Malintent Trauma Among Prehistoric Las Palmas People

J. Eldon Molto

Abstract

The Las Palmas people, ancestral to the historic Pericú of the Baja California Cape Region, have the highest prevalence of malintent skeletal trauma (52.5 percent) of any New World aboriginal population reported in the anthropological literature. The trauma is primarily healed depression fractures of the cranial vault on the frontal bone (45.6 percent), the parietals (41.3 percent) and the occiput (4.3 percent); facial lesions occurred on 10.3 percent of the skulls. The vault wounds are either ellipsoidal or circular and vary in size from 4 mm x 4 mm to 32 mm x 18 mm. The smaller wounds are circular, and the larger ones are ellipsoidal. There is a slight tendency for trauma on the right side. The Las Palmas males have a significantly higher prevalence of trauma. At least two male individuals in the adult infracranial sample (n = 31) had unhealed sharp force trauma to vertebrae, likely caused by atlatl darts. Ethnohistoric literature and ecological circumstances suggest different explanations for traumatic lesions, but intergroup conflict, most likely involving natural resources and polygyny, best fits the skeletal evidence. Pericú polygyny was associated with endemic warfare. The archaeological data provide additional evidence that armed conflict was common among their prehistoric counterparts. The abundant evidence of trauma among the prehistoric Las Palmas people is at variance with the old anthropological theory that conflict and warfare are more characteristic of complex agricultural societies than of foragers.

Introduction

Paleoepidemiology is the scientific study of disease in past human populations. It weds the fields of paleopathology, epidemiology, archaeology, and ecology, and it is the nexus of human health and environment. One aspect of paleoepidemiology that has recently received increased attention is trauma resulting from human conflicts, herein called malintent trauma. (e.g., Walker 1989, 2001; Kilgore et al. 1997; Lovell 1997; Wedel and Galloway 1999; Standen and Arriaza 2000; Jurmain 2001; Glencross and Sawchuk 2002, 2003; Dawson et al. 2003; Judd 2004, 2006; Andrushko et al. 2005; Arkush and Allen 2006; Domett and Talyes 2006; Mitchell 2006; Patrick 2006; Powers 2006; Buzon and Richman 2007; Jiménez et al. 2007; Paine et al. 2007; Tung 2007).

Contemporary literature tends to explain malintent trauma as the result of cultural or ecological factors such as overexploitation of food resources or drought-driven resource stress (Walker 2001; Torres-Rouff and Costa Junquiera 2006). Earlier anthropologists hypothesized that with the advent of agriculture, violent encounters accelerated with the need for land and crop protection, exacerbated by population size and density increases. Conversely, less sedentary, more mobile, hunter-gatherers were thought to be less inclined toward violence. This model has not survived the rigors of modern bioarchaeological research (Walker 2001). Scholars are now coming to believe that ancient human conflict was often the product of competition for resources. The present study provides evidence in support of this newer explanation. The Las Palmas material, however, suggests that it was not scarcity as much as unequal distribution of resources that resulted in chronic conflict.

Background

The present paper examines the prevalence of trauma in a Las Palmas skeletal population from the Cape Region of Baja California Sur, Mexico (Figure 1). When Baja California was first encountered by Europeans in 1533, the Peninsula was inhabited by

hunter-gatherer-fisher societies that anthropologists and archaeologists subsequently grouped into four major linguistic-ethnic-geographic divisions: Yumans in the north; Cochimí in the central zone; Guaycura in the south-central area; and Pericú in the Cape Region, including La Paz Bay (Mathes 1989, 2006). At contact the Pericú also occupied the Islands of San José, Partida, Espíritu Santo, and Cerralvo (Mathes 2006; Fujita 2006). Mathes (1975, 2006) hypothesized that the Pericú were displaced by the Guaycura in the La Paz Bay area during the Historic period.

Although the Baja California Peninsula is categorized as a desert, the Cape Region is diverse ecologically and had the largest precontact population density (Laylander 1987). These foraging peoples were described first by explorers, adventurers, and privateers, then later by missionaries (Mathes 2006). Permanent settlement on peninsular California was problematic; the harsh arid conditions and compromising terrain made agriculture difficult. It was not until 1697, or 164 years after discovery, that the Jesuits established their first mission (Mathes 1989).

Figure 1. The Cape Region of Baja California, with archaeological sites keyed to map numbers.

Ethnocentricism probably contributed to underestimating the richness of the subsistence base in the Baja California Peninsula, particularly in the Cape Region. Also, the perception of limited resources was reinforced by certain resources being concentrated rather than widely dispersed, particularly shellfish and fresh water. A ubiquitous aspect of Native life described in the ethnohistoric accounts was endemic intergroup conflict, particularly between the Pericú and the Guaycura (Mathes 2009, 2011, 2013). Jesuit writings describe intergroup hostilities over water, shellfish, cacti, and women. Early encounters between the Europeans and Native peoples also led to conflict over water resources when the Manila galleons, for example, often stopped at San José del Cabo to replenish their supply of fresh water before sailing to Acapulco.

The accidental discovery of California in 1533 ended abruptly when hostile Indians attacked the Fortún Ximénez naval expedition, forcing them to flee the Bay of La Paz (Mathes 1977:15). Years later, hostilities between the Guaycura, Pericú, and Europeans became inimical to Jesuit missionization goals. The Jesuit mission at Loreto in the central part of the Peninsula followed an earlier failure to establish a base in La Paz because of Native hostility. While European presence escalated historic conflicts in the Cape Region, the skeletal remains of the Las Palmas archaeological culture likewise tell a story of violent encounters.

