Violence targeting children or violent society? Craniofacial injuries among the pre-Hispanic subadult population of Gran Canaria (Canary Islands)

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Abstract
The approach to Gran Canaria’s pre-Hispanic period has traditionally been dominated by a romantic and propitious view of its indigenous populations advocating a historical evolution on the margin of the conflicts and contradictions common to any society. Yet new data indicate that the ancient Canarians were subject to high rates of internal violence linked to the island’s isolation and harsh biogeographical conditions, as well as marked personal differences and a strong hierarchization of the social order. However, the effects of such a degree of violence among the subadult population remain unknown. The study of the assemblage of the victims, particularly the younger members of society, requires a global analysis of the historical conditions to determine whether this violence was exceptional or habitual. The findings of this study point to a prevalence of trauma among subadults (surpassing 20%), thus bolstering the notion of a society with widespread physical violence affecting the whole population or at least that above the age of 5 or 6 years. The data also suggest widespread violence within the framework of interpersonal relationships rather than violence directed specifically against the population’s younger sector.

KEYWORDS
blunt force trauma, insular context, interpersonal violence, subadult, trauma

1 INTRODUCTION

The prevalence of trauma among subadults in archaeological populations is usually lower than that of adults. There are several causes that explain this situation. The two most common are subadults’ osteological characteristics and, above all, the type of activities carried out by these individuals before attaining maturity. It is well known that the bone tissues of children respond external forces differently to those of adults giving way to different processes and recovery periods (Bilo, Robben, & van Rijn, 2010; Frick & Jones, 2014; Green & Swiontkowski, 2003; Jiménez-Brobei, Al Oumaoui, & Du Souich, 2007; Lewis, 2007, 2014; Symes, Ericka, L’Abbé, Chapman, & Dirkmaat, 2012). Furthermore, there is also a vast chronological and spatial variability as to the types of ventures that can result in recognizable injuries among the skeletons of subadults (play and learning activities, war, and labour) that can generate in each case different degrees of exposure to the different agents of injury. Thus, faced with such a complex reality, it is not surprising to note significant differences of the percentage of traumatic injuries among adults and non-adults of different archaeological populations, as well as the variety of circumstances and events that prompt them (Lewis, 2014).

Studies of violent injuries among subadults and their different origins (abuse, confrontations, massacres, etc.) are compelling from the osteoarchaeological perspective. Recognizing and assessing victims leads to insight into the social and historical relationships giving rise to these violent situations and, in this framework, their exceptional or recurring nature. The number of publications devoted to these questions has increased significantly in recent years highlighting a segment of the ancient populations not receiving due attention that, nonetheless, offers an enormous potential of information. In this
context, cranial injuries are especially informative and although it is true that according to age and cultural context they may be associated with different social scenarios (Lewis, 2014), most clinical, forensic, and bioarchaeological literature unanimously point to the head as the recurrent and preferred target in violent situations, both in adults (Jurmain et al., 2009; Walker, 2001) and subadult individuals (Bilo et al., 2010).

In the current case, the studied population is from an insular context that reveals a relatively high frequency of craniofacial trauma among adults, for the most part linked to interpersonal clashes. The study’s geochronological framework is ideal to undertake deeper research into this subject as it focuses on the North African populations that arrived in the Canarian Archipelago around the turn of the Common Era and that, at least in the case of Gran Canaria, remained isolated from the continent and the other islands for hundreds of years. This scenario led to the development of a strongly hierarchical socio-economic model in Gran Canaria based on agriculture and livestock, at least at the time close to the island’s conquest by the Castilians in the 15th century. In this context, conflicts between groups must have been frequent as recorded by archaeological and ethnohistorical sources. Under these conditions, how was the subadult population affected? Did they live in an environment marked by widespread violence? Were they victims? What ranges of age were mainly affected? The present study therefore attempts to collect data and respond, as fully as possible, to these and other questions in the framework of a general project focusing on the forms of violence among the ancient Canarian islanders.

