



Research Article

Indigenous violence in Northern Mexico on the eve of contact

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ABSTRACT

La Cueva de Dos Cuchillos, near San Francisco de Borja, is a mortuary cave site in Chihuahua, Mexico. Dating to the late Prehistoric period, commingled human skeletal remains were interred in this cave and are thought to belong to the Tarahumara cultural group. Skeletal analyses indicate that a minimum of 10 adults and 7 subadults were interred at this site. Of these, three individuals exhibited signs of perimortem trauma. This included chop marks on one adult male and perimortem neck fractures on two other individuals. In order to investigate these indications of violence and place the remains in the larger social and political landscape, archeological, ethnographic and ethnohistoric data on the Tarahumara and other groups in the region was examined. This included information on intergroup interactions between the Tarahumara and other local cultures. The results of the analysis indicate that the wounds on these three individuals could be consistent with reports of regional intergroup performative violence. Due to the combination of multiple types of evidence in this case, it is suggested that at least some people at this site were victims of either regional intergroup performative violence, or conflict with non-local groups traveling in this important trade corridor.

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1. Introduction

San Francisco de Borja is a mortuary cave site in Chihuahua, Mexico excavated by Richard and Sheilagh Brooks in the 1950s. The skeletal remains are now curated at the University of Nevada, Las Vegas. This site appeared to be a place where commingled human remains were interred over a period of time. Dating to the late Prehistoric period, these individuals are likely ancestral to the contemporary Tarahumara culture. The purpose of this project was to perform a reanalysis using current scientific methodologies in order to evaluate the initial findings that these remains may have been part of a larger pattern of violence in the region. In addition to using standard osteological techniques to obtain data on individual identity (age, sex, stature and pathological status) the remains were thoroughly analyzed for cut marks, abrasions, fracture patterns and other signs of perimortem cultural modification. The taphonomy of the burial site was reconstructed using original field notes, which were provided by Richard Brooks.

1.1. San Francisco de Borja

Human remains from La Cueva de Dos Cuchillos were excavated from a cave site near the town of San Francisco de Borja during 1956

and 1957 by Richard and Sheilagh Brooks. The town is located in the eastern portion of the Sierra Madre Occidental in the state of Chihuahua, Mexico next to the Rio San Pedro. Its location is shown in Fig. 1. This region has historically been populated by the people of the Tarahumara culture (Brooks and Brooks, 1990). The area around the site has been described by Brooks and Brooks (1990) as foothills with cliff faces containing caves and rock shelters. The cave containing the remains was small with a front to back length of approximately 4 m, a width of 2.5 m in the front and 1.3 m in the back (Brooks and Brooks, 1990). Inside the cave was a midden containing human remains and cultural materials. The depth of the cultural deposit was variable throughout the cave and ranged from 31 cm at the front to 8–11 cm at the back of the cave. This site was gridded by the Brooks' into four quadrants and then excavated in levels of 15 cm. All excavated material was put through a 1/8th inch screen (Brooks and Brooks, 1990).

During the excavation, intermingled artifacts and human remains were discovered. At the surface of the midden, at least four individuals were found. Artifacts on the midden surface included corn cobs, spindle whorls, an arrow foreshaft, basket fragments, corn cobs, gourd cups or ladles, a bone bead, and wooden sticks that had been burned. Below the surface of the midden, artifacts including pottery, shell beads and pendants, manos, pieces of a stone bowl, red ochre, smoothing stones, pieces of baskets, part of a gourd ladle, spindle whorls, a scraper, a chopper and stone flakes were unearthed. Two metal knives and blue beads were also discovered. Even though some of the human remains found in the cave were burned, there was no evidence of fire within the cave (Brooks

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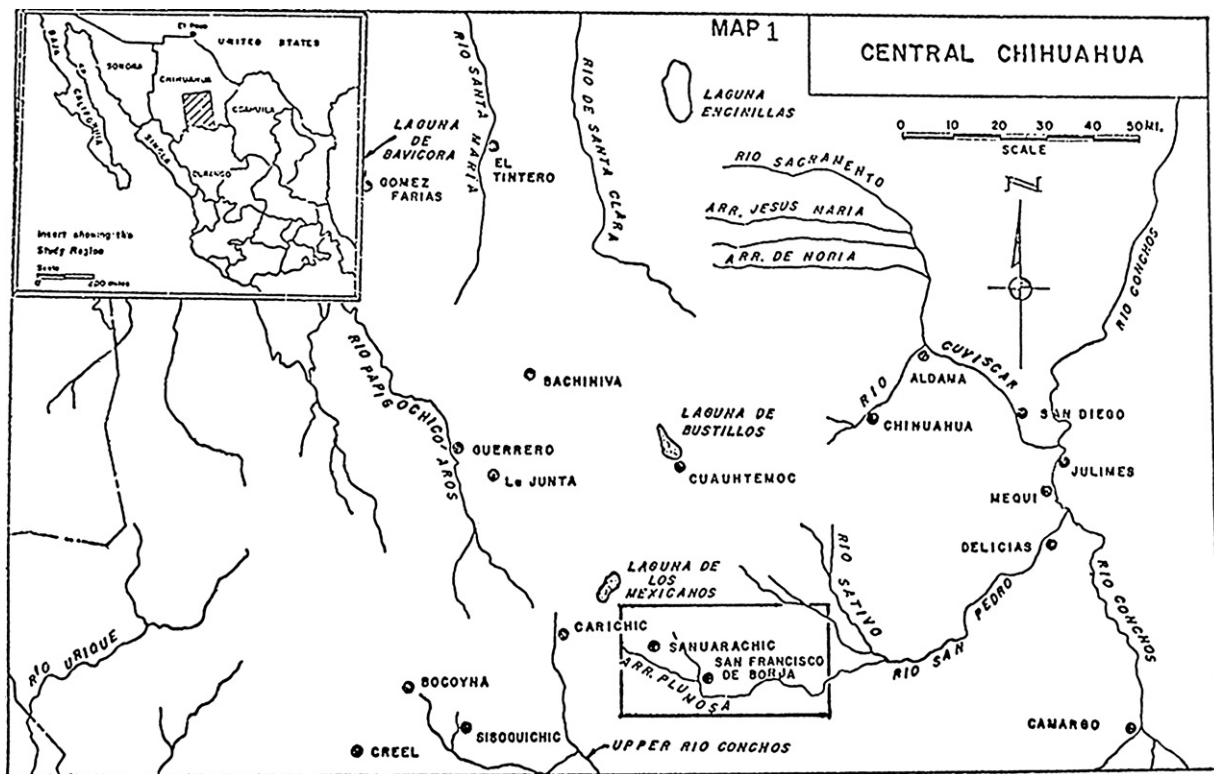


Fig. 1. Map of Chihuahua, Mexico.