Anthropological research in Baja California began in the Cape Region in the 1880s with Herman F. C. ten Kate representing the Musée de l'Homme, Paris. His efforts were of limited success because the entire Pericú population had by then been devastated by European diseases (Cook 1937; see also Mathes 2005). Ten Kate and a colleague, Lyman Belding,

recovered several skeletons from the region's caves and informed the anthropological world of the unusual Pericú cranial morphology (hyperdolichocranic) and mortuary customs (ten Kate 1884; Belding 1885).[1] It was not until the late 1940s that modern archaeology was conducted in the Cape Region when William C. Massey (1955, 1966) studied the material culture of the prehistoric and protohistoric Pericú. Massey's Las Palmas culture was named after the bay where he found and excavated the first undisturbed burial caves (Figure 1) in the East Cape Region, Cañada de la Huertita (BC 111) and Piedra Gorda (BC 114). These two caves and a third location, Cabo Pulmo (75 BC), are the only intact Las Palmas sites excavated to date, although at least 21 others have yielded Las Palmas remains (Fujita 2006; Raab and Boxt 2007). Of these, 14 are incorporated into this study (Figure 1). Although Las Palmas skeletal remains are well preserved, completeness of the skeletons is inconsistent because most were secondary burials (Carmean and Molto 1991; Molto 2005; Rosales-López et al. 2007) and because many specimens were recovered by non-archaeologists who were selectively biased towards crania at the expense of postcranial elements (Laylander 1987).

Material and Methods

Over 100 Las Palmas skeletons have been recovered (Molto 2005). The majority of these date from ca. AD 1000–1500, but a few could belong within the early Historic period (Stewart et al. 1998). The present study sample includes 51 adult crania, 31 infracranial[2] adult skeletons, and 15 subadult skeletons. The analysis does not include hand bones due to their underrepresentation in the Las Palmas sample. Analysis of cranial lesions follows Walker (1989); each lesion was measured twice with sliding calipers, and lesions with clear evidence of infection were excluded (Molto and Fujita 1995). Blunt force cranial depression fractures were classified as either circular or ellipsoidal (Walker 1989). Circular lesions were defined as those where the difference between the two largest dimensions was 3 mm or less, and ellipsoidal lesions were those whose dimensions exceeded 3 mm. Lesion size was arbitrarily divided into large (at least one measurement was > 10 mm) and small (both measurements were < 10 mm). Lesions were further classified as healed or unhealed; for unhealed lesions no statements on cause of death are advanced. Figures 2–11 illustrate the characteristics and size ranges of the trauma found on the Las Palmas crania, while Figures 12–15 refer to postcranial elements.

As only 26 skeletons could be assessed for sex using os pubis criteria (Phenice 1969), sex determination was based on skull robusticity (brow ridge, mastoid process, supramastoidal crest, inion, facial tubercles) and size (cranial module).[3] Analysis of the best preserved Las Palmas skeletons with archaeological context (Carmean and Molto 1991) allowed for development of a dental attrition standard relative to bone age (Ubelaker 1991) as a means of estimating chronological age at death. Skulls with no teeth (n = 5) were classified only as "adult" because the sutural synostosis method of age estimation is not reliable.

Osteological Analysis

Table 1 summarizes the prevalence of trauma in Las Palmas males versus females. Noteworthy is the extremely high overall prevalence of trauma (53 percent) in the Las Palmas population sample. Male versus female trauma data are 59.1 percent versus 33.3 percent, which is obviously statistically significant.[4]

In both sexes skull lesions are by far the most common (61.1 percent in males and 26.7 percent in females). The low prevalence of facial lesions, 9.3 percent in males and 8.3 percent in females, is surprising given the high rate of cranial vault trauma. Of note is that all the facial lesions were restricted to the nasal region, and of the four individuals with nasal fractures, two also had healed vault depression

Table 1. Summary of Las Palmas Trauma.

	Male				Female				Total Adult		
Area	**P**	**N**	**% with trauma**		**P**	**N**	**% with trauma**		**P**	**N**	**% with trauma**
Cranium	21	36	55.3		4	15	26.7		25	51	49
Face	3	27	9.3		1	12	8.3		4	39	10.3
Total Skull	22	36	61.1		4	15	26.7		26	51	51
Infracranial	4	21	19		1	10	10		5	31	16.1
Total Skeleton	26	44	59.1		5	15	33.3		31	59	52.5

Note: P = Individuals with trauma; N = cohort size.

fractures (Figure 2). Multiple fractures occur on 50 percent of female skulls (2/4) and 42.9 percent (9/21) of male skulls. Both of these female skulls have two depression fractures, while the distribution of multiple lesions in the males is 44.4 percent (4/9) with two lesions (Figures 8–10), 22.2 percent (2/9) with three lesions, and 33.3 percent (3/9) with four lesions. When all lesions are healed (see Figures 3 and 4), it is not possible to determine if they were from a single event. In one case, however, Skull 19759, a male in his early 20s, there were two healed depression fractures on the right parietal and two large unhealed ellipsoidal fractures on the posterior parietals (Figure 5). Unhealed cranial fractures are uncommon, however, occurring on two of the 21 (9.5 percent) male skulls with wounds (Figures 6–10). Three of the unhealed lesions were on the parietals, and one was on the occiput. All frontal fractures were healed. Also noteworthy is that of the four males with infracranial traumatic lesions, two were unhealed (Figures 12 and 13). Moreover, these four males all had sharp force trauma wounds, and none displayed skull trauma. Three of the four individuals (Figures 12–14) also have wounds in the back, suggesting that they may have been ambushed or hit while fleeing. The lone female (sex determined by pelvic data) with infracranial trauma had a long-healed Parry fracture of her ulna, possibly a defense wound (Kilgore et al 1997; Wedel and Galloway 1999). Infracranial trauma (19 percent in males and 10 percent in females) is notably less than cranial trauma.

