

# Violence indicators in Quebrada de Humahuaca, Jujuy, Argentina: The Regional Development Period from a regional perspective

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**ABSTRACT:** Quebrada de Humahuaca (Jujuy, Argentina) has been extensively studied by archaeologists. Studies have been focused mainly on the Late Regional Development Period (1250–1430 AD), which has been defined as a time of social conflict. In this paper we present bioarchaeological evidence of interpersonal violence related trauma found in populations of the region. A sample of 153 skulls from three sites of Quebrada de Humahuaca: Los Amarillos, La Huerta and Yacoraita, were analyzed, differentiating antemortem and perimortem fractures, cut marks as well as the presence of trophy skulls.

The results were subjected to nonparametric statistical tests, in order to assess inter-site level differences, sex and age distribution.

Bioarchaeological analysis determined a high frequency of interpersonal violence related trauma. Most registered injuries belonged to the antemortem type, demonstrating that the individuals of those events that had generated said cranial trauma had managed to survive. Interpersonal violence affected both men and women the same, registering no differences in neither sex nor age group, however evidence of trauma varied geographically from site to site. Statistical calculations reveal that the Yacoraita site is where the highest frequency of trauma was found, while La Huerta is where the highest level of trophy skulls was registered.

**KEY WORDS:** bioarchaeology, interpersonal violence, Northwest Argentina, social conflict, trauma, trophy skulls, cranial deformation

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## Introduction

According to a diversity of recorded evidence, archaeology has postulated that, ancient Andean inhabited societies had experienced various social conflicts (Ve-

rano 2007). These conflicts were recorded by ethnohistorical sources (Guaman Poma 1980 [1615]), in archaeological (Arkush and Stanish 2005; Nielsen 2007) and in bioarchaeological records (Andrushko 2007; Tung 2007; Verano 1995).

However, the conflicts seemed to have not been developed uniformly along the meridional Andes. In fact, in analyses both at an inter-regional level (Gheggi and Seldes 2012) as well as over time (Seldes 2007) show a wide variability had been recorded.

In the case Northwest Argentina (NWA), more specifically Quebrada de Humahuaca (Jujuy, Argentina), archaeological studies suggest that the Regional Development Period or RDP (1000–1430 AD) is recognized as a time of great social and political change that was intensified beginning in 1250 AD, and which involved the consolidation of corporate type societies including the relocation of populations, an intensification of agropastoral exploitation, an increase of the circulation of goods through the presence of highland origin caravan groups, the formation of clusters denominated residential Pukaras and the evidence of conflict (Nielsen 2001; 2007). It's important to mention that although the word Pukará is related to strictly defensive structures, unlike other regions, in this case, this is not necessarily so. However, due to its elevated location with high visibility positions, the name used to call these types of conglomerates is maintained (Nielsen 2001).

The conflict could have been triggered by a competition for resources, which were becoming scarce due to climate change and the process of population concentration (Nielsen 2003; 2007). It has been postulated that the conflict could have included either continuous or exceptional type confrontations, formal battles, surprise assaults, as well as looting or ambushes (Nielsen and Boschi 2007).

The impact is still unknown but may have had varying levels in different re-

gions of the meridional Andes, especially in Quebrada de Humahuaca. A few years ago bioarchaeology began providing information about the impact of interpersonal violence on the health and lifestyle of individuals, through the analysis of the evidence of trauma. Evaluating its characteristics, both at a regional level and among the different populations of Northwest Argentina (Botta 2012; Gheggi and Seldes 2012).

This paper presents the analysis and discussion of the bioarchaeological evidence of conflict in Quebrada de Humahuaca during late RDP (1250–1430 AD) on a collection of skulls from three archaeological sites, in order to assess the levels of social conflict of the populations living in the region and the impact on their lifestyles.

## Quebrada de Humahuaca

Quebrada de Humahuaca is located in the central part of the province of Jujuy, Argentina (Figure 1), forming a narrow arid valley intersected by the Grande River of Humahuaca. It has a course that runs from North to South for almost 100 km and is bordered on the east by the mountain ranges consisting of Zenta – Arpazo – Horconal – Tilcara mountains and to the west is bordered by Aguilar – Mal Paso – Chañi, receiving contributions from several side valleys that segment these mountains (Cabrera 1976; Albeck 1992).

Archaeological theories from recent studies propose that the socio-political organization of this region was characterized, until the year 1000 AD, by the presence of small communities living in the vicinity of its resources, optimizing the possibilities to exploit the environment (Olivera and Palma 1986). There is

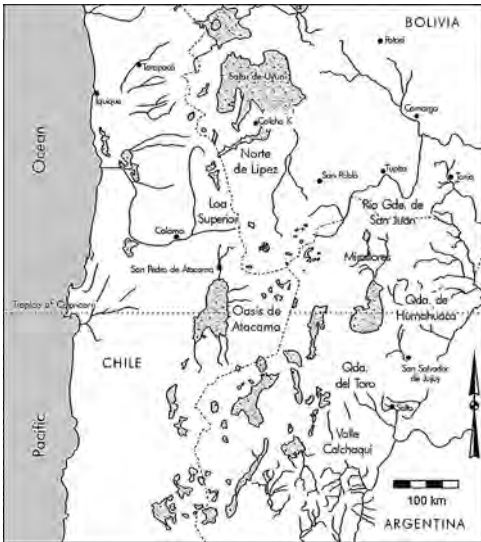


Fig. 1. Location of Quebrada de Humahuaca

no registered evidence, for this period, of neither a centralized power nor the presence of structural social inequalities. It's also possible that interpersonal relationships, as well as a system of appropriation of resources were regulated by reciprocal relationships derived from kinship ties (Nielsen 2001). The settlement pattern for the villages were dispersed or formed semi-conglomerates (Madraza and Otonello 1966), where housing could be found in integrated spaces with farming activities. In the absence of social restrictions, individuals would gradually occupy places suitable for their way of life and thus maintain low levels of economic competition, resulting intra-group tensions by fission (Nielsen 2001).

Archaeological evidence indicates that while the upper and middle portions of the tributary valleys were abandoned as areas of permanent residence by the year 1000 AD, a series of changes in the socio-political sphere began, which are evident by a process of population concentration in the core valley. Recorded

as well, is an increase in building density and an intensification of agricultural practices on sites like Coctaca, Alfarcito and Rodero. In turn, the first signs of conflict in rupestrian art and in the presence of trophy heads arose (Pelissero 1995; Nielsen 2001).