Brooks and Brooks (1990).

and Brooks, 1990). The human remains in the cave were not directly associated with any of the artifacts but were commingled and scattered throughout the midden layers. Brooks and Brooks (1990) also suggest that this site may have been a temporary living area before it was used as a burial cave.

In establishing a chronology, the metal knives and beads are of special interest since they were used by Brooks and Brooks (1990, ND) to estimate the date of the site, which was originally thought to be from the 17th or 18th century AD. This date has recently been called into question as an AMS radiocarbon date was obtained on a human bone sample, Burial 1-118, from San Francisco de Borja. The 95% confidence interval provided by the bone sample was Cal. AD 1280–1400, which is well before the Spanish colonial period. Because of this, it is now suggested that at least some of the individuals predate Spanish contact and the placement of Spanish colonial period artifacts in the cave. As only one absolute date has been obtained for this site thus far, it is unknown whether all of the individuals at the site are prehistoric or if some were interred in later time periods.

1.2. Tarahumara mortuary practices

An understanding of Tarahumara mortuary patterns is important for the analysis and interpretation of the human remains from San Francisco de Borja. Through an examination of this information it is possible to distinguish signs of violence from standard mortuary treatment. The Tarahumara have traditionally been a semi-nomadic, semi-agricultural group located in Western Chihuahua, Mexico. At the time of Spanish contact the Tarahumara were bordered by the Tubar, Témori, Tepehuán, Concho, Jova, Pima Bajo, Guazapar, and Varohío cultural groups. All of these cultural groups speak Uto-Aztecan languages that are closely related to each other (Pennington, 1963; Bennett and Zingg, 1976). Tarahumara habitation practices have been described by Lumholtz (1903) and

indicate that, in general, the Tarahumara were mobile and did not reside in the same location for the entire year. Tarahumara burial practices and ideas about the deceased are very particular. In more recent times, the deceased is wrapped in a blanket with their hands tied together on the chest with a cross. A fire is built on the side and near the head of the deceased individual. Items such as food, clothes, and knives are placed on the ground and these are the possessions the deceased used during their lifetime. The body is then carried to a cave where other people have been buried. The body and burial items are set down with a fire at the feet of the deceased. The body is then pushed inside the cave with the food and other items. When this has been completed, the cave is closed with stones and mud (Bennett and Zingg, 1976).

Behaviors similar to these modern Tarahumara practices have also been identified in the archeological record of the Sierra Madre Occidental. In general, the characteristics of Tarahumara burials include the use of caves, multiple interments, wrapping bodies in mats and blankets, placement of fire next to the deceased, and placement of food and personal items with the deceased (Ascher and Clune, 1960; Bennett and Zingg, 1976). While use of fire during the burial ritual was a common practice, the Tarahumara did not intentionally cremate the dead so many of the human burials do not exhibit burning. Waterfall cave is one example of an archeological burial cave exhibiting signs of behavior consistent with the above mentioned practices. At Waterfall cave ten human burials were examined and their context reported by Ascher and Clune (1960) as a way of testing whether this region was used as a trade corridor between the Greater Southwest and Mexico. The human burials consisted of both individual and multiple interments, with flexed positions and skulls facing toward the entrance of the cave. The bodies were wrapped in blankets and then mats, with rocks on top of the mats. A fire pit was also found close to the burials (Ascher and Clune, 1960). Ascher and Clune (1960) found these burial practices to be consistent with ethnographic reports of Tarahumara burials.

A more recent investigation by Walker (2006) included excavation and analysis of thirteen burial caves in the Sierra Madre Occidental and gave detailed descriptions of the human remains from eight of these caves. The burial cave dates range from AD 1099 to AD 1769 and several of these are from approximately the same time period as San Francisco de Borja. All of the prehistoric burial caves except one in this sample contained multiple interments and these were often commingled. One cave showed signs of a fire on the roof of the cave and two additional caves contained burned human remains although the burning in these caves was interpreted as recent (Walker, 2006). Human remains in the caves investigated by Walker (2006) were found in flexed positions and there was evidence that at least some individuals were wrapped in mats. No differences in burial treatments were observed between individuals. Burial items discovered in the caves included ceramics, corn, and lithics (Walker, 2006).

2. Materials and methods

Standard bioarcheological techniques (Acsádi and Nemeskéri, 1970; Bass, 1995; Brooks and Suchey, 1990; Buikstra and Ubelaker, 1994; Lovejoy et al., 1985; Meindl and Lovejoy, 1989; Buikstra and Mielke, 1985; Phenice, 1969; Todd, 1920, 1921) were utilized during the analysis. A complete inventory of all the bones and bone fragments from this commingled assemblage was performed and the minimum number of individuals was calculated based on the skeletal element most represented in the sample (Stodder and Osterholtz, 2010; White, 1992; White and Folkens, 2000; White et al., 2011). When possible, adult age-at-death and sex were estimated based on criteria summarized in Buikstra and Ubelaker (1994). In addition to standard methods based on pelvis and skull morphology as well as measurements of the femora, sex was estimated for all isolated adult second cervical vertebrae using methods outlined in Wescott (2000) and Marlow and Pastor (2011). While this is not a preferred method, it was necessary due to the commingled state of the remains. Age at death was estimated for subadults based upon epiphyseal fusion, dental development and eruption, and long bone length (Anderson et al., 1964; Hillson, 1996; Johnston, 1962; Scheuer and Black, 2000; Smith, 1991). Subadults were placed into age categories as outlined in Lewis (2007). This system consists of three subadults categories, infant (birth–1 year), child (1–14.6 years), and adolescent (14.6–17 years). All individuals over the age of 17 are considered to be adult and were placed into one of 3 adult age categories. These categories include young adult (17–35 years), middle adult (35–50 years), and old adult (50+ years) (Buikstra and Ubelaker, 1994; Lewis, 2007).