None of the 15 subadults (≤15 years) had evidence of trauma (Table 2). At least two late adolescent males (included with young adults) had evidence of trauma, and one may have died from wounds received in

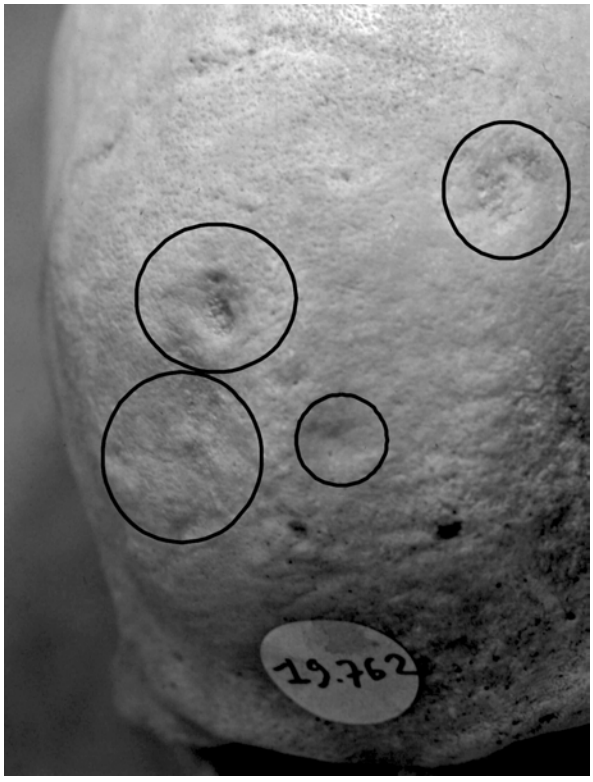

Figure 2. Frontal bone of Burial 19762 from El Pescadero on the East Cape, a male likely in his late 20s, with four healed depression factures circled. The smallest measures 7 mm x 7 mm, the largest 23 mm x 20 mm. Whether all occurred simultaneously is unknown.

Figure 3. Healed depression fracture of the posterior left parietal of a Las Palmas male, Burial 19758 from El Pescadero, estimated to be in his mid-30s. The wound measures 27 mm x 18 mm. Although classified as elliptical, it has a curvilinear shape with its deepest penetration on one side. Skull traumas occur in 17.4 percent on the left parietal bone. Trauma to the parietals is slightly lower (41.3 percent) than frontal trauma (41 percent).

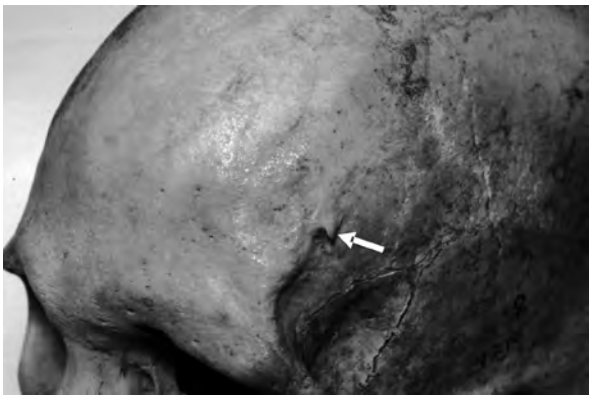

Figure 4. Well-healed depression fracture of the left lateral frontal bone of Burial 7219, a male in his mid-30s from the Piedra Gorda site. This elliptical or elongated fracture measures 17 mm (sagittal) and 9 mm (coronal) and resulted in the displacement of a bone fragment or a developmental exostosis on the margin of the superior temporal line (arrow). Of the Las Palmas skull fractures 21.7 percent occur on the left frontal region. All frontal fractures and facial fractures were healed.

Figure 5. Posterior view of Cranium 19759, a young adult male (20-25 years) from the Punta Pescadero area on Las Palmas Bay. This individual has two unhealed depression fractures of the right (A) and left (B) posterior parietals. The right lesion (elliptical) measures 33 mm x 18 mm. The left lesion measures 17 mm x 13 mm and is elliptical, although it has a straight distinct super border. This individual also had two circular healed lesions (9 mm x 10 mm and 5 x 5 mm), of the anterior portion of the right parietal, obviously from a separate and earlier traumatic event.

Figure 6. Anterior view or La Mantancita Skull 2 (male, in his 40s), showing a long-healed curvilinear fracture of both nasal bones. Facial-nasal fractures are present in 9.3 percent of male skulls and 8.3 percent of female skulls in the Las Palmas sample.

Table 2. Las Palmas Trauma by Age and Sex.

	Male				Female				Total		
Age	**P**	**N**	**% with trauma**		**P**	**N**	**% with trauma**		**P**	**N**	**% with trauma**
< 18	–	–	–		–	–	–		0	15	0
18–35	12	26	46.2		3	10	30.0		15	36	41.6
35+	14	18	77.7		2	5	40.0		16	23	69.6

Note: P = Individuals with trauma; N = cohort size.

Figure 7. La Mantancita Skull 2, superior view. Two well-healed, vault depression fractures.