Around the year 1250 AD, this change process deepened. According to Nielsen (2001) the populations began to organize themselves through political formations of an unprecedented scale for the area, which were able to mobilize and coordinate a large labor force (Nielsen 2001).

Recent studies suggest that societies of Quebrada de Humahuaca could have had a strong corporate orientation, equipped with multiple institutional arrangements and with a regulation of exercising political power and restricted economic accumulation by individuals or particular lineages. The corporate nature of the power wielded by main houses or ayllus (the minimum form of organization in which Andean communities concentrated themselves in. It generally includes a family group collectively working on land and which are recognized as linked by having a common descent or ancestor) was held by institutional arrangements that forced individuals exercising political functions to constantly negotiate their position with other members of the group. Beyond these mechanisms that limit the accumulation of power within lineages, there could have been others that balanced relations between the curacas (the head of the ayllu and as such was responsible for distributing the land and organize collective work) and the community at large, subordinating the legitimacy of political power to the fulfillment of certain obligations (Nielsen 2006a).

Political hierarchies were translated into economic benefits, since they

justified the appropriation of resources that were restricted to other lineages or members of the community. However, economic accumulation was limited by redistributive obligations and generosity associated with positions of authority and the decentralized nature of the production structure. The main forms of accumulation were based on social and symbolic capital, in other words, the true wealth of curaca didn't reside in the goods one owned, but in the magnitude of the redistributive net one articulated (Nielsen 2006a).

Ayllus had the opportunity to maintain collective control over key economic resources and to retain the right to appoint and supervise their own authorities (Nielsen 2006a). Thus there was a division of labor between different social units, or between some members within each community, both referred to as the production of subsistence resources, specialized activities and metallurgy to name a few examples (Nielsen 2001; 2003).

One important point that has been raised concerning the history of the occupation of the region is the apparent decline in the availability of resources, which is probably associated with what is known as the Medieval Climate Anomaly (Thompson et al. 1985; Shimada et al. 1991; Fritz et al. 2004). Although its existence in the region has not been conclusively proved, it would be consistent with the registered changes and it has been postulated that it could have been the trigger of a series of interregional conflicts that would have resulted in the competition for access and control of resources (Nielsen 2003; 2007).

Conflicts arising may have evolved in various ways, including continuous or exceptional type confrontations, for-

mal battles, surprise attacks, looting or ambushes. Whatever the form, in practice meant a state of latent insecurity in which the groups felt threatened (Nielsen and Boschi 2007).

The concentration of population settlements, generally located in highly visible places with difficult access, refers to the choice of living spaces and forms of organization that grant themselves as defensive properties (Nielsen 2001; 2003).

There is archaeological evidence of conflict manifested through the installation of populations in highly placed settlements (pukaras) such as, rock art depicting fighting scenes, weapons and war paraphernalia, among others (Ruiz and Albeck 1997; Tarragó 2000; Nielsen 2001; 2007; Nielsen et al. 2001).

A point to take into consideration is that, contrary to the traditionally considered view, is the existence of conflict and interregional exchange of goods as not necessarily mutually exclusive activities. The increase of interregional traffic and the arrival of allochthonous resources, both luxury and for subsistence, could have been circulated by Puna-Altiplano caravan groups, or they may have been obtained through the "organization of logistical parties" from the valley (Nielsen 2003). In fact, the rock art shows, in the same media, both llama caravans scenes as well as images of warriors with distinctive headdresses and shields (Nielsen 2007).

At a bioarchaeological level, evidence of trauma is an important tool for the analysis of the manifestations of conflict and violence. Some studies in the region provide a starting point for understanding the degree of violence instituted in the prehispanic societies, including comparisons at an interregional level (Botta 2012; Gheggi and Seldes 2012).

In summary, the archaeological and bioarchaeological record could be showing a series of changes that were intensified by the year 1250 AD and resulted in a new social reorganization, which would have had important effects on the social practices and daily life of individuals (Seldes 2012). This must have affected the lifestyle of the population, among such, an increased level of social tension which is an important point to evaluate.

## Materials and Methods

The bioarchaeological sample consists of 153 skulls deposited at the Ethnographic Museum “J.B. Ambrosetti” of the Facultad de Filosofía y Letras at the University of Buenos Aires (FFyL, UBA). The material was recovered by Debenedetti in archaeological campaigns conducted between 1919 (XV Expedition FFyL, UBA) and 1921 (XVII FFyL Expedition, UBA).

The skulls form the collection from the sites Yacoraite, Los Amarillos and La Huerta (Table 1, Figure 2). According to the criteria used in excavations in the beginnings of the last century, archaeologists collected the skeletons and then divided them by anatomical parts, leaving no record of which individuals were entitled to each one. Therefore, the anatomical connection of each skeleton was lost, and in actuality the skull and postcranial skeleton have to be analyzed separated.

Following the criteria used then, each individual’s exact origin was not stated either, which also made it impossible to reconstruct the specific context of each burial. However, research conducted in the region in recent years provides insight into the characteristics of the burials: both collective and individual, mostly in domestic contexts except in the Pucara

Table 1. Origins of the sample

Site	Skulls
Yacoraite	44
Los Amarillos	60
La Huerta	49
Total	153

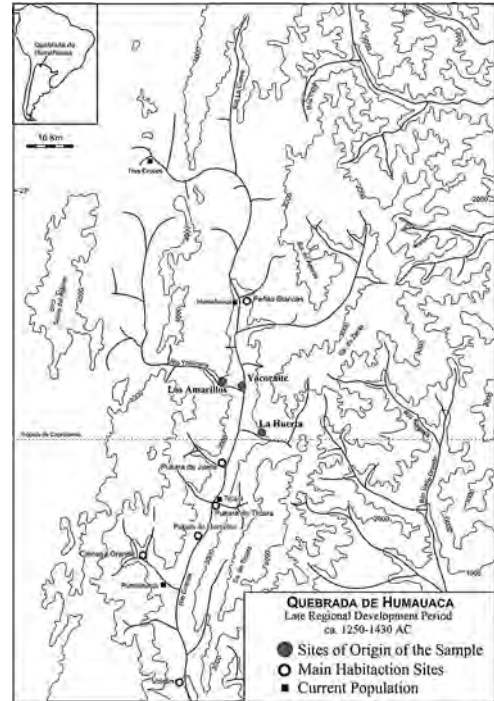


Fig. 2. Location the archaeological sites of origin of the sample

of Tilcara and Volcán which recorded the presence of a segregated space for burial. Direct burials and cists with mostly perinate bodies were also found in urns (Nielsen 2001; Seldes 2010).