All skeletal elements were examined for signs of antemortem and perimortem trauma and, when present, this was recorded. Trauma was identified as perimortem or antemortem based on the presence or absence of healing and fracture morphology (Galloway, 1999; Walker, 2001). Perimortem fracture patterns were interpreted using Galloway (1999), Korres et al. (1994), and Shapiro et al. (1973). Sharp force trauma was identified as perimortem or post-mortem based on the color and morphology of the base of the mark (Buikstra and Ubelaker, 1994). Cut marks and chop marks were assessed based on criteria outlined in Haynes and Stanford (1984) and Shipman (1981). The dimensions of all traumatic lesions were also recorded.

In addition to trauma, all of the human remains from this site were examined for signs of pathology. Pathological conditions were identified by unusual bone formation, bone destruction, abnormal bone shape or size, or unusual bone density (Ortner, 2003). Detailed descriptions of any pathological bone were recorded during the analysis. The information was then compared to the criteria in Aufderheide and Rodríguez-Martin (1998) and Ortner (2003) in

order to perform a differential diagnosis. This information is useful for discussing the health of individuals and the population as a whole at San Francisco de Borja.

Taphonomic data, such as weathering and burning, was also evaluated for the human remains at San Francisco de Borja. Weathering was scored using Behrensmeier (1978) and was considered present at stage 2 or above. Stage 2 is defined by flaking and cracking of the outermost surface of the bone. This was undertaken in order to aid in the identification of individuals who were exposed to the elements or secondarily interred. Presence or absence of burning was assessed and scored using Buikstra and Ubelaker (1994). When burning was present, the color of the bone was recorded as tan, black, or white (calcined) in order to estimate temperature (Buikstra and Ubelaker, 1994).

3. Results

3.1. Demography

The results of the analysis indicate that a minimum of 17 individuals were interred in the San Francisco de Borja burial cave including 10 adults and 7 subadults. The minimum number of individuals was based on the presence of the right and left femora, which were the most abundant elements in this collection. The complete list of the calculated MNI for major skeletal elements is presented in Table 1. The results of the age and sex analysis for this sample are presented in Table 2 and show the presence of children, at least one adolescent, and adults of all three age categories. Both male and female adults are also present, although there are twice as many females as males in this sample.

3.2. Trauma

Evidence for perimortem trauma was found on at least three individuals. These individuals include one of the few non-commingled individuals in the sample, Burial 1-118, and two isolated adult neck vertebrae. Burials 1-118 was the most complete individual in the collection, as most other individuals were commingled and fragmentary, and was approximately 40% complete. This burial number refers to a 50+ year old adult male who

Table 1
Minimum number of individuals.

Element	MNI
Frontal	4
Right temporal	10
Left temporal	10
Occipital	8
Mandible	14
C1	9
C2	7
Right humerus	14
Left humerus	10
Right ulna	14
Left ulna	11
Right radius	13
Left radius	9
Right hand (MC1, MC2)	6
Left hand (MC2)	7
Right os coxa	11
Left os coxa	14
Right femur	17
Left femur	17
Right tibia	14
Left tibia	14
Right fibula	8
Left fibula	9
Right foot (calcaneus)	11
Left foot (calcaneus, talus)	9

Table 2
Results of age-at-death and sex analysis.

Number	Age	Sex
Subadults		
5	Child	Undetermined
1	Child or adolescent	Undetermined
1	Adolescent	Undetermined
Adults		
1	Young adult	Female
3	Middle adult	Female
2	Undetermined	Female
1	Middle adult	Male
1	Old adult	Male
1	Undetermined	Male
1	Undetermined	Undetermined
Total	17	



Fig. 2. Right tibia of Burial 1-118.

displayed extensive perimortem trauma. The left os coxa of this individual exhibited two chop marks, one of which extended from the iliac crest to the center of the iliac blade and was approximately 5.4 cm in length. The second chop mark on this element was slightly anterior to the first and smaller, only 1.5 cm in length. The right tibia also displayed one chop mark across the proximal epiphysis extending from the anterior portion, slightly to the left of center, to the center of the lateral condyle and this mark measured 4.2 cm in length. The third element with signs of perimortem trauma was the left femur, which had one chopmark located on the lesser trochanter, which measured 1.7 cm. All of the chop marks on this individual were very straight and v-shaped in cross section. These are interpreted as perimortem trauma due to the morphology of the bone around the edges of the chop marks and the lack of evidence for healing (Galloway, 1999). The evidence for perimortem trauma on this individual is shown in Figs. 2–5 and described in Table 3. This individual also had signs of active pathology on both tibiae and the right femur and may have been in poor health at the time of death.

Perimortem fractures were also found on two isolated adult second cervical vertebrae, both of which displayed teardrop fractures on the anterior inferior portions of the vertebral bodies.

Table 3
Sharp force trauma measurements for Burial 1-118.

Location	Length (cm)	Width (cm)	Depth (cm)
Left os coxa	5.4	0.4	0.3
Left os coxa	1.5	0.3	0.3
Right tibia	4.2	0.3	0.3
Left femur	1.7	0.4	0.2

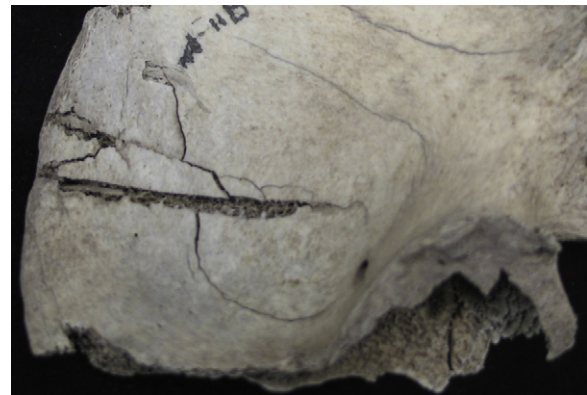


Fig. 3. Left os coxa of Burial 1-118.

