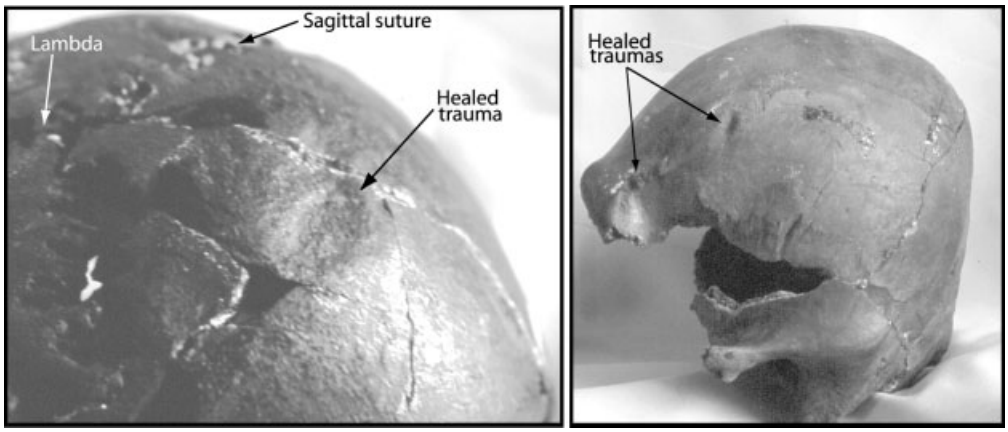

Fig. 7. Healed cranial trauma on two adults from La Real. Left photo: healed wound on right parietal boss. Right photo: two healed wounds on left frontal bone.

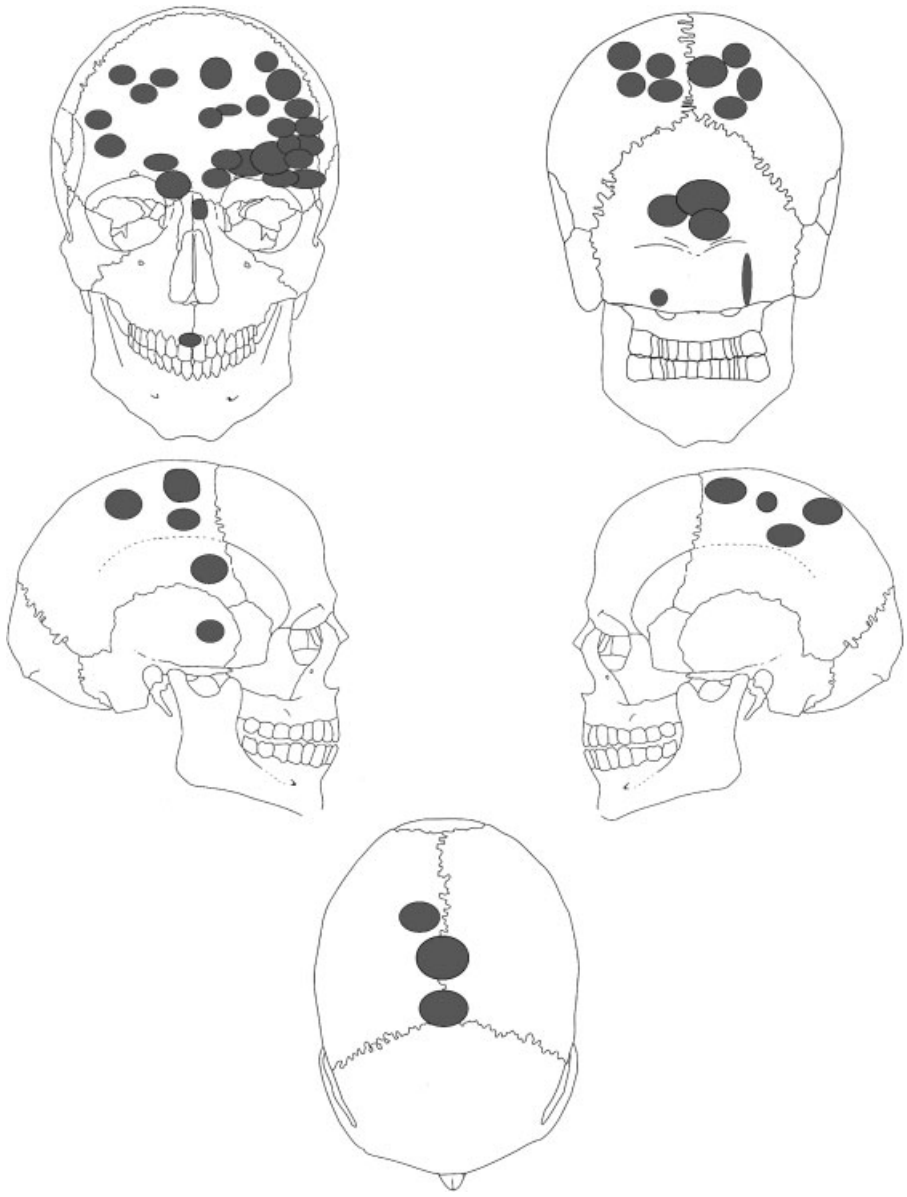

Fig. 8. Wound locations on adult skulls from La Real, Majes valley.