The three sites of origin of the samples analyzed here present, according to the field books and the publications describing archaeological campaigns written by Debenedetti, a massive occupation during the RDP, and to a lesser extent during the occupation of the Inca Empire. In turn, these archaeological sites were excavated after the recovery of

Table 2. Radiocarbon dating

Site	Code	BP Dating	AD	Reference
Los Amarillos	LP 669	780±70	1059–1382	Nielsen (1997)
	AA 16239	620±49	1284–1417	Nielsen (1997)
	AA 12135	590±55	1289–1436	Nielsen (1997)
	LP 165	1150±80	688–1020	Raffino y Alvis (1993)
La Huerta	LP 700	660±40	1274–1397	Raffino y Alvis (1993)
	LP 389	740±110	1041–1412	Raffino y Alvis (1993)
	LP 335	680±90	1174–1429	Palma (1998)

collections that formed the sample here analyzed, therefore radiocarbon dates are taken in at least two of them: Los Amarillos y La Huerta. In the case of Yacoraite, the temporary location is inferred by an association of the findings described by Debenedetti. Both types of information allow the remains to be ascribed to the late RDP (Table 2).

Referring to each site individually, in the case of Los Amarillos, it is a residential conglomerate located on Quebrada de Yacoraite, at 5.5 km of the Grande River, a watercourse that accompanies the route made by the core valley (Berardi 2004). The site was originally excavated by Salvador Debenedetti, and again decades later by Axel Nielsen and team (Debenedetti 1918; Nielsen 2006b). Its occupation lasted from the RDP (900–1430 AD) to the Inka Period (900–1536 AD), when it was abandoned. Its maximum occupancy occurred during the late RDP, when it reached an area of 10 hectares (Nielsen 2006b). This conglomerate had a great complexity and architectural diversity, as well as a differentiation and internal hierarchization of spaces, which separated residential, public and specific task areas (Berardi 2004; Nielsen 2006b).

For its part, the site La Huerta is located 3 km from the confluence of the Quebrada de La Huerta with the core valley. It was excavated by Debenedetti (1918), Raffino (Raffino and Alvis 1993),

Palma (1998) and Leibowitz (2012). It constitutes of a conglomerate with high building density and a significant internal complexity, covering approximately 8 hectares. It had an important occupation during the RDP and then under the Inka domination, it eventually became one of the administrative heads of the empire (Raffino and Alvis 1993; Palma 1998; Leibowitz 2012).

The third site, Yacoraite is located on an elevated position (approximately 100 m above ground level), on the right bank of the Grande River in the core valley and surrounded by stepped defensive walls. This site was excavated by Debenedetti between 1919 and 1921 and later by Krapovickas (1981–82). Its occupation was massively developed in the late RDP and to a less extent in the beginnings of the Inka Period (1250 – 1430 AD).

## Methodology

The bioarchaeological analysis consisted of three steps: 1) Structure of the sample formed from determined sex and an age estimation of each individual 2) Classification of skull deformation practices and 3) Survey of trauma evidence associated with interpersonal violence.

For sex determination, morphological features proposed by Buikstra and Ubelaker (1994) were observed. These were: supra-orbital ridge/glabella, nuchal chest,

supra-orbital margin, mastoid process, and mental eminence, in the latter cases where there lower mandible was present. The skulls were then assigned within the categories: male, indeterminate and female (Buikstra and Ubelaker 1994).

Regarding the estimation of age, the synostosis of the cranial sutures were considered, especially the fusion of the spheno-occipital synchondrosis and tooth eruption, classifying the sample into three groups: subadult (-18), young adult (18-35) and mature adult (+35) (Buikstra and Ubelaker 1994).

Secondly, intentional skull deformations were analyzed. This refers to a type of practice done by many Americans who altered the morphology of their heads, as a sign of belonging to a region, community, lineage or ethnicity among others (Hoschouer et al. 1995; Verano and Lombardi 1999; Blom 2005; Verano 2005). Skull deformations result from the application of bandages or boards compressing the cranial vault. In the case of tabular deformations, they refer to the ones that result from the pressure of boards that generate a skull width expansion. This differs from the pressure made with bandages only, which generates deformation called annular or circular, that produces an elongated and backwards tubular shape, presenting as well an increasing length of the skull. Meanwhile erect and oblique variants are defined in both cases by the form taken by the posterior head angle (Imbelloni 1924-25; Torres Rouff 2007). The skull deformations were classified as tabular erect (TE), tabular oblique (TO), circular erect (CE), and circular oblique (CO).

Finally, the traumatic type injuries of each skull were registered that were considered as trauma, wounds inflicted on the tissue by an extrinsic force or mechanism to the body. Trauma, defined as the

complete or incomplete break of bone, can be caused by accidental events or be the effect of interpersonal violence. The determinations of one reason or another depends on a variety of factors such as the type of injury, the shape, the specific location of trauma and injury pattern on the rest of the skeleton (Lovell 1997; Milner 2005; Waldron 2009). According to literature, there is a consensus that head injuries are probably the result of violence rather than accident (Webb 1995; Judd 2006; Torres Rouff 2007).

The first step consisted of separating trauma from postmortem or taphonomic modifications. This was differentiated since the latter generally presents distinct colors on the unbroken bone surface in opposition to the edge of the break. On the other hand, the edges of a perimortem fracture are the same color as the rest of the bone because both surfaces share the same burial environment (Tung 2012).

Following this step, traumas were classified into skull depressed fractures and cut marks.

Each lesion was analyzed by recording their location with respect to sutures or the nearest osteometric points, the bone in which it is located, the type of fracture (linear or crushing) and shape (oval, circular, punctual, starry, linear, or other) taking different proposals made by authors such as Campillo (2001), Galloway (1999) and Lovell (1997).