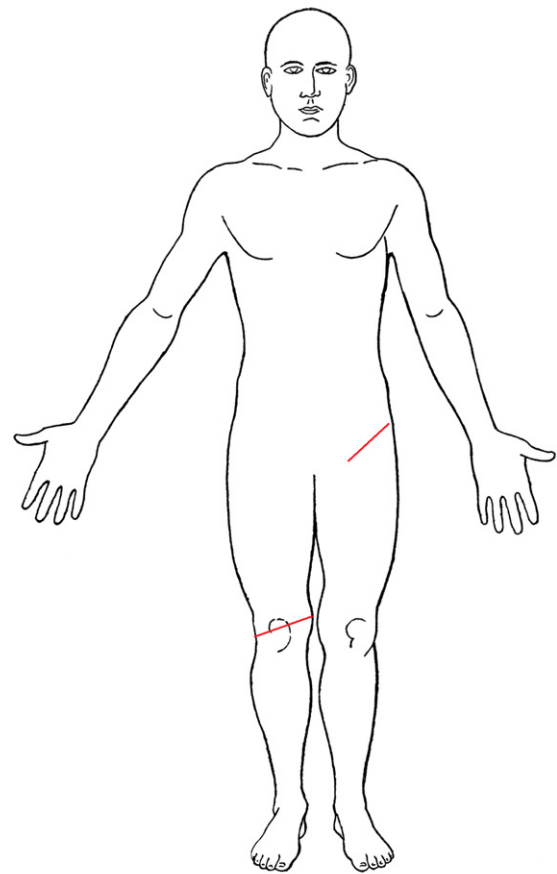


Fig. 4. Body diagram with chop mark locations.

The dimensions of these fractures are included in Table 4 and Figs. 6 and 7 include photos of these fractures. This type of fracture is caused by hyperextension of the neck and occurs when the anterior longitudinal ligament is ruptured as a result of the articular and spinous portions being squeezed together (Galloway, 1999; Shapiro et al., 1973). One of the individuals exhibiting neck trauma in this sample was estimated as male, based on Wescott (2000) and

Table 4
Teardrop fracture measurements.

Sex	Length (cm)	Width (cm)	Depth (cm)
Male	1.6	1.6	0.4
Undetermined	1.0	1.8	0.3

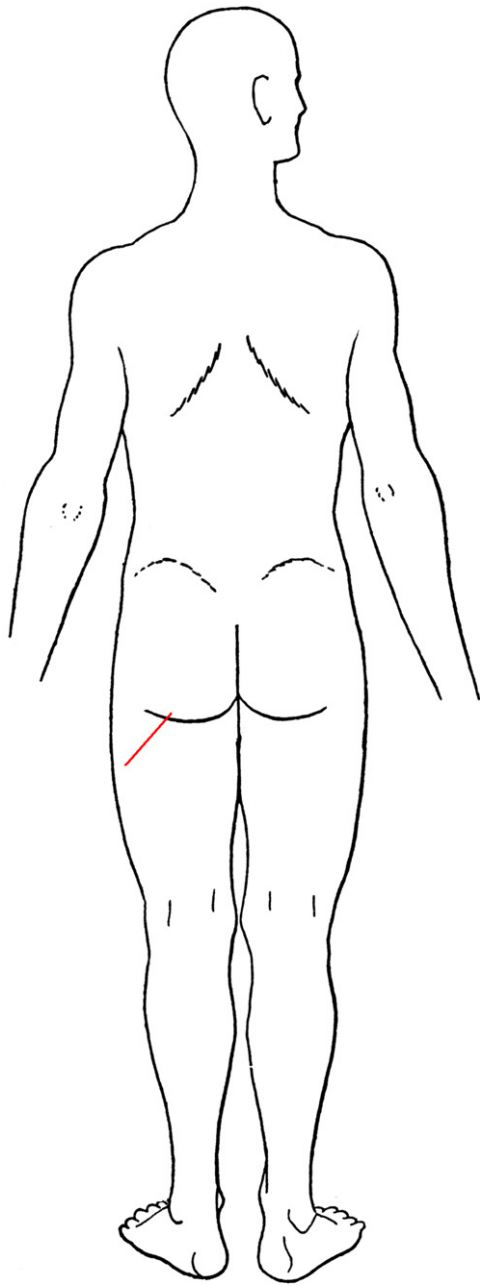


Fig. 5. Body diagram with chop mark locations.

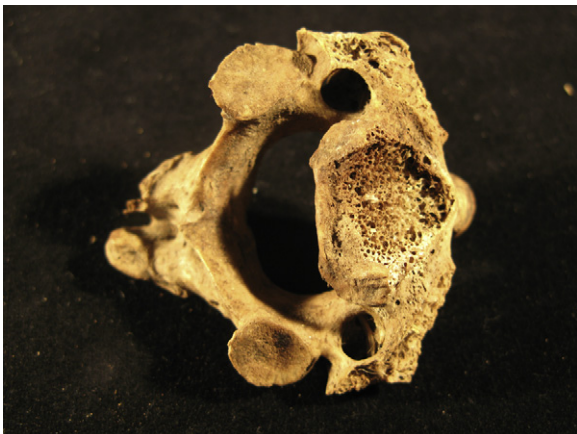


Fig. 6. Teardrop fracture.