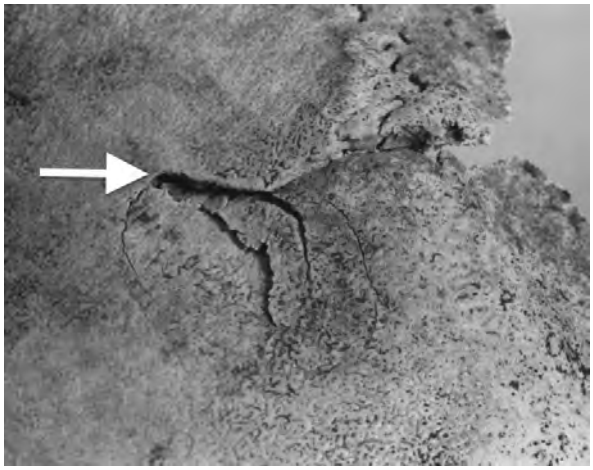

Figure 9. Agua Amarga site, Burial 7199. Unhealed depression fracture (21 mm x 11 mm) on the anterior right parietal near the sagittal suture.

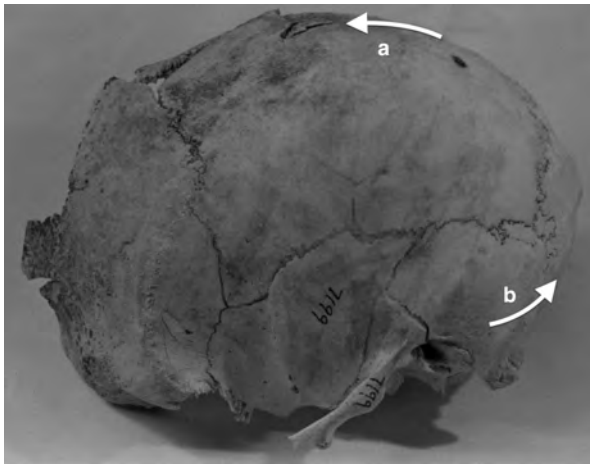

Figure 8. Agua Amarga site skull, Burial 7199 (ca. 40-year-old male). Left lateral view showing unhealed lesions. Lesions a and b are enlarged in Figures 9 and 10, respectively.

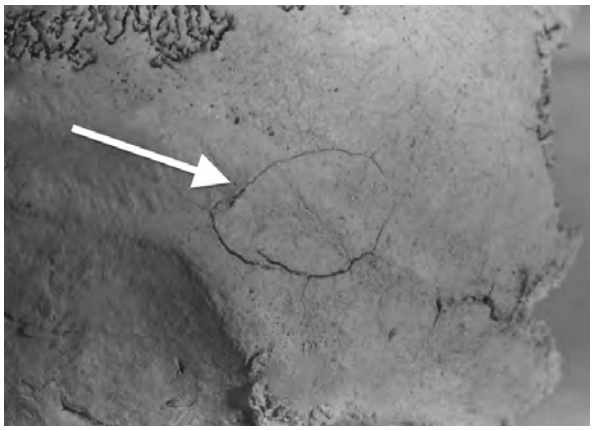

Figure 10. Agua Amarga site, Burial 7199. Unhealed depression fracture (7.5 mm x 11.1 mm) on the occiput and slightly left and superior to the inion.

conflict (Figure 13). The adult data are divided into young (18 to 35) and older adults (35+). Table 2 shows that in both sexes, particularly the males, the prevalence of trauma is higher in the older adults. These data are expected given the high overall prevalence of trauma in Las Palmas skeletons and the fact that fractures occurring in young adults will also be present in individuals when they are older. While it is highly probable that the risk of fractures would be greatest in younger males (Figures 6, 7, and 13), at least two adult males, estimated to be in their late 30s to early 40s, had wounds occurring just prior to death (Figures 8–10 and 14). Older adults also had a much higher prevalence of multiple lesions, again supporting the hypothesis that these accumulate with increasing age.

Figure 11 shows the distribution of traumatic lesions on the skull, while Table 3 summarizes their sizes and

Table 3. Distribution and Characterization of Traumatic Lesions on Las Palmas Skulls.

	Male				Female				Total	
	No. (%)	**% Healed**	**Size Range (mm)**		**No. (%)**	**% Healed**	**Size Range (mm)**		**No. (%)**	**% Healed**
R. Frontal	9 (23.1)	–	7 x 3 to 24 x 20		2 (28.6)	–	–		11 (23.9)	–
L. Frontal	7 (17.9)	–	5 x 5 to 17 x 9		3(42.9)	–	–		10 (21.7)	–
Total Frontal	16 (41.0)	100	5 x 5 to 24.3		5 (71.4)	100	4 x 4 - 25 x 17		21 (45.6)	100
R. Parietal	10 (25.6)	–	4 x 4 to 33 x 18		1 (14.3)	–	–		11 (23.9)	–
L. Parietal	8 (20.5)	–	9 x 7 to 27 x 18		0 (0)	–	–		8 (17.4)	–
Total Parietal	18 (46.2)	83.3	4 x 4 to 33 x 18		1 (14.3)	100	7 x 6		19 (41.3)	84.2
Occiput	2 (5.1)	50	8 x 5 to 15 x 8		0 (0)	–	–		2 (4.3)	50
Face (nose)	3 (7.7)	100	–		1(14.3)	100	–		4 (8.7)	100

Note: No. = number of traumatic lesions; % = percentage of distribution of traumatiic lesions.