2 MATERIALS AND METHOD

The study population comprised a total of 65 subadults ranging from 1 to 17 years from the osteological collection of El Museo Canario. Apart from age, the criteria serving to select the samples were preservation of at least 75% of the cranium (including both the vault and the facial skeleton) and absence of alterations or surface erosion impeding direct observation of the skull’s bone tissues. Although the assemblage comprises individuals from nine archaeological sites of Gran Canaria (Table 1: Figure 1), the site of Guayadeque with 42 individuals is the most represented (64.6%). This greater proportion can be explained by two circumstances: the abundance of collective burials concentrated in the southeast of Gran Canaria and that since the end of the 19th century, this area of the island was subject to more intensive explorations aimed at increasing the collection of the El Museo Canario. Most of the individuals (55/65) were discovered in the context of cave burials, whereas 10 originate from two cemeteries with pits and cist burials located in the south of the island (Maspalomas and Mogán).

It is essential to point out that the materials under study constitute a large percentage of subadults surpassing the age of 1 year recovered at archaeological sites throughout the island. The limited number of subadults, compared with the collection of adult individuals preserved in El Museo Canario, is due, among other reasons, to the under-representation of this age group in many of the cemeteries explored to date. Yet it is very complex to pinpoint the reason for this lack of representation. Among the causes are differences of burial practices of certain age groups, taphonomic issues, and the limited interest in infant skeletal remains in Canarian archaeological research until the last third of the 20th century. The early archaeologists were in fact more concerned with collecting adult skulls and long bones that served their raciological objectives (Delgado-Darias, 2009; Estévez-González, 1987). For this same reason only the remains from the cemetery of Maspalomas (n = 8) and one of the individuals from Acusa retain the postcranial skeleton thus obliging the current study to focus exclusively in the craniofacial region. In any case, the bias introduced by the collecting pattern does not seem to affect the representation of the subadults population in the cemeteries analysed, as it is deduced from the percentages of the two archaeological sites with the greatest number of individuals. In Guayadeque, where the remains were collected between the late 19th and the early 20th centuries, subadults represent 10.8% if they are quantified with an unselected sample of adults from this same place (Delgado-Darias, Alberto-Barroso, & Velasco-Vázquez, 2017). In the cemetery of Maspalomas, excavated between 2009 and 2012, this same group of population represents 11.72% of its total. In both cases, individuals older than 3 years represent more than 85% of the overall subadults total.

According to current chronological sequences, the materials under study cover a large portion of the pre-Hispanic occupation of Gran Canaria (Table 1). Specifically, the datings cover long chronological sequences: Guayadeque from the sixth to seventh to the 12th–13th century cal CE; Acusa from the sixth to the 10th century cal CE; and Maspalomas from the 12th to the 15th cal CE (Alberto-Barroso,
2014; Delgado-Darias, 2014). It is an extensive timeframe in which, as revealed by different studies, there appears to be a marked continuity in many of the cultural practices characterising the ancient Canarian islanders, in particular, funerary practices.

Subadult designation (0–17 years in this case) is based on the union of the sphenoid-occipital synchondrosis and third molar eruption. Age estimation, in turn, is based on the analysis of the process of formation and eruption of the dental pieces of both arches (Buikstra & Ubelaker, 1994). In order to establish comparisons, the subjects were grouped into different subsets: infant Ia (0–2 years), Ib (3–7 years), II (8–14 years), and III (≥15 years; Scheuer & Black, 2000). Following the findings of previous research (Fibiger, 2014; Gaither & Murphy, 2012), the current study, to facilitate comparison, settled on two main age groups: birth to 11 and 12–17 years. Unfortunately, for the time being, it is not possible to establish a direct relationship between biological age and social age for the ancient Canarians.