Another distinction was made between antemortem and perimortem, using the presence of bone regeneration as the first group indicator, signaling survival of the individual to the lesion. Meanwhile, perimortem fractures were recognized as not having evidence of bone regeneration, they present radiating fractures or linear strokes that flow from it,

bone fragments attached, internal bevel, sharp, defined edges and/or taphonomic changes at the edges (Ortner and Putschar 1981; Wakeley 1997; Aufderheide and Rodríguez Martín 1998; Sauer 1998, Facchini et al. 2007; Wheatley 2008).

On the other hand, the cut marks were recorded, which were measured and located according to the cranial sutures. Cut marks may be isolated or grouped and show or lack evidence of bone regeneration, which indicates ante or perimortem cut marks respectively. Generally many of the latter are traditionally linked to anthropogenic processes aimed at preparing a human head as a trophy by decapitation (Ortner and Putschar 1981; Aufderheide and Rodríguez Martín 1998).

Finally, the presence of trophy skulls was registered; in the case of NWA, the heads were converted into trophies through the enlargement of the foramen magnum and circular shaped perforation in the middle sector of the sagittal su-

ture, which generates an orifice that presents some variations to the left or right of said suture. Due to the cultural component implicit in this treatment of cranial remains, these were considered as a separate category, distinguished from the general trauma mentioned above.

In order to make comparisons on an inter-site level, as well as by sex and age group, we used a  $\chi^2$  statistical test, in which a parameter of  $p$  with a 0.05 value was taken.

## Results

### Composition and structure of the sample

First the sex and age composition of the individuals analyzed is presented, differentiating the three sites (Table 3).

According to the frequencies reported in Table 3, it shows that in the three sites

Table 3. Sex and age at death distributions in studied samples

Sample	Age	Sex			Total
		Male n (%)	Indetermined n (%)	Female n (%)	
Los Amarillos	Subadult	0	2 (3.3)	0	2 (3.3)
	Young Adult	31 (54.7)	5 (8.3)	1 (1.7)	53 (88.3)
	Mature	4 (6.7)	1 (1.7)	0	5 (8.3)
	Total	35 (58.3)	8 (13.3)	17 (28.3)	60 (100.0)
La Huerta	Subadult	0	1 (2.0)	0	1 (2.0)
	Young Adult	28 (57.1)	5 (10.2)	12 (24.5)	45 (91.8)
	Mature	3 (6.1)	0	0	3 (6.1)
	Total	31 (63.3)	6 (12.2)	12 (24.5)	49 (100.0)
Yacoraite	Subadult	0	4 (9.1)	0	4 (9.1)
	Young Adult	19 (43.2)	5 (11.4)	12 (27.3)	36 (81.8)
	Mature	3 (6.8)	1 (2.3)	0	4 (9.1)
	Total	22 (50.0)	10 (22.7)	12 (27.3)	44 (100.0)
General sample	Subadult	0	7 (4.6)	0	7 (4.6)
	Young Adult	78 (51.0)	15 (9.8)	41 (26.8)	134 (87.6)
	Mature	10 (6.5)	2 (1.3)	0	12 (7.8)
	Total	88 (57.5)	41 (26.8)	24 (15.7)	153 (100.0)



Table 4. Cranial deformation

	Los Amarillos	La Huerta	Yacoraite	Total
	n (%)	n (%)	n (%)	n (%)
Tabular erect (TE)	11 (18.3)	10 (20.4)	16 (36.4)	37 (24.2)
Tabular oblique (TO)	38 (63.3)	27 (55.1)	21 (47.7)	86 (56.2)
Circular erect (CE)	0	2 (4.1)	1 (2.3)	3 (2.00)
Circular oblique (CO)	9 (1)	8 (16.3)	5 (11.3)	22 (14.4)
No deformación	1 (1.7)	1 (2.0)	0	2 (1.3)
No datos (N/D)	1 (1.7)	1 (2.0)	1 (2.3)	3 (2.0)
Total	60 (100.0)	49 (100.0)	44 (100.0)	153 (100.0)

there are a significant majority of adult individuals (87.58%). This distribution by age group is maintained in the same proportions in all three sites: 88.33% in Los Amarillos, 91.84% in La Huerta, and 81.82% in Yacoraite. Individual subadult frequencies are low as well: being 3.33% in Los Amarillos, 2.04% in La Huerta and 9.09% in Yacoraite. The same can be stated for the mature adult group, for which there is 8.33% in the site Los Amarillos, 6.12% in La Huerta and 9.09% in Yacoraite. These results point out that most individuals could survive to adulthood but did not exceed 35 years of age.



Fig. 3. Tabular erect deformation, Los Amarillos

In terms of gender distribution, we can see that in general there is a majority of male subjects (57.52%) and that women represent less than half (26.80%) compared to men. Looking at each of the three sites, the majority of male individuals is preserved, presented in the largest extent is La Huerta with 63.27% male and over 24.49% female. Then comes Los Amarillos with a proportion of 58.33% male and 28.33% female. Finally the lowest difference is in Yacoraite, which provides a collection composed of 50% male compared to 24.49% female (Table 3).

Regarding skull deformation practices (Table 4), it can be observed that in general there is more than double of the TO variant (56.21%) while less than

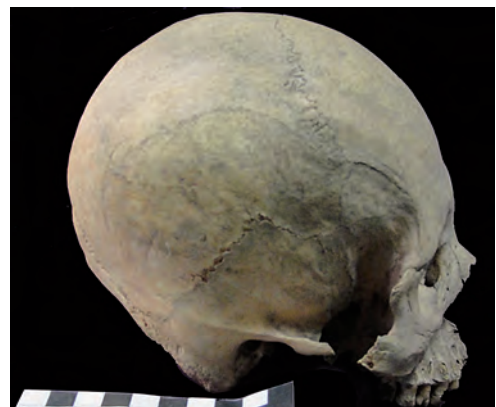


Fig. 4. Tabular oblique deformation, Los Amarillos

half presented is the type TE (24.81%), the rest of deformations are presented in lower frequencies: 14.38% for CO, 1.96% for CE, while 1.31% recorded no cranial deformation (Figures 3 and 4). By comparing the distribution of deformation practices between the three sites, non-statistically significant differences were detected ( $\chi^2=7.67$ ,  $p=0.26$ ).