The greater percentage of young adults at La Real (with fewer years exposed to potential violence) did not translate to a lower average trauma frequency relative to the samples with a greater percentage of older adults (with more years exposed to the risks for violence). There was, however, a general pattern of higher cranial

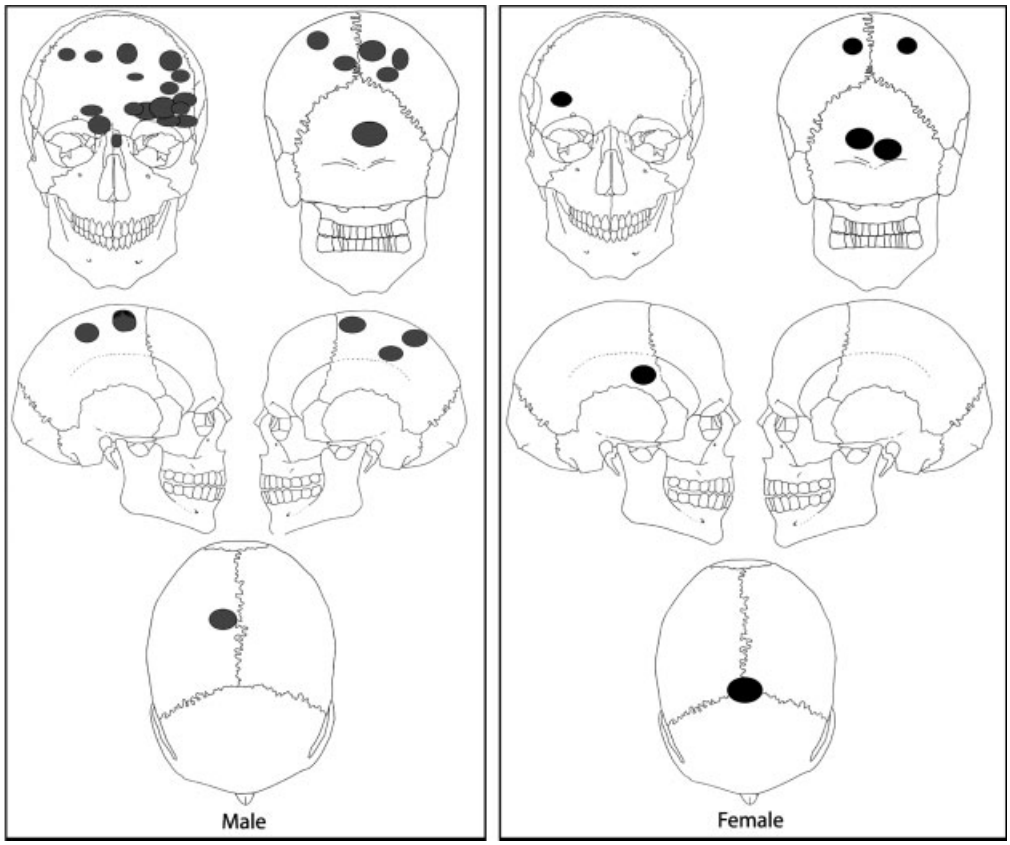

Fig. 9. Wound locations on adult males and females from La Real. Trauma on unsexed individuals not shown.

trauma frequency among old adults relative to young adults in all three burial samples.

Conchopata: Where are the Wari warriors?

A diachronic comparison of cranial trauma at Conchopata shows an increase from 9% to 26% from the pre-Wari to Wari period; however, the difference is not statistically significant ($P = 0.245$, Fisher's exact; $N = 38$). While the Middle Horizon was certainly marked by changes in social and political organization (Isbell and Cook, 2002), the trauma data do not seem to suggest that violence significantly increased with the transition to a centrally administered, expansive state. This is a similar pattern to San Pedro de Atacama populations in Chile that had ties to the contemporaneous Tiwanaku state, where cranial trauma rates slightly increased, though not significantly, from the pre-Tiwanaku to Tiwanaku period (Torres-Rouff and Costa Junqueira, 2006).