Cranial remains were examined for evidence of fractures. A magnifying glass and a perpendicular light source assisted identification and examination of the characteristics of the fractures. Fracture description is in fact fundamental in order to understand and explain trauma (Lovell, 2008; Martin & Harrod, 2014; Symes et al., 2012). Hence, fractures were classified according to the mechanisms causing them: sharp force trauma, puncture injuries, and blunt force trauma (BFT). These categories are well defined and widely studied in bioarchaeology and forensic anthropology (Galloway & Wedel, 2014; Kranioti, 2015; Lovell, 1997; Torres Rouff & Costa Junqueira, 2006).

In the case of BFT, the injuries from the impacts on the cranial vault were classified according to their morphology: linear, depressed, comminuted, diastatic, radiating and concentric fracture, or combinations of different impacts. The depressed type is based on its form (circular, oval, triangular, or irregular). Recording of each injury also consisted of identifying the location, characteristics of the lesion, state of healing, and dimensions (Timmins, Seréville-Niel, & Brickley, 2017). Furthermore, BFT to the face (mandible, maxillary, nasal, zigomatic bone, and orbit) were differentiated in order to better characterize wound patterns (Galloway & Wedel, 2014; Lovell, 2008; Martin & Harrod, 2014).

Antemortem trauma was diagnosed on the basis of macroscopic evidence of healing, including the presence of porosity near the breaks that indicate bone activity and resorption, rounding of the edges of the break, and/or existence of bony bridges (Sauer, 1998). Perimortem traumatic injuries include sharp edges without remodeling, radiating and/or concentric fractures, hinge fractures, delamination, knapping or flaking (Sauer, 1998). Additionally, the color of the fracture had to be consistent with that of the adjacent bone (Buikstra & Ubelaker, 1994; Sauer, 1998). The statistical comparison of trauma prevalence by subsets was carried out by means of Fisher’s exact, two-tailed test, with a consistent statistical significance of 5%.

3 | RESULTS

The study identified a total of 14 individuals (21.54%) with craniofacial injuries, all suffering from BFT. Two reveal fractures classified as perimortem (2/14, 14.28%), probably the direct cause of death (Figure 2). The general values of the trauma according to site are listed in Table 1.

No significant statistical differences were observed when comparing the sites yielding the greatest number of individuals (Guayadeque, Acusa and Maspalomas; Table 1; Table 3). The results of the assessment by age group (Table 2; Table 3), by contrast, indicate a maximum frequency of lesions affecting group Ib (eight individuals, 25%), especially among the greater ages, followed by group III with 22%, and finally group II with four (19%). Moreover, there are no significant statistical differences when comparing the different age groups among themselves, not even group Ia, despite the fact that 100% of the cranial trauma are detected among individuals older than five. There are also no significant differences between the individuals when grouped into two categories (1–11 and 12–18 years) as the proportions are, respectively, 12 out of 41 (29.27%) and two out of eight (20%; Table 3).
A total of 78.57% of the population with trauma shows single injuries (11/14), while the remaining 14.3% reveal two (3/14). Of the total number of lesions (N = 17), 82.35% are antemortem and 17.65% perimortem. It is noteworthy that of the three subjects with two injuries, one showed two perimortem wounds, another two antemortem wounds, and the last one of each type. With regard to their position (Figure 3), five are on the left parietal (29.41%), three on the right parietal (17.65%), seven on the frontal (41.17%), one in the facial region (5.88%), and one in the occipital region (5.88%).

Most of the trauma types are depressed (14/16, 87.5%), two are linear (12.5%), and an isolated case in the nasal and right maxilla area does not fall into any of the previous categories. The depressed examples exceed, on an average, 15 mm in length along their major axis (Figure 4 and Figure 5), and no significant differences are observed when combining dimensions and positions (frontal: 19.94 ± 14.98 mm, left parietal: 10.908 ± 5.57 mm, right parietal: 19.783 ± 8.27 mm). Although there are few comparative elements, the differences in the size of the antemortem and perimortem lesions are striking as they respectively measure 13.03 ± 6.99 and 38.54 ± 0.4 mm.