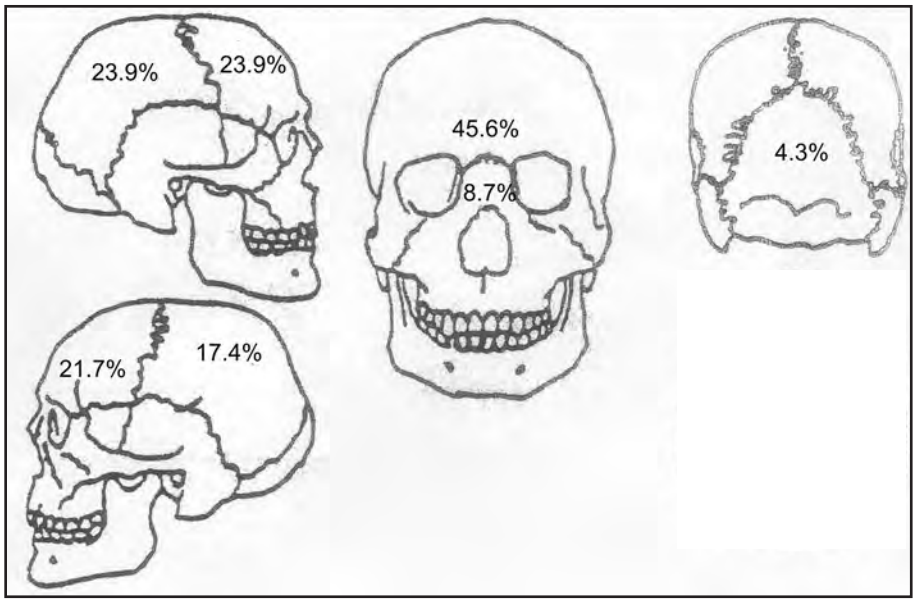

Figure 11. Relative frequencies of trauma in the Las Palmas sample by part of skull.

characterizations. The fractures predominate on the frontal and parietals (respectively, 45.6 percent and 41.3 percent). There is a slight tendency for the lesions to occur on the right versus the left side (47.8 percent to 39.1 percent). This difference, however, may be somewhat inflated because there were many lesions on the frontal that were difficult to classify as to side (e.g., those overlapping the midline). In the female skulls the trauma is more common on the frontal bone (5/6 = 83.3 percent), but the small sample size makes any conclusions presumptive at best. Also, as noted previously, all frontal bone lesions were healed. Though it is difficult and somewhat arbitrary to classify the shape of the vault lesions, there is a slightly higher prevalence (22/42 = 52.4 percent) of the ellipsoidal type. Of the 19 ellipsoidal lesions in males, 84.2 percent are large, whereas of the 17 circular lesions, 14 (82.4 percent) are small.

In the females one of the three ellipsoidal lesions was large; overall, three of the six lesions were classified as small, and all were circular. While the differentiation between ellipsoidal and circular is obviously arbitrary and biased toward small lesions being circular, these may be significant when evaluating which ethnohistoric weapons might have been employed against the prehistoric people represented by the study skeletons.

Table 4 summarizes the comparative data on malintent cranial trauma from selected New World populations. Skulls are emphasized because they more often show trauma (Walker 1989). Littoral, marine-adapted, hunter-gatherer-fisher populations such as the Pericú, the Channel Island populations of southern California (Walker 1989), and the Chinchorro of northern Chile (Standen and Arriaza 2000) have very high rates of malintent trauma. The Las Palmas population has the highest overall rate of malintent trauma recorded in the New World. Only the Middle Horizon-Late Intermediate skeletal population of San Pedro de Atacama in Peru has comparable rates (Torres-Rouff and Costa Junquieira 2006), which are somewhat higher for females (31/85 = 36.3 percent) than the Las Palmas data (33 percent). In the Torres-Rouff and Costa Junquieira study, the oasis population was experiencing stressful periods of drought and cultural factors that might have accounted for the increase in violence. Population samples from before and after the Middle Horizon-Late Intermediate period had very low rates of trauma even though sedentism and horticulture were well established.

Ethnohistoric Comparisons and Interpretations

Lovell (1997:164–165) notes that in order to properly interpret causes of trauma, three things must be considered: "1) the specific characteristics of each fracture; 2) the skeletal pattern of trauma in the individual and the population; and 3) the social, cultural historical and/or environmental context of the human remains, including the presence of artifacts." In the Las Palmas skeletons, healed "nonlethal" depression fractures of the cranial vault predominate, with facial and infracranial lesions being much less common. Most infracranial lesions are associated with males, representing sharp force trauma from atlatl darts or, less likely, spears and arrows. At least two of the four wounds had limited healing and may have been associated with the cause of death, although wounds in other parts of the body could have been the primary source of mortality. These skeletal wounds are unequivocally indicative of malintent trauma, most likely from intergroup violence. The cranial vault wounds are similarly indicative of malintent trauma, although some of the smaller circular wounds could have resulted from accidents such as falls, etc. (Lovell 1997). An alternative explanation for cranial trauma advanced by Tyson (1977), who quotes Clavigero, is self-mutilation by women following the loss of a loved one:

> If the patient, after being aided in this way by the guama and his relatives, finally ended by dying, then the weeping was greater and the

Table 4. Comparative Cranial Trauma Prevalence Among Select Prehistoric New World Indian Populations.