### Evidence of trauma

The lesions were classified into trauma and trophy skulls, including a separate category for two skulls that present enlargement of the occipital bone in one case, and an orifice made on the interparietal region in another.

According to analyzes done, it was registered that 34.64% of the samples present evidence of trauma (Table 5), which is an important manifestation of interpersonal violence. Within this group, women account for 37.21% while men represent 31.82% of the sample. This means that the differences between sexes are not statistically significant ( $\chi^2=0.499$ ,  $p=0.47$ ).

In turn, traumas were registered on individuals independently to the type of deformation practiced (Table 6), being that the differences are not statistically significant either ( $\chi^2=3.59$ ,  $p=0.308$ ).

Table 6. Trauma distribution by cranial deformation

Cranial deformation	Presence	Absence	Total
	n (%)	n (%)	n
Tabular erect (TE)	9 (24.3)	28 (75.7)	37
Tabular oblique (TO)	32 (37.6)	53 (62.3)	85
Circular erect (CE)	0	3 (100.0)	3
Circular oblique (CO)	7 (31.8)	15 (68.2)	22

When comparing the frequency of trauma among sites (Table 7), it shows that Yacoraite individuals were the ones who had suffered more from interpersonal violence situations (56.81%), while Los Amarillos and La Huerta have lower frequencies (30.61% for the former and 21.66% for the latter). The differences are statistically significant ( $\chi^2=12.08$ ,  $p=0.002$ ) making it possible to postulate the presence of differential characteristics to the exposure to interpersonal violence among the three sites.

Regarding the frequency and of antemortem and perimortem trauma (Table 8), it was recorded that most cases correspond to the first type, because this type of lesion presents bone remodeling, one could infer that the individuals had survived and that injuries were not life threatening. The inter-site level comparison was not statistically significant ( $\chi^2=5.32$ ,  $p=0.07$ ), being that 88% in Yacoraite, 92% in Los Amarillos and 60% in La Huerta has antemortem injuries.

Table 5. Sexual distribution of trauma evidence\*

	Male	Indeterminate	Female	Total
	n (%)	n (%)	n (%)	
Trauma	28 (31.8)	9 (37.5)	16 (37.2)	53
Trophy skull	10 (11.4)	1 (4.2)	6 (13.9)	17
Enlargement of the occipital	1 (1.1)	1 (4.2)	0	2
No trauma	49 (55.7)	13 (54.2)	21 (48.8)	83
Total	88 (100.0)	24 (100.0)	43 (100.0)	155

\* The total number of cases is greater than the amount of skulls analyzed because some trophy skulls also present evidence of trauma.

Table 7. Lesion distribution by site. LA: Los Amarillos, LH: La Huerta, Y: Yacoraite\*

Site	N	Presence	Absence	Trophy skull	Enlargement of the occipital
		n (%)	n (%)	n (%)	n (%)
LA	60	13 (21.7)	42 (7)	4 (6.7)	0
LH	49	15 (30.6)	23 (46.9)	11 (22.4)	2 (4.1)
Y	44	25 (56.8)	18 (36.7)	2 (45.4)	0
Total	153	53 (34.6)	83 (54.2)	17 (11.1)	2 (1.3)

\* The total number of cases is greater than the amount of skulls analyzed because some trophy skulls also present evidence of trauma.

Table 8. Antemortem y perimortem trauma

Traumas	Yacoraite	Los Amarillos	La Huerta	Total
	n (%)	n (%)	n (%)	n
Antemortem trauma	22 (78.6)	12 (92.3)	9 (56.2)	43
Perimortem trauma	6 (21.4)	1 (7.7)	7 (43.7)	14
Total trauma	28 (100.0)	13 (100.0)	16 (100.0)	57

Most of the registered injuries are fractures (81.82%), which are distributed evenly among the three sites (Table 9), recording no statistically significant differences ( $\chi^2=5.78$ ,  $p=0.055$ ). Compared with these injuries, cut marks represent a low frequency (18.18%) is in Yacoraite, being where they are in greater numbers, having 8 out of a total of 27 traumas registered on the site (29.63%). In two of the sites (Los Amarillos and Yacoraite), 3 of the 10 cases recorded had cut marks, that were found distributed in an even pattern across both parietal bones.

Regarding the distribution of fractures on the skull (Table 10), it was recorded that the majority of fractures were found in the frontal (32.76%) and parietal (43.10%) bone. The figure exceeds

the number of individuals with injuries, as there are some that present more than one trauma, which in why in this table each lesion is counted separated in order to place them on the cranium.

Comparing the location of the fractures on the skulls between the three sites, the results are striking. While most of the injuries in Los Amarillos (33.33%) and Yacoraite (52%) are recorded in the parietal bones, in the case of La Huerta trauma is mostly located in the frontal bone (52.38%) indicating a difference in this last place in the fracture distribution pattern (Figure 5).

In the case of cut marks (Figure 6), they are recorded at low frequencies (18.18% of the total of injuries). Being that Yacoraite (Table 9) is where there

Table 9. Fracture and cut mark distribution

Traumas	Los Amarillos	La Huerta	Yacoraite	Total
	n (%)	n (%)	n (%)	n (%)
Fracture	11 (84.6)	15 (100.0)	19 (70.4)	45 (81.8)
Cut marks	2 (15.4)	0	8 (29.6)	10 (18.2)
Total	13 (100.0)	15 (100.0)	27 (100.0)	55 (100.0)

Table 10. Fracture location

Location	Los Amarillos	La Huerta	Yacoraite	Total
	n (%)	n (%)	n (%)	n (%)
Frontal	4 (33.3)	11 (52.4)	4 (16.0)	19 (32.8)
Parietal	7 (58.3)	5 (23.8)	13 (52.0)	25 (43.1)
Occipital	1 (8.3)	4 (19.0)	3 (12.0)	8 (13.8)
Maxilar	0	1	0	1
Zygomatic	0	0	1	1
Nasal	0	0	1	1
Temporal	0	0	3	3
Total	12	21	25	58

are the highest number of cases, 8 in the parietal and one in the front, while in Los Amarillos there were 2 in parietal bone and in La Huerta there were none registered. Frequencies were too low to perform statistical calculations, but the fact that it is in Yacoraite where they were recorded more frequently, and that this is also the site with the least amount of trophy skulls, is something to keep in mind in that is going to be integrated into a more general discussion.