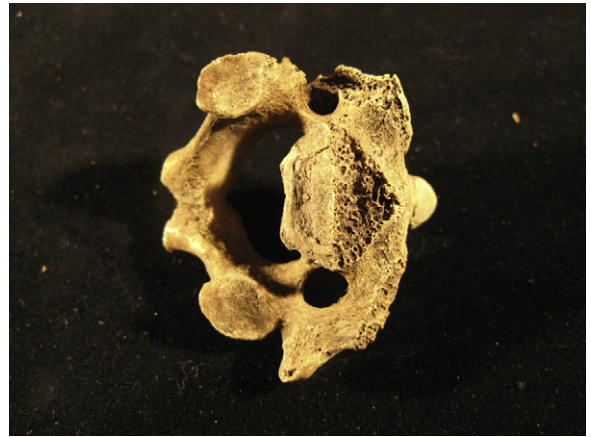


Fig. 7. Teardrop fracture.

Marlow and Pastor (2011), but it was not possible to estimate sex for the other individual. It is interesting that two out of a total of seven recovered second cervical vertebrae (28.5%) display this type of fracture. The authors are not aware of other bioarcheological studies documenting second cervical vertebrae teardrop fractures but modern, clinical descriptions exist. It has been argued that this type of fracture, and most trauma to the upper cervical vertebrae in general, is usually caused by head trauma (Shapiro et al., 1973). In modern times, this fracture most often occurs as the result of motor vehicle accidents but it has also been documented in cases where individuals fell from a height or had a diving accident (Korres et al., 1994). Spinal cord damage may sometimes result from this type of trauma. The portion of bone that separates from the anterior inferior body of the vertebra occurs at the area where the ligament ruptures and is the important indicator for hyperextension injury (Shapiro et al., 1973). According to Korres et al. (1994), this type of fracture is not seen very frequently in clinical settings.

In addition to this, potential perimortem breakage was found on the base of the occipital, across the foramen magnum, on two subadult individuals. The ages of these individuals are estimated, based on Scheuer and Black (2000), as a 5–7-year-old child and a 7–18-year-old child or adolescent. While it was not possible to determine with certainty that these fractures are perimortem, they appear to be consistent with some of the criteria. There is no difference in the color of the bone, for example, between the portion that is fractured and the rest of the bone segment. The fractures on both foramina magnum are very straight and look as if they could have been the result of some type of trauma to the head.

Only one example of antemortem trauma was found in this skeletal sample, which was located on the isolated mandible of an adult female. This individual had an antemortem defect on the right side of the mental eminence. This may be the result of a fracture on the mandible that had healed.

3.3. Pathology

The results of the skeletal analysis also indicated that some individuals suffered from pathological conditions, although it was not possible to identify the condition in most cases. Burial 1-118 had the most severe signs of pathology, with several elements showing signs of healed or active disorders. An active, osteoproliferative periosteal reaction extending down the entire lateral diaphysis of the right tibia was discovered on this individual and is shown in Fig. 8. Periosteal reaction was also found on the left tibia but it was much less severe. The distal epiphysis of the right femur of Burial 1-118 also had a lesion, which may be associated with the pathological condition on the right tibia. Other pathology on this individual



Fig. 8. Periostitis on Burial 1-118.

included healed porotic hyperostosis on the left parietal. The right parietal on this individual is not present and could not be examined. Burial 1-118 also had an osteophyte on the inferior portion of the left calcaneus and lipping on the glenoid fossa of the right scapula.

Pathology was also discovered on a few other individuals and the complete list is shown in Table 5. This included the isolated skull of a male, which exhibited healed porotic hyperostosis on both parietals and the frontal. Another isolated left parietal fragment had some porosity. Osteophytes were discovered on an isolated right calcaneus and a fragment of a vertebral body. The vertebral osteophyte has been interpreted as potential osteoarthritis. Additionally, a fused C2 and C3 was found and appeared to be very asymmetrical. Unfortunately, with the exception of Burial 1-118, it was not possible to associate any of these elements with a specific, complete individual. This limited the ability to estimate the number of

Table 5
Results of paleopathology analysis.

Skeletal element	Condition	Description
Left and right tibia	Non-specific	Periostitis on diaphyses of both tibiae accompanied by lesion on distal right femur. Burial 1-118.
Left calcaneus	Non-specific	Osteophyte located on the inferior surface. Burial 1-118.
Scapula	Non-specific	Lipping around perimeter of glenoid fossa. Burial 1-118.
Left parietal	Non-specific	Healed porotic hyperostosis. Burial 1-118.
Left and right parietals, frontal	Non-specific	Healed porotic hyperostosis
Left parietal	Non-specific	Some porosity on posterior portion
Right calcaneus	Non-specific	Osteophyte located on the inferior surface.
C2 and C3	Fused	Fused C2 and C3 vertebrae. Asymmetrical.
Vertebral fragment	Osteoarthritis	Osteophyte on body
1st proximal pedal phalanx	Non-specific	Lesion on proximal epiphysis
Rib fragments	Non-specific	Porosity

individuals suffering from pathological conditions in this sample. It does appear, however, that at least two individuals (11.7%) had porotic hyperostosis at some point in their lives, which had subsequently healed. This condition is often caused by some sort of anemia and could indicate occasional stress in this population.

3.4. Taphonomy

The results of the taphonomic analysis demonstrate big differences in preservation and presence or absence of burning between individuals. Burning was observed on at least 3 individuals, including 1 adult and 2 subadults. This comprises 17.6% of the total sample from this cave. One adult individual in particular exhibited extensive burning with vertebral, sacral and costal portions of the body burned. The color of the burns ranged from black to white (calcined) on this individual, indicating temperatures up to at least 800 degrees centigrade (Buikstra and Ubelaker, 1994). Additional burials displaying evidence for burning include two subadults with burned crania, several completely burned adult metatarsals, and an adult cranium among others. It was also observed that 4 individuals (23.5%) exhibited signs of weathering. This was in sharp contrast to the very good preservation observed on other individuals, some of which even retained dried tissue. These differences in preservation could be due a number of factors including differential exposure, differences in the postmortem interval, or secondary interment.