Geographic Area, Site(s)	Reference	Subsistence Strategy	Male No. (P) %	Female No. (P) %	Total No. (P)	Total %
Baja California, Cape Region	this study	HGF	22 (36) 61.1	4 (15) 26.7	26 (51)	51
S. California, Channel Islands	Walker (1989)	HGF	75 (234) 32.1	33 (319) 10.3	144 (744)	19.3
Chile, Chinchorro	Standen and Arriaza (2000)	HGF	13(38) 34.2	4 (31) 12.9	17 (69)	24.6
California, Central Valley	Newman (1957)	HG	–	–	3 (140)	2.14
Central California	Jurmain (2001)	HG	4 (no P given)	3 (no P given)	7 (159)	4.40
New Mexico, Paa-ko-Pueblo	Ferguson (1980)	Hort., H	–	–	3 (121)	2.5
New Mexico, Pecos Pueblo	Hooton (1930)	Hort., H	–	–	18 (518)	3.4
Colorado, Wetherill Mesa	Miles (1975)	Hort., H	–	–	9 (179)	0
New Mexico, Pueblo Bonito and Pueblo Hawiku	Stewart and Quade (1969)	Hort., H	6 (67) 9.0	6 (103) 5.8	12 (170)	7.1
Kentucky, Indian Knoll	Snow (1948)	HGF	23 (263) 8.7	6 (189) 3.2	29 (452)	6.4
Ohio, Libben site	Lovejoy and Heiple (1981)	HGF	–	–	2 (102)	2
Chile, San Pedro de Atacama	Torres-Rouff and Costa Junqueira (2006)	Pastoralism	31 (85) 36.3	31 (85) 36.3	62 (192)	32.3

Note: No. = number with trauma; P = cohort size; % = percentage with trauma; HGF = hunter-gatherer-fisher; HG = hunter-gatherer; Hort. = horticulture; H = hunting.

> crisis louder, especially among the Guiacura women, who were accustomed to strike their heads furiously. It was necessary for the missionaries to exercise particular vigilance in order to prevent these barbarous demonstrations of grief, which the Indian women did not give up even after they were baptized [Clavigero 1937:113].

Tyson (1977:57) mentions several ethnohistoric accounts of self-mutilation, mostly involving women, concluding that "whether or not any of the scars on the skulls of the Baja California skeletal remains are the result of self-inflicted wounds will probably never be known." Her study, however, involved only cranial analysis. The pattern of skeletal pathology described herein, with the infracranial wounds clearly being made by penetrating weapons, supports the opposite hypothesis that the majority of wounds resulted from chronic intergroup hostility. Moreover, many of the larger cranial ellipsoidal wounds and the parietal wound patterns, which are as common as frontal ones, are very difficult to reconcile with self-infliction.

The ethnohistoric accounts, beginning with the original European landing in La Paz in 1533, include abundant mentions of intergroup hostilities among Native Baja Californians. These accounts leave little doubt that warfare was endemic on the Baja California Peninsula, particularly in the Cape Region (Mathes 2011). One early authority wrote:

> Thus it has been seen, principally in the rancherías of the south, that many of them have been declining through mutual hatred and revenge. Those of Loreto [Cochimí] and north also had them, but not to such excess [Venegas (1979:96–98].

Figure 12. Sharp force trauma from a projectile (atlatl dart?) penetrating the spinal chord through the right transverse process of the 10th thoracic vertebrae of an adult (40 ± 5 years) Las Palmas male (Burial 7192) from the Cabo Pulmo site. The slight osteoblastic response indicated that this individual lived less than two weeks after being wounded and may have succumbed to infection involving cerebospinal fluid since the point penetrated deeply into the spinal chord.

The same author described Pericú conflicts and their motives:

> The motives of these dissentions could not be for domination and possession of land; they were ordinarily to revenge damage done by one individual to others, or more frequently when some went to fish or collect fruit where they were most accustomed and had rights over the others. The method of revenge was for the offended person to make a threat to the offender, and if it could not be made on his person, to do so on one of his relatives or persons of his ranchería. From this point all took the cause to be their own and if they did not think they were enough, they called for aid from the rancherías that were their friends to go against the enemy together. The method of declaring war was, with great noise, to gather a large supply of cane and flints for their arrows, and seek that, by various trails, that their actions would reach the ears of