### DISCUSSION

The results indicate a high rate of traumatic craniofacial injuries in the subadult population over 5 years (21.54%), values that are much greater than those determined for other archaeological groups in different contexts and chronologies (Fibiger, 2014; Gaither & Murphy, 2012; Krakowka, 2017; Lewis, 2007, 2014; Timmins et al., 2017). A recent study of more than 300 adult individuals at Guayadeque in Gran Canaria (Delgado-Darias et al., 2017) reports a high prevalence of craniofacial injuries (27.4%; 95/347). As clearly it is reflected by the few differences in the percentage of injuries in adults and subadults of Gran Canaria, with no significant statistical differences between each group. (Fisher’s exact test = 0.44111, non-significative [n.s.]). There were also no differences between adults and subadults.
when comparing the percentages of the perimortem fractures ($p = .6381$, n.s.) or the antemortem ones ($p = .3616$, n.s.). Based on the findings of this study, and the comparisons with adults, it is possible to determine the existence of a pattern of cranial fractures that can be classified as characteristic of a significant percentage of the pre-Hispanic population of the Canary Islands ranging from childhood (5–6 years) to adulthood. Hence, it can be argued that the ancient Canarians population, at different stages, suffered a regular exposure to the agents resulting in these types of injuries. This data can also be considered a relevant criterion for the knowledge of the relationships between biological age and social age established among the ancient Canarian. Apparently, from the age of 5–6, the subadults participate in a general social model, even as victims of violence in similar proportions to the rest of the population. The similarities in the percentage of trauma among the different age groups of subadults, as well as between the group III of the subadults (22%) and that of the youngest adults (20.5%; Delgado-Darias et al., 2017) helps to maintain this proposal.
The research carried out to date for the island of Gran Canaria points to violence as the main cause of this type of trauma especially when considering position, dimensions, and typology (Bosch-Millares, 1975; Delgado-Darias et al., 2017; Owens, 2007). Recent studies on violence among the adult population of the ancient Canarians reveal that the greatest concentration of fractures are found on the frontal and facial bones (68.8% of the total) and that there is a higher incidence of lesions to the left parietal than to the right (Delgado-Darias et al., 2017). This is a pattern of recurrent injuries corresponding to wounds resulting from interpersonal aggression, particularly from face-to-face confrontations (Guyomarc'h, Campagna-Vaillancourt, Kremer, & Sauvageau, 2010; Kranioti, 2015; Kremer & Sauvageau, 2009). In the case of the subadult population, the frontal, the facial skeleton, and the left parietal comprise 76.46% of the trauma which, according to the same logic, bolsters the hypothesis that violent actions were behind a significant proportion of the injuries identified among this sector of the population.

In any case, among the assemblage under study, it is not possible to completely discard the possibility of accidental injuries because, apart from the methodological complications to distinguish them, the abrupt relief of the island and the habitual mobility of part of the population also could have resulted in cranial injuries (Velasco-Vázquez, Alberto-Barroso, Delgado-Darias, & Santana-Cabrera, 2017). In this sense, the perimortem linear trauma located in the occipital of one of the subadults of Guayadeque (11 years old), although unique among the whole assemblage due to its position and nature, could well be the result of a backward fall (Guyomarc'h et al., 2010). To these, arguments can be added that a great part of the wounds identified are above the hat brim line which, despite not being a definitive criterion (Lefèvre, Alvarez, & Grandmaison, 2015), serve as evidence that, together with other factors, helps determine a violent nature of the lesions. The age at which the presence of fractures in the studied series begins to be observed, following current forensic criteria (Bilo et al., 2010), may support the notion that accidental falls are no longer the most likely cause of the injuries.