Although pre-Wari to Wari era differences in trauma are not significant, it is noteworthy that more than one out of four Conchopata adults suffered a head injury during the time of Wari. This is a statistically significantly higher trauma frequency than that among a contemporaneous Wari affiliated group from the Nasca region of coastal Peru (9%, $N = 97$) (Kellner, 2002) ($P = 0.031$, Fisher's exact; $N = 124$), and statistically significantly higher at the $P = 0.054$ level (Fisher's exact; $N = 119$) relative to the Middle Horizon group from San Pedro de Atacama in Chile (11%, $N = 92$) (Torres-Rouff and Costa Junqueira, 2006).

Conchopata males show no anterior cranial wounds or parry fractures, suggesting that those excavated thus far probably did not engage in physical combat or warfare. If there were male warriors who suffered skeletal trauma during battles, they have not yet been excavated at Conchopata. They may be buried in other parts of the site, in other locales, or they may have died in distant military campaigns, particularly in zones where Wari architecture is present. That males from Conchopata may have died while away is supported by the unequal sex profile, showing significantly more females (62%) than males (38%) relative to an equal distribution (Fisher's exact, $P = 0.0176$; $N = 81$) (Tung 2003). The notion that there were mobile Wari warriors is also supported by iconographic evidence depicting warriors carrying weapons while kneeling on reed boats (Ochatoma and Cabrera, 2002), a mode of transport that was common on the north coast of Peru and the Lake Titicaca Basin in the south, and apparently uncommon in the Ayacucho Basin of the Wari empire. That they traveled to other regions (and perhaps died there) is also supported by strontium isotope data. Some of the male victims that were transformed into Wari trophy heads and deposited in Conchopata ritual structures exhibit nonlocal strontium isotope values, suggesting that they were taken from distant locales, perhaps by Wari warriors (Tung, 2003; Tung and Knudson, nd). It is also possible that the trophy head victims migrated to the Wari heartland on their own. In short, the military iconography, the strontium isotope data, and a sex profile showing significantly fewer males

than females together suggest that some of the male population (possible warriors) may not have been buried at Conchopata or have yet to be excavated from the site.

Raids at Beringa

Adults from Beringa in the Majes valley show high frequencies of posterior wounds, suggesting attacks from behind, perhaps during raids (Webb, 1995). Given that Beringa is in a defensible location, inhabitants may have been concerned about raiding events. The anterior wounds and parry fractures suggest that individuals were also in face-to-face conflicts and attempted to protect themselves from blows to the head. While this could have occurred in organized warfare, the defensible site location and injuries among both men and women—not just men as might be expected in battles of war—suggest that Beringa inhabitants may have been injured during raids by other groups. The notion of "social substitutability" (Kelly, 2000) states that the perpetrators of raids may target any individual from a group—whether man, woman, or child—because either of them can be substitutes or representatives of the "enemy" community.

If raiding did occur, it is difficult to determine if the perpetrators were Wari military agents (interregional violence) or individuals from the local region (intraregional violence). There is no evidence for a Wari administrative center in the middle Majes valley, decreasing the likelihood that there was a strong physical presence by Wari personnel, so the attackers may have been from nearby communities and not the Wari heartland. The possibility that violence was between local groups is similar to the intratribal conflicts that emerged when the Europeans colonized parts of the Caribbean and Amazon. Even in areas where the European colonialists had no direct presence, their regional influence rippled through the region, destabilizing political networks and trade alliances, aggravating, or creating tension between the native communities (Ferguson and Whitehead, 1992). It may be that Wari imperial influence had similar effects.

La Real: Ritual battles (*tinku*) or physical conflict resolution (ritual fights)

The concentration of anterior head wounds among La Real adult males suggests that they often engaged in face-to-face combat that may have been highly routinized and governed by strict rules of engagement. Warfare often has stringent prescriptions, but the nonlethality of the vast majority of wounds requires additional explanations. On the one hand, it is possible that the opponents of La Real men were ineffective war combatants, causing only sublethal head injuries, or that La Real was simply the primary burial locale for those warriors who survived. On the other hand, the nonfatal wounds may have been incurred in nonwarfare contexts, perhaps during ritual battles known ethnographically and ethnohistorically in the Andes as *tinku* (Hartmann, 1972; Gifford et al., 1976; Sallnow, 1987; Allen, 1988; Schultz, 1988; Schuller and Petermann, 1992; Orlove, 1994; Bolin, 1998; Brachetti, 2001; Chacon et al., 2004; Arkush and Stanish, 2005). *Tinku* is a ritual battle in which men (and sometimes women) square off and fight with fists or maces, or they hurl stones at each other with slings, often leading to serious skull fractures (Schuller and Petermann, 1992; Orlove, 1994). The blood spilled in these ritual encounters is viewed as an offering to the earth to ensure bountiful harvests (Allen, 1988; Bolin, 1998; Gifford et al., 1976). The kinds of weapons used in *tinku* have been recovered from both Beringa and La Real.