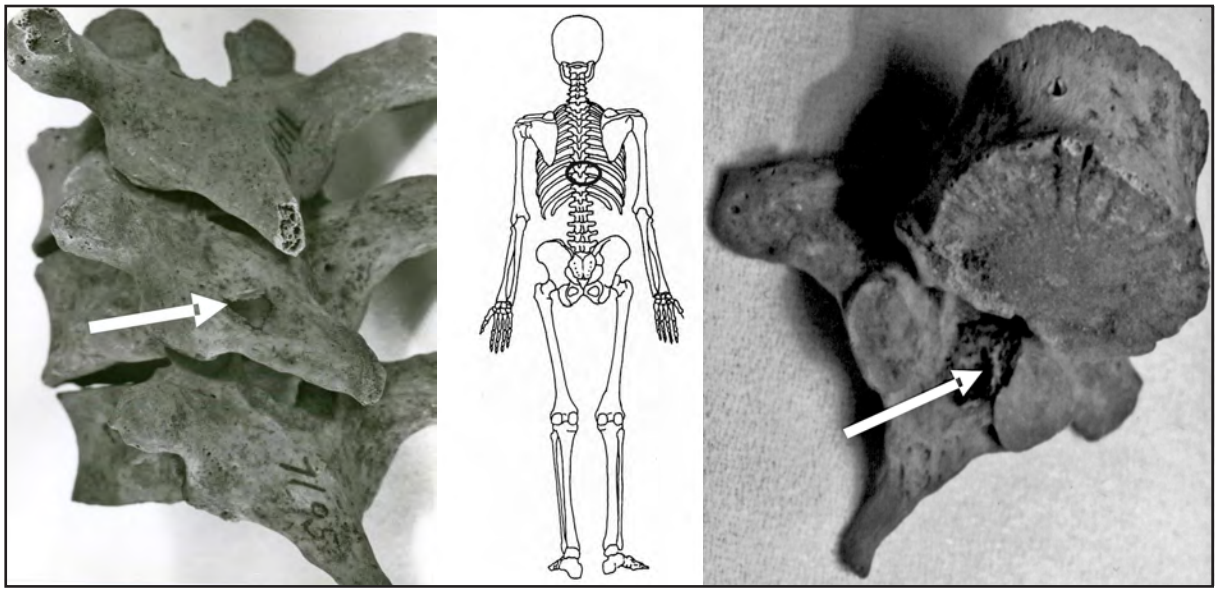

Figure 13. Sharp force trauma (white arrows) to the left laminal plate of the neural arch of T9 in Burial 7195b from the Cabo Pulmo site. This late adolescent male (age based on unfused annular rings) was likely in retreat when he was struck by an atlatl dart. Limited healing suggests that this individual did not survive.

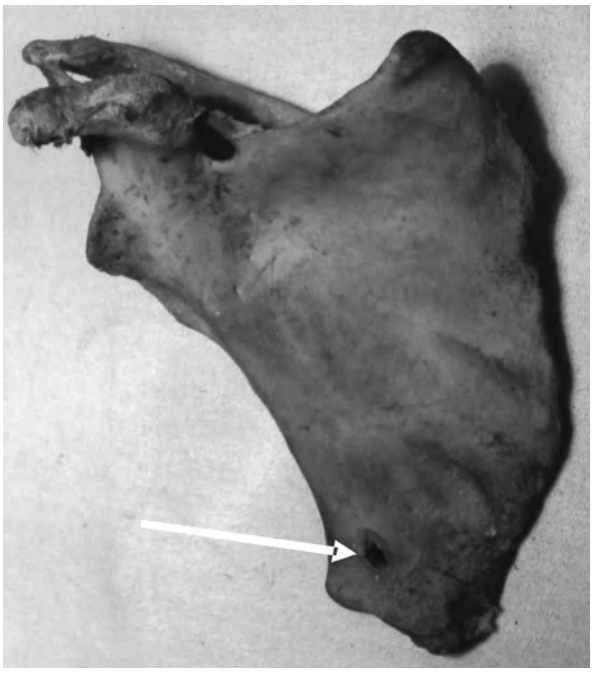

Figure 14. Anterior view of sharp force trauma (white arrow) to the right inferior scapula of an adult (mid-30s). Las Palmas male (Burial 7227) from the Piedra Gorda site. This healed circular wound was likely caused by an atlatl dart.

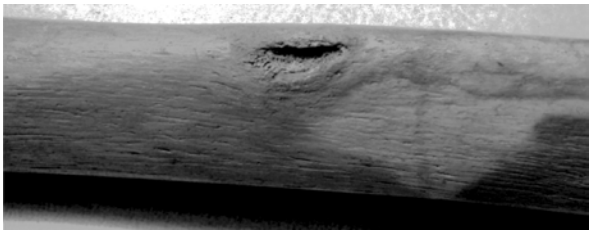

Figure 15. Sharp force trauma to the anterior border of the left tibia in a young adult (mid-20s) male from the Cabo Pulmo site (Burial 7190); the wound measures 14 mm x 5 mm and penetrates approximately 3 mm into the cortical bone. Such a wound could have been from a stone-tipped arrow. Extensive osteoblastic activity indicates healing prior to the time of death.

> their enemy, attempting to intimidate them to defeat them. When the decisive encounter of the battle arrived, they presented themselves as a confusing troop, with great shouting and yelling, without any form of military order. Thus they confronted one another in disorderly platoons until they came within arrow shot, and then the fight began. They only kept some order in moving the squads around to the front of the army, when the first retired, because of exhaustion or due to a lack of arrows. The latter were made of cane, with pointed stones as a point, but they did not poison them, nor there known to be found in all the land, a poisonous plant that could serve such a purpose. When they closed in combat they used to close in some short lances or darts of branches, with the points sharpened and fire hardened, which at times had no less effect nor were less certain than steel. Finally won, not by those who had more skill or more force but by those who remained stronger against their own fear or were able to instill it in the enemy. Thus grew and became general the rancor, the prejudices, and the wars, and as each occurred, one or the other declined with reciprocal deaths [Venegas 1979:I, 80–81].

Clearly, the ethnohistoric documents favor the idea that a key cause of warfare in the Cape Region was conflict over resources in this harsh environment. I disagree with the hypothesis that competition could not be for the domination and possession of land. In my opinion any such assertion is a biased, western interpretation of land ownership and a misunderstanding of the resources that foraging peoples, like the Pericú, exploited over the millennia. European attempts to colonize the Baja California peninsula after 1533 failed mainly because the soils and rainfall were not conducive to western agriculture, not because of limited resources per se. I believe that it was not a limitation of resources in the Cape Region but their distribution that was fundamental to Pericú concepts of land ownership and protection. Freshwater, shellfish collecting areas, concentrations of cacti, terrestrial animals, marine fish, and marine mammals could and did support a relatively large hunter-gatherer-fisher

population in the Cape Region (Laylander 1987). Protecting key water and shellfish resource areas was essential to the survival of Native populations, and Pericú rancherías cooperated in the defense of such areas. Fujita (2006) noted the richness of La Paz Bay with its protected harbor and abundant shellfish and other marine resources, while Mathes (1975, 1989) reported that the same area was continually contested by the Pericú and the Guaycura. Interestingly, in 1633 Europeans joined the Pericú from La Paz as allies on a small military campaign into Guaycura country, helping to defeat them in battle.