4. Discussion

4.1. Ethnohistoric and bioarcheological evidence for regional violence

In order to place the human remains from San Francisco de Borja into the larger social and political landscape, it is necessary to examine the regional context during this time period. While there is considerable bioarcheological evidence for regional patterns of violence elsewhere in the Americas during the Prehistoric period (see Kuckelman et al., 2002; Martin et al., 2008; Osterholtz, 2011; Pérez, 2006 for just a few examples), few of these have focused on the Sierra Madre Occidental. There is, however, considerable ethnographic evidence for similar patterns of violence in Northern Mexico, which will be discussed in this paper. Much of this evidence describes very performative practices of violent conflict. Violence as a performance is significant as it goes beyond the simple act of killing one's victims and becomes a culturally meaningful act. Its impact is not only felt by the victims of the violent trauma, but also by those who are not physically injured but have witnessed the results (Schröder and Schmidt, 2001; Pérez, 2006). This type of violence is also important as it is often used for political purposes as a form of intimidation and social control. In particular, performative practices such as mutilation and display of the corpses of enemies can symbolize the destruction of their society while reinforcing the power of the perpetrators (Pérez, 2006). In this way, the individual body is conquered and serves the purpose of the political body (Scheper-Hughes and Lock, 1987). This way of viewing the motivation behind and impact of violent acts is very important in Northern Mexico, where mutilation and display of corpses had a central role in patterns of conflict.

In order to investigate the perimortem trauma exhibited by some individuals at this site, an examination of the available ethnohistoric information was performed. This was essential for identifying potential regional patterns of conflict and violence. Historical accounts from this time period, written by early 17th century Spanish invaders, describe relationships between the Tarahumara and other indigenous cultural groups living in the region. While reports written by the Spanish can be problematic as far as accuracy

and objectivity, in this case they provide the only information on intergroup relationships in the Sierra Madre Occidental. During the early 17th century, intertribal warfare and violence was common in Northern Mexico. One practice in particular, the taking of the heads of enemies, is reported to have been widespread among all groups in the region and was a practice that had special, ceremonial significance (Beals, 1933, 1973; Moser, 1973; Nelson et al., 1992). The reports describe how the heads of captured enemies were cut off with hatchets and the skulls were then perforated and put on display, a practice that has been compared to the Aztec skull racks (Kelley, 1978; Moser, 1973). These reports by the Spanish describe a regional pattern of intergroup, performance based violence, which existed in the early historic period and perhaps prior to contact as well.

While there have been very few bioarcheological studies in this region that focus skeletal trauma and violence, there is some suggestion of potential violence at least two other late prehistoric Tarahumara burial cave sites, which were described by Walker (2006). This evidence may support previously mentioned arguments for Prehistoric intergroup and performative violence. The first cave, identified as Cueva Juárez, dates to approximately AD 1208–1302 and held the remains of an adolescent female who is reported as having head trauma. This injury is described as blunt force trauma to the basicranium, which led to decapitation of the individual (Walker, 2006). Walker's (2006) interpretation of this is that the female may have died either as the result of an accident or interpersonal violence. This was the only example of perimortem trauma in Cueva Juárez, although two other individuals in the cave demonstrated antemortem trauma (Walker, 2006). The second cave reported by Walker (2006), Hedionda cave, contained the remains of two individuals who died as a result of blunt force trauma to the head and dated to AD 1262–1511. The first, a young adult female, exhibited both antemortem and perimortem trauma to the basicranium and it is suggested that a fracture posterior to the foramen magnum may have been the cause of death. The second individual, a young adult male, also had both antemortem and perimortem head trauma (Walker, 2006). The antemortem trauma described by Walker (2006) consisted of cranial depression fractures near the lambdoid suture. Two perimortem blunt force trauma injuries were discovered as well. The first blunt force injury affected the left side of the skull, specifically the frontal, parietal, and temporal. The second blunt force trauma was to the right side of the skull, posterior and superior to the mastoid process (Walker, 2006). It was argued that the trauma on this second individual is consistent with a fall where the individual hits their head first on the left side and then on the right (Walker, 2006). It is suggested by these authors that the trauma described by Walker (2006) could also be consistent with violence. The potential evidence for violence from caves dating to the same time period, combined with the skeletal data from San Francisco de Borja, provides direct evidence that could be consistent with regional, intergroup violence. It is also relevant, however, to consider possible violent interaction with non-local groups as the Sierra Madre Occidental was a major trade corridor between Mesoamerica and the Greater Southwest.

4.2. Interpretation of San Francisco de Borja

The ethnographic descriptions of Tarahumara burial practices allow for a more nuanced view of the mortuary context at San Francisco de Borja. The interment of multiple individuals over a period of time, which appears to have occurred at this site, is consistent with ethnographic accounts. Additionally, this pattern has been seen at other Tarahumara burial caves in the Sierra Madre Occidental, such as those described by Ascher and Clune (1960), Lumholtz (1903), Pastron and Clelow (1974), Walker (2006), and Zingg (1940). It also explains the disturbed and commingled state

of the remains. The grave goods placed in the cave are consistent with burial goods reported in the ethnographic literature and other archeological sites thought to be Tarahumara. The presence of burning on at least three individuals, while not an intentional practice among the Tarahumara, may have been the accidental result of the placement of fire next to individuals. The reason for the extensive burning on much of the body of one individual is unknown. One possibility is that the blankets and mats wrapped around the deceased, both of which would have been made of flammable materials, could have caught fire, leading to more widespread burning. While the original excavators did not find evidence for fire within the burial cave that would provide an explanation for the burning on these individuals, fire is an important part of Tarahumara burial practices and this part of the ritual may have taken place outside of the cave or in a different location. The wide range of preservation seen on these individuals could also be consistent with use of the cave over a long period of time or differences in exposure. It is also possible that some individuals at this cave site are secondarily interred.