Physical conflict resolution (i.e., ritual fights) may also explain some of the nonfatal cranial wounds. Among the Yanomamo of Venezuela (Chagnon, 1992) and the Oro-Warí of southern Brazil (Conklin, 2001), men square off giving and receiving hits to the head with wood clubs, often as a means to express and resolve a conflict between two kin groups. As Conklin notes among the Oro-Warí,

> ... serious internal conflicts may be dealt with through ritualized fights ... [that] follow strict rules. Blows can be struck only with *temem* [wood clubs], and opponents are supposed to hit each other only on the head and shoulders. The objective is never to kill, but only to hurt and punish." (2001:40).

The La Real trauma pattern is also similar to that of the prehistoric Chumash from coastal California (Walker, 1989; Lambert, 1994), where skeletons show high frequencies of sublethal anterior head wounds, but little to no parry fractures. Based on those observations, Walker (1989) and Lambert (1994) suggested that they resulted from head clubbings (and some accidental injuries). The dearth of parry fractures among Chumash males led Lambert (1994) to suggest that cultural norms for ritualized club fights meant that men should not block a blow to the head. Importantly, she notes that if physical conflicts were unregulated forms of lethal battles, there should have been more parry fractures (evidence of attempting to deflect hits to the head) (Lambert, 1994:118). Similarly, if La Real men were in lethal battles, there should have been some evidence of protecting one's self from potentially fatal blows. Instead, it may be that La Real males practiced some form of ritualized battles or fights, such as *tinku* or conflict resolution, where they received blows to the skull that they were not supposed to parry. (No shields were recovered from any of the sites.) Participation in either of these physically risky, yet socially visible activities may have increased their social standing, providing some men with the necessary "credentials" for burial at the elite ceremonial and mortuary site of La Real.

Sex-based differences

Sex-based differences in head trauma rates are evident, but only at La Real, where men show significantly more head trauma than women. This, along with the archaeological data revealing their high status, suggests that La Real males may have belonged to something like a warrior class or some group whose status was closely linked to physical prowess. In contrast, the elite females from La Real appear to have been the most protected from violence, as they show the lowest rate of any subgroup at the three sites.

Comparisons to other Andean skeletal populations

While the frequency of trauma in the Majes valley groups is high overall, it is unknown if this represents an increase or decrease from the preceding period (no

TABLE 7. Summary of cranial trauma rates from other skeletal populations in the Andes

Site/region	Time period	Frequency	Reference
Atacama	pre AD 600	5% ($N = 99$)	Torres-Rouff and Costa Junqueira, 2006
Atacama	AD 600–950	11% ($N = 92$)	Torres-Rouff and Costa Junqueira, 2006
Nasca	AD 1–600	8.6% ($N = 81$) (early, middle, and late Nasca combined)	Kellner, 2002
Nasca	AD 600–1000	9.3% ($N = 97$)	Kellner, 2002
Titcaca Basin and Moquegua	AD 550–1000	2% ($N = 191$ parietal vaults)	Blom et al., 2003
Estuquiña	AD 1000–1450	"5.4% exhibited cranial trauma" ($N = ?$) (p.191). Or based on Table 15, 2/208 (1%) external vaults show trauma (p. 185)	Williams, 1990:185, 191
Chiribaya	AD 900–1350	1/99 individuals observed for fractures, but not all have crania, so specific cranial trauma % is unknown (Excludes perimortem trauma.)	Burgess, 1999
Puruchuco-Huaquerones	AD 1400–1532	10% ($N = 190$, includes adults and juveniles	Murphy, 2004
Machu Picchu	AD 1400–1532	3/156 adults, but not all have crania, so specific cranial trauma % is unknown.	Verano, 2003
Peruvian Highlands (8 sites combined)	Various	9.5% ($N = 199$). Percent was based on the four mentioned in text and 15 presented in images and described. Those with trepanation, but no mention of fractures were not included because MacCurdy noted that he could not always identify trauma that preceded trepanation.	MacCurdy, 1923