The notion of a violent origin is also bolstered by the characteristics of the wounds, almost exclusively of the depressed type (usually oval or circular) that are most commonly linked to intentional aggressions and not accidents (Bilo et al., 2010; Fibiger, 2014). In addition, these types of lesions are compatible with the weapons commonly used by ancient Canarians made of stones and sticks, at times in the form of clubs (Abreu-Galindo, 1977 [1590–1602]), due to the absence of metal weapons. On the other hand, it must be taken into account that the limited number of linear fractures, rather than indicative of a low incidence, could result, at least in part, from the difficulty of their identification due to the rapid bone regeneration among the subadult population. This may have reached the point of not being visible (Gaither & Murphy, 2012; Jones, 2003; Lewis, 2014). Although it is impossible to estimate the number of these cases, it can be inferred that cranial lesions represent only a part of those suffered by the subadult population, perhaps only those of greater severity (Timmins et al., 2017; Walker, 2001).

The impossibility of examining the postcranial skeleton in most of the individuals renders it difficult to assess the possibility of mistreatment of children among this series. Yet the position, type, and even size of the lesions of the skull (Bilo et al., 2010; Cramer & Green, 2003) bolsters the idea that many were the result of extreme violence. However, the age that they begin to become widespread (basically from 5 to 6 years), and the fact that no other trauma were identified among the known cases with the postcranial skeletons (Acusa and Maspalomas; Figure 6), complicates categorising these aggressions as child abuse, at least, and always following the caution required in these cases, according to current forensic medicine child abuse criteria (Gaither, 2012). The fact that they are found among several age groups, with an equivalent proportion among adults, suggests a scenario of far-reaching physical violence in a society that is not specifically directed toward non-adults at specific moments of their existence.

The chronology of the sites, as well as the absence of sharp injuries, rules out that the aggressions were the result of the process of Castilian conquest of the island in the 15th century (Santana-Cabrera, Velasco-Vázquez, Rodríguez-Rodríguez, González-Marrero, & Delgado-Darias, 2016). Judging from the current evidence, the indications of violence cannot be credited to the arrival of populations from another island as there is no evidence of contacts between Gran Canaria and the rest of the archipelago preceding the Castilian conquest, and in the event that they had occurred, they were not consistent enough to explain a pattern of injury taking place over a long time.

The different findings indicate that the subadults were victims of interpersonal violence generated within the framework of this human group as a result of social tensions originating from different circumstances that are not always possible to identify. In this sense, one must bear in mind that these communities remained isolated, or at least without significant contacts from abroad, for a little more than a millennium, populating a territory of scarcely 1,500 km². Their environment was thus characterised by fragile and fragmented ecosystems modified fundamentally by the development of an economy based on agriculture and livestock, resulting in, among other problems, the progressive reduction of the natural forests (Nascimento et al., 2016).

To these, conditions can be added recurrent episodes of drought or plagues of locusts from the neighbouring African continent that diminished crops, pastures, and water sources essential to the survival of the population.

**FIGURE 6** Individual (5–6 years old) from Maspalomas with a depressed trauma on the right parietal bone [Colour figure can be viewed at wileyonlinelibrary.com]
of populations lacking the possibility to migrate to other territories or receive external assistance. Although documents for the indigenous period are not available, 18 locust plagues and 28 winter rain droughts, among other catastrophes, are recorded subsequent to the Castillian conquest between the 17th and 18th centuries (Arroyo, 2009; García et al., 2003; Herrera, 1979). These catastrophes also at times took place simultaneously provoking famine and high mortality rates among the Canarians of the Old Regime.

Moreover, the existence of large collective granaries serving to store the products of agricultural and livestock surplus could, among other factors, reflect cultural mechanisms deployed by this population to minimize the effects of harsh episodic conditions, as also could the drastic practice of feminine infanticide recorded by European narratives (Abreu-Galindo, 1977 [1590–1602]) serving as a measure of demographic control. Finally, the broad demographic density (12–20 hr/km², according to the authors) also helps explain the existence of social tensions on the island especially in the final stages of Gran Canaria's pre-Hispanic society (Jiménez-González, 1999; Onrubia-Pintado, 2003). Furthermore, the archaeological evidence supports an intensification of agricultural production and pressure on the territory, at least in the 300–400 years before the arrival of the Europeans (Morales-Mateos, 2011).