The ethnohistoric descriptions of the social and political landscape of the Sierra Madre Occidental during the early historic period were critical to this research. At least three people from San Francisco de Borja exhibit perimortem trauma suggestive of violence. These types of trauma are not consistent with typical Tarahumara burial practices. According to the ethnohistoric documents, there was a regional pattern of intergroup performative violence, which included the Tarahumara and other local groups. It is suggested in this paper that it is also possible that these practices extended back into the late Prehistoric period. Some of the skeletal evidence from San Francisco de Borja, while not from the historic period, seems to be consistent with Spanish accounts of conflict between indigenous groups. The adult male exhibiting chop marks is an example of this. The three chop marks located on the pelvis and legs of this individual are consistent with chop marks made by a weapon. Weapons such as hatchets, obsidian edged swords, and others have been reported and these items may have been used during intergroup conflict (Beals, 1933; Moser, 1973). It is therefore suggested that the trauma present on this individual is consistent with ethnohistoric accounts of intergroup violence against the local Tarahumara. There is no evidence of trophy head taking with this individuals, however, as portions of the skull were recovered in the cave. While the precise circumstances of this person's death are unknown, this individual, in addition to being in poor health, may have been killed during a raid or warfare against a Tarahumara community. While the regional violence is of potential importance to the interpretations of these injuries, the possibility of interpersonal violence among the Tarahumara cannot be ruled out.

Even though either intergroup conflict between local groups or possibly intragroup violence seem to be likely explanations for the trauma seen at San Francisco de Borja, another possibility exists. There has been compelling evidence that the Sierra Madre Occidental was a trade corridor between Mesoamerica and the Greater Southwest during the late Prehistoric period (Ascher and Clune, 1960; Lister, 1958; Walker, 2006). Artifactual evidence demonstrates that there was interaction and trade between Mesoamerica and Paquimé and that the Sierra Madre Occidental was the likely corridor for this trade (DiPeso, 1974; DiPeso et al., 1974; Walker, 2006). It is also suggested that the Tarahumara would have had at least some interaction with groups traveling through the area. Additionally, there was almost certainly at least some interaction between the Tarahumara and the people living at Paquimé as items such as shell and Paquimé ceramics have been found at sites in the Sierra Madre (Walker, 2006). Because of the interaction between the Tarahumara and groups outside the region, a third possible explanation for the traumatic injuries seen at San Francisco de Borja is interpersonal violence between local and non local individuals.

The perimortem neck fractures found on some individuals could potentially be consistent with interpersonal violence as well. Out of a total of seven second cervical vertebra found at this site, two of these had teardrop fractures (28.5%). This is a higher prevalence than would be expected to occur under normal circumstances. This type of fracture is characterized by a teardrop shaped bone fragment separating from the anterior inferior margin of the second cervical vertebra and is usually caused by acute hyperextension of the neck. There are no known bioarcheological case studies of this type of fracture to be used for comparison, all reports are derived from forensic or medical literature. It is possible that this type of fracture could be caused either by severe, forced extension of the head backwards or removal of the head. Suggestions as to the potential cause of these wounds are tentative but these fractures could also be consistent with practices of violence and head removal, which have been reported as common among the local groups. It is also important that this type of injury is caused by direct trauma to the head, which has been documented at two other late prehistoric Tarahumara burial caves described by Walker (2006). Unfortunately, due to the commingled nature of the remains, it is not possible to determine whether the heads of these two individuals are missing from the collection.

5. Conclusions

Warfare, mutilation, decapitation and the display of the heads of enemies constitutes performative acts of violence against others as a form of intimidation and social control. These practices would have had a profound impact on the Tarahumara people in the region. San Francisco de Borja provides direct evidence of potential victims of this type of violence as three individuals at the site died violent deaths. These data, when combined with violent trauma from two other late Prehistoric Tarahumara sites, suggests that a regional pattern of performance based violence also existed during the late prehistoric. It is important to note, however, that while these data seem consistent with intraregional violence, two other possibilities also exist. First, it is possible the individuals could have fallen victim to non-local groups passing through this important trade corridor. Or second, these could represent victims of intra-group violence among the Tarahumara. Whatever the cause, the hostile political environment and violence would have affected the Tarahumara people living at San Francisco de Borja during the late Prehistoric period. The combination of biological, ethnographic, and ethnohistoric evidence in this case illustrates how individual lives were impacted by regional conflict and how this site fits into the larger pattern of violence in the region.