pre-Wari burials have yet been found in the Majes valley). Nonetheless, given that nearly one in three adults shows at least one head wound, it appears that violence was common in Majes during the time of Wari rule. This is made all the more clear when these trauma rates are compared with other prehispanic groups in the Andes. Skeletal populations from pre-Middle Horizon (before AD 600) and Middle Horizon periods in the San Pedro de Atacama of Chile show cranial trauma rates of 5% ($N = 99$) and 11% ($N = 92$), respectively (Torres-Rouff and Costa Junqueira, 2006). The Atacama head trauma frequencies are significantly lower than that of the Majes valley populations (pre-Middle Horizon Atacama vs. Majes, $P < 0.001$, Fisher's exact, $N = 242$; Middle Horizon Atacama vs. Majes, $P < 0.001$, Fisher's exact, $N = 235$). Cranial trauma is also significantly lower among pre-Wari (8.6%, $N = 81$) and Wari era (9.3%, $N = 97$) skeletal populations from Nasca (Kellner, 2002) (pre-Middle Horizon Nasca vs. Majes, $P < 0.001$, Fisher's exact, $N = 224$; Middle Horizon Nasca vs. Majes, $P < 0.001$, Fisher's exact, $N = 240$).

Kellner (2002) has shown that the Nasca trauma frequency is low for the entire adult population (9.3%), but trauma among particular subgroups is not. Wari-era Nasca males exhibit a trauma frequency of 19.4% ($N = 36$), and among the subset of males buried with Wari goods (known as the Nasca–Chakipampa subgroup), 37.5% ($N = 8$) show trauma (Kellner, 2002). Furthermore, Nasca–Chakipampa male and female head wound frequencies are 37.5% ($N = 8$) and 12.5% ($N = 8$), respectively (Kellner, 2002). This is similar to La Real: males = 41% ($N = 39$) and females = 19% ($N = 26$). The similarities between burial populations with Wari grave goods in Nasca and Majes are extraordinary, especially given their paralleled articulation to the Wari state. It appears that Majes and Nasca populations with close ties to Wari may have suffered similar rates of trauma, and although sample sizes are small, perhaps this pattern reflects some shared experience for those in Wari's southern hinterland, where both the Nasca and Majes valleys are located.

Based on broader comparisons to other ancient groups, the Wari era populations in this study can be qualitatively described as having high levels of cranial trauma. The cranial trauma frequency of this study sample is higher than several other prehispanic Andean groups, where the average is about 11% (Table 7) (and see works by MacCurdy, 1923; Williams, 1990; Burgess, 1999; Kellner, 2002; Blom et al., 2003; Verano, 2003; Murphy, 2004).

CONCLUSION

Cranial trauma was similarly common among the three populations in this study, indicating that the period of Wari imperialism was concomitant with high levels of violence in both the core and the periphery. This also suggests that differential positioning within the Wari empire did not translate into distinct rates of violence. However, the social contexts in which violent encounters occurred may have differed for each community. In particular, the Conchopata trauma pattern among those excavated thus far may suggest that they were not engaged in warfare. At Beringa, the archaeological and skeletal trauma data suggest that this community may have been victim to raids. And adult males from the high status site of La Real appear to have been the most prone to violent acts involving nonlethal frontal assaults. These may have occurred in ritual battles or physical conflict resolutions. The various trauma patterns between the three populations and between males and females exemplify the notion that periods of imperialism are not uniformly experienced by all communities or subgroups within a community.

At a broader level, the skeletal trauma data suggest that Wari influence in the southern hinterlands did little to stabilize this particular region. Instead, it may have upset the balance of power, maintaining or fomenting an atmosphere conducive to violence manifested as raids or the greater need for ritual battles and/or physical conflict resolutions. This could suggest that the Wari empire did little to create a *Pax Wari* in the Majes valley, but does not suggest that this was the effect throughout the entire Wari domain. Rather, this study provides insight into two particular pockets of Wari's realm: the Majes valley in the southern hinterland and a small part of the Wari heartland (Conchopata). The insights from this and other studies may eventually reveal region-specific strat-

egies, actions, and reactions by Wari and the groups that they sought to incorporate.

This case study has illustrated that imperial expansion likely contributed to violence, perhaps having devastating effects on segments of Wari society. This may be mirrored in other cases of ancient imperialism. The commonalities of some imperial processes often lead to similar (intended and unintended) outcomes. But, the unique social and political contexts in which these processes occur also contribute to distinct outcomes for various segments of the ruling and subject populations. A goal of anthropological bioarchaeology should be to document those outcomes and explore the environmental, social, and political factors that contribute to their similarities and differences. This should provide key insights into how the social and political structures of empires can enhance or diminish the well-being of an individual, a family, and a community.

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