While assessing the presence of skulls that were modified to be used as trophies (Figures 7 and 8), it is observed that they have no cut marks that would allow inferring that they were scalped immediately after death. In the sample analyzed

(Table 5), a low presence of trophy skulls is registered (11.11%), in which the differences between the sexes are not statistically significant ( $\chi^2=2.15$ ,  $p=0.76$ ). However, in the evaluation of their distribution between sites, the higher frequency of trophy skulls is in La Huerta (Table 7) and the difference when compared to Los Amarillos y Yacoraite is statistically significant ( $\chi^2=9.49$ ,  $p=0.008$ ).

In the entire set of analyzed skulls, two cases were observed with special cuts. One of them in La Huerta, where observed featuring a cut in the occipital condyle (Figure 9). Another case was registered in a trophy head of Los Amarillos, in which the mandible has a cut in the lower angle of the ramus (Figure 10).



Fig. 5. Fracture, Yacoraite



Fig. 6. Cut marks, Los Amarillos



Fig. 7. Trophy skull, orifice on the interparietal region, La Huerta



Fig. 8. Trophy skull, enlargement of the occipital, Yacoraité

In both cases trauma showed edges that could be consistent with the intentional use of cutting instruments. The first case was a horizontal cut at the skull base, in the transactional plane. The second case presented a beveled edge that could have generated bone detachment (Campillo 2001). It also exhibited more than one point of impact which formed a regular injury pattern. According to Aufderhei-

de and Rodriguez-Martin (1998), these types of injuries could be associated with decapitation practices. However, not having the rest of the skeleton implies not being able to deepen the analysis further; still it is left registered in order to indicate its possible etiology.

In the case of the potential impact of cranial deformation in the decision to transform a skull into a trophy (Table 11), the results do not show statistically significant differences ( $\chi^2=0.99$ ,  $p=0.80$ ), indicating that this is not a factor that differentiates the degree of exposure of individuals to interpersonal violence.

The presence of an orifice on the parietal bone without the enlarging of the occipital, and the reversed situation on the other skull could be related to attempts to convert them into trophy skulls; how-



Fig. 9. Cut in the occipital condyle, La Huerta



Fig. 10. Cuts in mandible, Los Amarillos

Table 11. Trophy skull distribution by cranial deformation

Cranial deformation	Presence	Absence	Total
	n (%)	n (%)	
Tabular erect (TE)	5 (13.5)	32 (86.5)	37
Tabular oblique (TO)	8 (9.4)	77 (90.6)	85
Circular erect (CE)	0	3 (100.0)	3
Circular oblique (CO)	3 (13.6)	19 (86.4)	22

ever, being unable to perform imaging studies, it is possible to deepen the analysis of these cases. At this moment, the institution protocols where the skulls are deposited, do not allow the transfer of the remains or imaging studies on display.

An interesting case constitutes of a skull that presents an orifice in the interparietal region. The beveled edges and their rounded shape show a particular care in its treatment, which is not like the rest of the holes presented in the trophy skulls observed (Figure 11). As in previous cases, it is not currently possible to deepen the analysis, remaining for now unknown if it is a trepanation or, if on



Fig. 11. Orifice on the interparietal region, La Huerta

the contrary, it is one more case of a cranium transformed for trophy use.

## Discussion

### Sample structure

The first point to address is regarding the structure of the sample, mainly the question of the number of men in relation to women. One possibility is that the increased presence of male individuals is the result of difficulties in sex determination, causing in the analysis, for one sex to be overestimated over the other. To assess this, several observations were made by each of the researchers separately on the entire individual within the sample, to control intra-observer and inter-observer error. The results showed that the difference being recorded was minimal, making a joint observation to solve incongruity cases in sex determination.

One option to consider is that this is linked to the effect of cranial deformation, which could be affecting some of the points used for sex determination. Recent studies indicate that the deformation in an oblique orientation (TO and CE in this case) could be producing further development of sterno – cleido – mastoid, generating erroneous observations on sexual allocation of the mastoid apophysis, mainly because of the tendency to masculinization that the deformation could be generating in that part of the skull (Retamal and Saez 2006). However, studies on other skulls in the region showed that the correlation between sex determination by morphological and genetic (mtDNA) traits is 95% (Seldes 2010), therefore discarding that this as a possible explanation for the predomi-

nance of men over women in the sample analyzed here.

Another possibility is that sex differentiated burials existed, and the excavations here were carried out mostly in the sector belonging to burials of male individuals. This is not possible to ascertain with the information provided by Debenedetti on the sectors of origin of the sample at each site. However, archaeological investigations have postulated that the custom in the region was to bury the dead in domestic settings, without any existing segregation by group, sex or age. Even in the case of the few registered necropolis, as in the cases of Pucara of Tilcara and Volcan, there was no sexual differentiation criteria for burials (Seldes 2010).

A point that could be considered is that perhaps the female skulls were more susceptible to taphonomic modifications and therefore discarded by archaeologists during the initial excavations for being more damaged and/or fragmented. However, when analyzing the conditions of preservation, they were found to be similar in both sexes. That is, we could not detect a greater predisposition for fragmentation or other post-depositional changes in female skulls (Botta 2012).

In conclusion, there is no current explanation regarding the majority presence of male individuals. This is because there is not sufficient information, both systemic and archaeological, of the mortuary contexts and excavation background. However, the fact that the same proportion is repeated at three sites in the region suggests that it is not a hap-hazard or random pattern.

Regarding sex and age composition of the sample (Tables 3 and 4), analyzes account for an adult majority at the three sites, still there were few individu-

als who survived beyond 35 years of age. Is it possible that interpersonal violence had influenced this? This possibility is not ruled out. Although to be able to assert this kind of issue, nutritional – metabolic stress, diet and occupational stress analyses would have to be considered to weigh the influence of different types of stressors in the lives of the individuals. Unfortunately these collections lack the postcranial skeleton, but analyzes of diet and nutritional – metabolic stress present in these skulls are in the process of being analyzed, so that once completed a whole assessment can be made.