Military action with their Pericú allies against the Guaycura and other agonistic encounters with all peninsular Native peoples gave the Europeans first-hand familiarity with their weaponry and tactics: "The method and custom of fighting these Guaycura Indians is with a dart and arrow, and by surprise when their opponent is sleeping they attack in the early morning at dawn, and after the skirmish they retire to the bush and to the west coast" (Ortega 1992:243). The infracranial injuries described herein (Figures 12–15) are clear evidence of dart wounds. Two Las Palmas sites, La Matancita and Cabo Pulmo, each contained four atlatls associated with male burials (Molto and Fujita 1995). Why Pericú skulls do not bear witness to similar weaponry is curious because the documents indicate all groups of the peninsula shot arrows en masse during battle (Mathes 2011:4). Other accounts indicate that weapons not only included bows and arrows and atlatls and darts, but rocks. Pericú ethnohistory notes rocks being thrown rather than slung, although a form of sling was used by the Cochimí (Venegas 1979). Pericú skull trauma could possibly have been made by rocks or perishable clubs, although the latter are neither described among the Pericú nor found in their mortuary features or habitation sites.

Among the Chinchorro people of northern Peru, similar healed depression fractures of the anterior vault are attributed by Standen and Arriaza (2000) to injuries from small rocks thrown by hand. Walker (1989), however, interprets similar frontal-parietal wounds as possibly indicating a ritualistic pattern where the intent was to injure, not kill. Among the southern Baja California populations, the ethnohistoric accounts indicate that mortality was common during raids such as the one described by Ortega at La Paz in 1633: "On 2nd of December … Guaycuras surprised and attacked them. The said Conichí, his wife, and a son of two years who was baptized were killed, along with 30 persons including women and children" (Ortega 1992:241). Clearly warfare in the Cape Region was not ritualistic, and such ritualistic behavior is not documented in historical records.

Walker (1989) also suggests that the concentration of wounds in the frontal bone of the Channel Islanders could indicate face-to-face combat with clubs. In Tung's (2007:952) Wari Empire (Peru) study of trauma, numerous anterior vault wounds are attributed to face-to-face conflict. One would also expect that facial wounds would characterize such conflicts, particularly if clubs were used. Since the great majority of people worldwide are right-handed, cranial-facial wounds should predominate on the left side in hand-to-hand combat. The two unhealed parietal wounds on Burial 19759 (Figure 5), could have been caused by rocks flung via a sling or a bola type of weapon, although the latter is not described in either historic or ethnographic records. The small number of facial wounds in the Pericú skulls and their documented warfare patterns contradict Walker's (1989) and Tung's (2007) conclusions. Chronic warfare between the Pericú and Guaycura seems anything but ritualistic, but instead may have been intended to protect or control resources at all costs. This may be why the Pericú had such a high prevalence of malintent trauma when compared with other marine foraging populations in southern California and Chile. Moreover, this high prevalence of skeletal trauma, with more than half of the Las Palmas males and a third of the females afflicted, probably reflects a gross underrepresentation of the actual wounds

incurred during warfare because many more injuries to soft tissue than bone must have occurred.

Symons (1979) asserts that violence within and between traditional societies is often over females. Polygyny and female status within the Las Palmas population may have causal significance for Pericú violence. Both the Pericú and Guaycura engaged in polygyny, a practice often associated with endemic warfare (White and Burton 1988). Most unions in polygynous societies remain monogamous (Murdoch 1967); typically, only a few high status males maintain plural wives. The 1734 Pericú uprising occurred, in part, over the issue of polygyny (Taraval 1931; Baegert 1952; Mathes 2009, 2011). Catholic-dictated monogamy resulted in a perceived loss of status by Pericú leaders, and their resistance to imposed change resulted in the deaths of two clerics. Pericú women were valued not only for childrearing but also as primary shellfish collectors and cactus harvesters. Further, they sometimes accompanied men on warring raids, although their exact roles are unknown. Possibly they acted as weapons porters. Some Las Palmas skull trauma may have resulted from internal Pericú competition for females. At least some warfare between the Guaycura and Pericú involved raids to kidnap females (White and Burton 1988), a custom common throughout western North America, including Alta California.

Conclusions

Bioarchaeological analysis of trauma complements ethnohistoric reports of endemic violence between Pericú and Guaycura peoples of the Baja California Cape Region. Competition over contested resources, such as shellfish, cacti, and freshwater, was undoubtedly a prime cause of violent conflicts. Some violence occurred over internal and intertribal competition for females. Polygyny among these populations may have also contributed to endemic warfare. The percentage of malintent fractures, particularly of Pericú skulls, is or is close to the highest ever reported in the paleoepidemiological literature worldwide. The level of violence discovered through analysis of the skeletal evidence suggests violent confrontations and constant competition among the Natives of this region.

Endnotes

1. Some readers may be more familiar with the term "hyperdolichocephalic," which is better applied to living populations.

2. The terms "infracranial" and "postcranial" can be used interchangeably.

3. When attempting to match pelves with associated skulls (n = 23 skeletons), there were two cases in which skull sex assignment and os pubis sex assignment did not match (8.7 percent error rate). Errors inherent in accurately estimating sex estimation were corrected by a consideration of all the observable morphological criteria and using the os pubis estimate, which has less potential for error than skull criteria.

4. An odds ratio comparing male and female relative trauma was highly significant by age but was not reported because the results are self explanatory.

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