The data available for Gran Canaria show a global scenario marked by frequent situations that would endanger the fragile balance between the size of the population and the amount of available resources, resulting in a widespread state of stress. Different studies suggest that populations subject to social, political, environmental, or economic pressures experience an increase in violence, including that perpetrated against subadults (Gaither, 2012; Lewis, 2007; Timmins et al., 2017; Tung, Miller, De Santis, Sharp, & Kelly, 2016). This may be the case of Gran Canaria where violence appears to have equally exerted an impact over the whole of the population.

A comparison of the current findings with those obtained in neighbouring Tenerife, the largest of the Canary Islands (3,034 km²) that shares biogeographical and cultural features, offers new elements to assess the question of Gran Canaria. The data regarding head injuries, for example, oscillate between the 25.3% for an assemblage of 182 skulls (Owens, 2007) and 7.4% for 408 individuals (Rodríguez-Martín, 1997; Rodríguez-Martín & Martín-Oval, 2009). In both cases, the injuries are directly linked to interpersonal clashes. But perhaps the most significant data along these lines are that no cranial trauma were detected in individuals under 17–18 years among the large number of samples examined of the Tenerife's pre-Hispanic population (Rodríguez-Martín & Martín-Oval, 2009). It can therefore be deduced that despite sharing common features (isolation, fragile ecosystems, etc.), the two societies reveal differences that may help explain the scenario of widespread violence among the population of Gran Canaria ranging from childhood to adulthood.

In this case, the greatest and most important difference resides in the marked hierarchy of the ancient Canarian society where inequalities were institutionalized imposing asymmetric access to the ownership of land, livestock, as well as to any other fundamental resource vital to survival. Such a scenario has been linked, among other issues, to a nutritional deficit affecting part of Gran Canaria's pre-Hispanic population due to unequal access to food, and in particular to livestock (Delgado-Darias, Velasco-Vázquez, Araya-de-la-Rosa, Martín-Rodríguez, & González-Reimers, 2005; Velasco-Vázquez et al., 1999). Therefore, if we add the interpersonal competition of political and social order to the conditions described above, it becomes simpler to explain a model of widespread physical violence extending to large sectors of the population, including subadults. Judging from the data, they become participants, after a certain age at least, as victims of a system where there is unequivocal evidence of structural and symbolic violence that most often reaches its climax at critical times (Tung et al., 2016). Subadults in these situations would have also be exposed to physical violence, either as combatants, or when considered as potential future combatants, or simply as another target of aggression. Some of these situations, uncommon judging by the data, would have led to the worst of consequences: death. As has also been argued for adults (Delgado-Darias et al., 2017), the predominance of fully recovered injuries and the moderate severity of such wounds seem to indicate that the final objective of most of the aggressions would not intended to cause the death. It is more likely that this violence has its origin in specific confrontations due to socioeconomic factors and that they affect, albeit in an unequal proportion, the whole population.

5 CONCLUSIONS

The prevalence of traumatic injuries among the ancient population of Gran Canaria appears to be the result of a model of society with widespread engrained violence (physical and structural) whose origin can be found both in social differences and in the biogeographical conditions imposed by an insular environment where contacts with the outside world are not known until the Late Middle Ages. In this case, and especially in certain episodes of social instability, it is perhaps possible to view Gran Canaria as suffering from what Tung (2008) defines as indiscriminate violence because it affects different segments of the population in specific historical situations. The potential of making comparisons with other insular populations would allow determining if the isolation in island contexts contributes to inciting violence, a state that is already heightened in conditions of social instability. In any case, the study of the profile of the victims of physical violence helps determine the historical circumstances and the social model in which these aggressions took place. An interesting line of work for future research in Gran Canaria is opened, which addresses, in addition to the injury patterns, the consequences for the subadults population within an insular social model as described.

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