Referring to the low frequency of sub-adult individuals, it is important to consider other studies that point out a great infant mortality, especially of times close to birth (Seldes 2007). Taking this into consideration, it would be expected, for the sample analyzed here, to present a larger amount of subadults. The small amount recorded in this work could be explained then, due to the collection criteria, which might affect the age distribution of this sample. Compared with skulls of adult individuals, there is possibly a differential preservation in the case of sub-adults, because the remains of children and perinate individuals are thinner and more gracile, and therefore more susceptible to post-depositional changes. This could have generated for them to not be selected and collected during the excavations conducted by Debenedetti early last century, due to being found in a more fragmented or incomplete condition.

Finally, while assessing cranial deformation, the higher frequency of individuals with TO deformation present in the three sites analyzed is striking, without statistical significant differences being

recorded. A point worth noting is the growing importance of tabular oblique deformation in the RDP, considering that it had not been registered for the Formative Period in the region (Mendonça et al. 1991; 2002; Bordach et al. 1999; Seldes 2012). The emergence of this variant and its high frequency has been proposed as a result of increased interregional exchange, which in this period is recorded as linked to the caravan trade boom in the circumpunean Andes. This may have led to the people of Quebrada de Humahuaca to adopt new identity practices (Seldes 2012).

### Evidence of interpersonal violence

Focusing on the traumas, the frequencies of individuals with evidence of having been exposed to events that resulted in bodily trauma (34.64%) indicate that the conflict was not just something latent or a feeling of insecurity, but that violence was effectively part of the lives of individuals. In this regard the bioarchaeological register would be supporting archaeological evidence of social conflict recorded for the region (Nielsen 2007) for the late RDP.

While making comparisons in trauma frequencies between men and women, we observed no statistically significant differences in the number of cases and the location of the traumas on the cranium. This would indicate that both sexes were exposed to interpersonal violence situations. The results obtained here are consistent with previous studies conducted on samples from the region and the Calchaquí Valleys (Gheggi and Seldes 2012). In this sense, the fact that men and women are equally affected in amount and type of trauma would be consistent, according to Tung from his

investigations of the Wari Empire, with what is expected if interpersonal violence situations were the result of raid type conflicts (Tung 2006):

“... just as expected in cases of raiding where “social substitutability” merits the attack on any individual in the community” (Tung 2006: 459).

The presence of women with evidence of trauma from interpersonal violence differs from traditionally raised theories that postulated the idea of the man’s role in conflict resolution and the image of women remaining a passive attitude towards social violence, dedicated in contrast, to household type tasks (Vila et al. 2011).

For the case of San Pedro de Atacama (Chile), the trauma in female individuals does not register early deaths or arrow wound impacts, which was associated with cases of violence in domestic contexts as a probable explanation of the injuries recorded (Lessa and Mendonca de Souza 2004; 2007). However, in another study also conducted on samples from San Pedro de Atacama, there were no differences regarding gender violence (Torres Rouff and Costa Junqueira 2005). It is not our intention to evaluate these results, but only to highlight the differences within a region as a starting point for rethinking the variability in the degree of exposure of women to interpersonal violence events.

It is possible that women may have only been victims of violence, but nothing has been said about her active participation or not in conflict resolution. For Quebrada de Humahuaca, there are not any ethnohistoric documents that can be used as a source of information. One might think that the participation of women in situations of interpersonal violence has been underestimated, while



in fact they had been an active part of conflict situations. This latter assertion could be reflected in the number of trauma registered on female individuals in this paper.

Regarding deformation practices, we have seen that there was not a differentiating factor regarding the presence of trauma, this meaning that the degree of exposure to interpersonal violence was independent of body modifications used as identity marks.

Continuing the comparisons made, the only one that resulted in significant differences was the frequency of traumas per site. That is, regardless of gender, age and the type cranial deformation, it was at an inter-site level where there were differences, being the individuals from the Yacoraite site, the ones who suffered from higher levels of interpersonal violence. An important point is the fact that, unlike Los Amarillos and La Huerta, which were located on the side of the valley, Yacoraite is located on the bank of the Grande River in the core valley. The Grande River is the only watercourse that remains constant throughout the year and constitutes the main means of communication with other regions.

In this sense, Nielsen (2001) argues that the conflict could have occurred between groups of different regions as a result of the dispute over access to and control of resources that had begun to dwindle from the Medieval Climatic Anomaly. Following this line of reasoning, one might think that living in the movement axis of populations, may have been a factor of greater exposure to encounters with other groups, collisions that apparently were sometimes resolved violently. On the contrary, people of Los Amarillos and La Huerta, located more than 6 km from the main route, may have

been more protected from the incursions of groups from other regions.

In all analyzed sites most individuals presenting trauma, had managed to survive them, indicating that said injuries were not life-threatening. It raises questions about what kind of conflict causes this type of injury. It has been mentioned that the possibility of ritualized type conflicts or "tinkus", including planned encounters between communities for various reasons such as gaining prestige, defending the territory, revenge, to ensure prosperity or for entertainment (Arkush and Stanish 2005; Tung 2012). These type encounters could have generated lesions, which in most cases were not vital (Andrushko 2007). However there is no agreement on the characteristics of the tinkus over time, or their nature in the different regions of the meridional Andes. Currently it is considered that conflict resolution may have included highly ritualized aspects and that in each region the evidence of interpersonal violence should be examined while assessing the degree of intensity that generates, especially considering the diversity of experiences in which the conflict may have taken form between the different andean groups (Arkush and Stanish 2005; Topic and Topic 2009).

The sample analyzed in this paper presents that most injuries in the lateral plane with a predominance of the posterior section of the parietal, except in La Huerta where injuries are concentrated in the anterior portion. It has been postulated that the blows located on the anterior portion of the skull are associated with face to face conflict, while trauma in the posterior plane would be tied to attacks made from behind, effectuated to fleeing opponents (Tung 2006; Walk-

er 1997; Gheggi and Seldes 2012). From the results of this study, we could link evidence that was found in the cases of Los Amarillos and Yacoraite to interpersonal violence events in which individuals were fleeing and therefore the trauma evidence found on them shows points of impact on the posterior portion of the skulls. Meanwhile in La Huerta the presence of non-lethal lesions in the anterior part of the skull could imply involvement in face-to-face confrontations, which was associated with both ritual encounters as well as conflict resolution through violence (Tung 2007).

Regarding the trophy skulls, they do not have a uniform pattern along the meridional Andes. In the case of the populations of Quebrada de Humahuaca, unlike Nasca, to cite an example that has been extensively studied (Verano 1995) in which the perforation was performed in the frontal bone, the preparation of the trophy head involved the enlargement of the occipital bone and the generation of an orifice on the interparietal region. This draws attention to not extrapolating the analyses to groups or populations with different practices, which could be responding to their own cultural logic. Said practices present sufficient levels of interregional difference in the meridional Andes to not make generalizations from a case.

In this sense, the meaning that had traditionally referred to trophy skulls belonged exclusively to male individuals which it discussed. Studies by Vignati (1930) can be used as a reference to the Northwest Argentina. However, later studies showed that womens' skulls were also converted into trophy heads (Palma 1997–1998; Tung and Knudson 2008), as it was recorded in the sample analyzed here.

In the case of cranial deformation and its possible influence on the choice of individuals' skulls that were going to be converted into trophy skulls, it was noted that in the sample they were maintained as separate categories, namely this identity practice would not be taken as a parameter in the decision or whether or not to convert a skull into a trophy.

It is noteworthy that in La Huerta two cases of skulls with orifices on the parietal bone without enlarging of the occipital bone and vice versa were registered, as if they had begun to be prepared as trophies but the practice was left unfinished. Having left the task half way through, could be a sign that there was some reason that impeded them from finishing the transformation of the trophy skulls, perhaps a new event of violence or attack arose, which made them unable to finish the activity.

Continuing the question of whether the conflict had or not a ritualized nature, the discussion about the significance of the trophy skulls must be added. In this sense, it has raised a debate on the dichotomy of "enemies" versus "ancestor worship" (Tung and Knudson 2008). While the former argues that these are individuals who were taken during raids or wars, and whose heads were turned into war trophies (Verano 1995). The latter considers that the presence of children and women among the trophy heads, would indicate that they were part of fertility rituals, and would also represent revered ancestors in what was called ancestor worship (Carmichael 1994), giving the violent encounters in many regions of the Andes, a ritualized character (Andrushko 2007).

A third position argues that trophy heads can have multiple meanings depending on the context and period and

hence it polysemic character. The ones associated to war allowed control of the enemy's power; their public display would be an effective way of commemorating the achievements reached in battle. At the same time, as testimony to the veneration of ancestors, they could have been used in fertility rites (Nielsen 2007).

An interesting feature in the case being analyzed in this paper is the absence of cut marks on the trophy skulls that would allow visualizing the scalping process. However there were three cases that presented cut marks distributed across both parietal bones which could be related to said process. On the other hand the few cut marks registered, were found in skulls that did not go through the preparation process to be converted into trophy skulls. At the moment it is not possible to make an interpretation of these cut marks. In addition to not having the postcranial skeleton, the possibilities of assessing whether there was decapitation, are scarce. However there were at least two cases (in La Huerta and Los Amarillos) of a cut on the occipital condyle and on the mandible that could be a signal possible decapitation, one of them on a trophy head. The presence of possible decapitation on a trophy head suggests that the skulls were not related to ancestor worship, but could have been enemies of an individual of another group with whom they were in conflict.

Finally, a point to be considered is the relationship between the trophy skull levels and the evidence of trauma at each site. In this sense, the highest amount of trophy skulls occurs in La Huerta, the site that has the lowest level of trauma evidence, located mostly in the frontal bone. This is followed by Los Amarillos and finally Yacoraite. The

latter presenting the lowest amount of trophy skulls against the highest level of trauma evidence. If the conflict in La Huerta had a more ritualized form, it could explain the higher frequency of trophy skulls, perhaps associated to fertility rites or as part of ancestor worship, which would also be consistent with lower amounts of registered trauma. However it is also possible to postulate that each group may have reacted in various ways to social conflict situations that arose in the region during the late RDP, resolving them according to particular contingencies and the decisions of social actors in the daily practices and in terms of social relations in each of the groups.

## Conclusions

In this paper, the evidence of trauma associated with interpersonal violence was registered, which reinforces the idea of the RDP as a time of social conflict, at least for the Quebrada de Humahuaca region. Archaeological evidence accounts for the conflict that existed at the time, for example in rock art, through the representation of various figures of what was called warriors (Nielsen et al. 2001), and in settlement pattern by the existence of defensive and strategically located sites (Nielsen 2007). It can be postulated that the conflict was more than a concern for the period and had a material correlation to a concrete effect on the health of individuals.

Whatever the nature of the conflict, either of ritualized character or not, might have assumed the fact that in Quebrada de Humahuaca conflicts of interest were in some cases resolved violently, involving both men and women, who to a great extent were able to survive these

situations, given the level of registered bone remodeling.

As expressed by Nielsen (2007), the real and ritual war is probably two ends of a continuum and not a true dichotomy to solve through analysis of the archaeological and bioarchaeological record. In this sense, not only regional differences indicate that the different populations from the meridional Andes had their own perception of conflict and a particular way of solving it, but within each region a variability in the nature of social conflict was also recorded.

In turn, the results of this paper, through trauma frequencies and trophy skulls registered on female individuals, reinforce the criticism of the invisibility of women in certain aspects of social life such as, in this case, conflict (Baffi and Seldes 2012). The fact of having registered evidence of interpersonal violence and female trophy skulls, make us aware about the need to not generalize the position that each society gives to men and women, which give the general role of violence to the man and naturalizing a social phenomenon that takes place and agency in each of the societies being studied (Escoriza Mateu and Castro Martínez 2011).

In order to deepen interpretations regarding conflict in Quebrada de Humahuaca in the RDP, it is necessary to continue the analysis incorporating other lines of evidence and methodologies such as imaging studies, molecular analysis and radiocarbon dating. These could help to further contribute to information in completing current investigations.

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### Author contribution

Verónica Seldes analyzed La Huerta samples, both separately analyzed Los Amarillos and Yacoraite samples. Statistical tests were performed and interpreted by Seldes. This work was written by both authors.

### Conflict of interest

The Authors declare that there is no conflict of interests regarding the publication of this article.

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