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References

- Acsádi, G., Nemeskéri, J., 1970. History of Human Life Span and Mortality. Akadémiai Kiadó, Budapest.
- Anderson, M., Messner, M.B., Green, W.T., 1964. Distribution of lengths of the normal femur and tibia in children from one to eighteen years of age. *Journal of Bone and Joint Surgery*. British Volume 46, 1197–1202.
- Ascher, R., Clune, F.J., 1960. Waterfall cave, Southern Chihuahua, Mexico. *American Antiquity* 26, 270–274.
- Aufderheide, A.C., Rodríguez-Martín, C., 1998. *The Cambridge Encyclopedia of Human Paleopathology*. Cambridge University Press, Cambridge.
- Bass, W.M., 1995. *Human Osteology: A Laboratory and Field Manual*. Missouri Archaeological Society, Columbia.
- Beals, R.L., 1973. *The Comparative Ethnology of Northern Mexico Before 1750*. Cooper Square Publishers, Inc., New York.
- Beals, R.L., 1933. *The Acaxee: A Mountain Tribe of Durango and Sinaloa*. University of California Press, Berkeley.
- Behrensmeier, A.K., 1978. Taphonomic and ecologic information from bone weathering. *Paleobiology* 4, 150–162.
- Bennett, W.C., Zingg, R.M., 1976. *The Tarahumara: An Indian Tribe of Northern Mexico*. The Rio Grande Press, Inc., Glorieta, New Mexico, pp. 236–251.
- Brooks, S.T., Brooks, R.H., 1990. Skeletal remains from La Cueva de Dos Cuchillos, San Francisco de Borja, Chihuahua, Mexico. In: *Para conocer al hombre: homenaje a Santiago Genovés a 33 años como investigador en la UNAM*. Universidad Nacional Autónoma de México, Ciudad Universitaria, Mexico, pp. 261–271.
- Brooks, S.T., Brooks, R.H., ND. Unpublished site report.
- Brooks, S.T., Suchey, J.M., 1990. Skeletal age determination based on the os pubis: a comparison of the Acsádi-Nemeskéri and Suchey-Brooks methods. *Human Evolution* 5, 227–238.
- Buikstra, J.E., Mielke, J.H., 1985. Demography, diet, and health. In: Gilbert Jr., R.I., Mielke, J.H. (Eds.), *The Analysis of Prehistoric Diets*. Academic Press, New York, pp. 359–422.
- Buikstra, J.E., Ubelaker, D.H., 1994. Standards for Data Collection from Human Skeletal Remains. *Arkansas Archaeological Survey Research Series No. 44*. Arkansas Archaeological Survey, Fayetteville.
- DiPeso, C.C., 1974. *Casas Grandes Volume 2: Medio Period*. Northland Press, Flagstaff.
- DiPeso, C.C., Rinaldo, J.B., Fenner, G.J., 1974. *Casas Grandes Volume 6: Ceramics and Shell*. Northland Press, Flagstaff.
- Galloway, A., 1999. *Broken Bones: Anthropological Analysis of Blunt Force Trauma*. Charles C. Thomas, Springfield.
- Haynes, G., Stanford, D., 1984. On the possible utilization of Camelops by Early Man in North America. *Quaternary Research* 22, 216–230.
- Hillson, S., 1996. *Dental Anthropology*. Cambridge University Press, Cambridge.
- Johnston, F.E., 1962. Growth of the long bones of infants and young children at Indian Knoll. *Human Biology* 23, 66–81.
- Kelley, E.A., 1978. The temple of the skulls at Alta Vista, Chalchihuites. In: Riley, C.L., Hedrick, B.C. (Eds.), *Across the Chichimec Sea: Papers in Honor of J. Charles Kelley*. Southern Illinois University Press, Carbondale and Edwardsville, pp. 102–126.
- Korres, D.S., Zoubos, A.B., Kavadias, K., Babis, G.C., Balalis, K., 1994. The “tear drop” (or avulsed) fracture of the anterior inferior angle of the axis. *European Spine Journal* 3, 151–154.
- Kuckelman, K.A., Lightfoot, R.R., Martin, D.L., 2002. The bioarchaeology and taphonomy of violence at Castle Rock and Sand Canyon Pueblos. *American Antiquity* 67, 486–513.
- Lewis, M.E., 2007. *The Bioarchaeology of Children: Perspectives from Biological and Forensic Anthropology*. Cambridge University Press, Cambridge.
- Lister, R.H., 1958. *Archaeological Excavations in the Northern Sierra Madre Occidental, Chihuahua and Sonora, Mexico*, with reports by Paul C. Mangelsdorf and Kate Peck Kent. University of Colorado Press, Boulder, pp. 8–40.
- Lovejoy, C.O., Meindl, R.S., Pryzbeck, T.R., Mensforth, R.P., 1985. Chronological metamorphosis of the auricular surface of the ilium: a new method for the determination of age at death. *American Journal of Physical Anthropology* 68, 15–28.
- Lumboltz, C., 1903. *Unknown Mexico*. MacMillan and Co., Limited, London.
- Marlow, E.J., Pastor, R.F., 2011. Sex determination using the second cervical vertebra – a test of the method. *Journal of Forensic Sciences* 56, 165–169.
- Martin, D.L., Akins, N.J., Crenshaw, B.J., Stone, P.K., 2008. Inscribed in the body, written in the bones: the consequences of social violence at La Plata. In: Nichols, D.L., Crown, P.L. (Eds.), *Social Violence in the Prehispanic American Southwest*. University of Arizona Press, Tucson, pp. 98–122.
- Meindl, R.S., Lovejoy, C.O., 1989. Age changes in the pelvis: implications for paleodemography. In: Iscan, M.Y. (Ed.), *Age Markers in the Human Skeleton*. Charles C. Thomas, Springfield, pp. 137–168.
- Moser, C.L., 1973. *Human Decapitation in Ancient Mesoamerica*. Trustees for Harvard University, Dumbarton Oaks, WA.
- Nelson, B.A., Darling, J.A., Kice, D.A., 1992. Mortuary practices and the social order at La Quemada, Zacatecas, Mexico. *Latin American Antiquity* 3, 298–315.
- Ortner, D.J., 2003. Identification of Pathological Conditions in Human Skeletal Remains. Academic Press, San Diego.
- Osterholtz, A.J., 2011. Hobbling and torture as performative violence: an example from the prehistoric southwest. In: Paper presented at the Annual Meeting of the American Anthropological Association, Montréal, November 17, 2011.
- Pastron, A.G., Clewlow Jr., C.W., 1974. The ethno-archaeology of an unusual Tarahumara Burial Cave. *Man* 9, 308–311.
- Pennington, C.W., 1963. *The Tarahumar of Mexico: Their Environment and Material Culture*. University of Utah Press, Salt Lake City.
- Pérez, V.R., 2006. The politicization of the dead: an analysis of cutmark morphology and culturally modified human remains. Ph.D. Dissertation, Department of Anthropology, University of Massachusetts, Amherst.
- Phenice, T., 1969. A newly discovered visual method of sexing in the os pubis. *American Journal of Physical Anthropology* 30, 297–301.
- Scheper-Hughes, N., Lock, M., 1987. The mindful body: a prolegomenon to future work in medical anthropology. *Medical Anthropology Quarterly* 1, 1–60.
- Scheuer, J., Black, S., 2000. *Developmental Juvenile Osteology*. Academic Press, San Diego.

- Schröder, I.W., Schmidt, B.E., 2001. Introduction: violent imaginaries and violent practices. In: Schmidt, B.E., Schröder, I.W. (Eds.), *Anthropology of Violence and Conflict*. Routledge, New York.
- Shapiro, R., Youngberg, A.S., Rothman, S.L., 1973. The differential diagnosis of traumatic lesions of the occipito-atlanto-axial segment. *Radiologic Clinics of North America* 11, 505–526.
- Shipman, P., 1981. Applications of scanning electron microscopy to taphonomic problems. *Annals of the New York Academy of Sciences* 276, 357–385.
- Smith, B.H., 1991. Standards of human tooth formation and dental age assessment. In: Kelley, M.A., Larsen, C.S. (Eds.), *Advances in Dental Anthropology*. Wiley-Liss, New York, pp. 143–168.
- Stodder, A.L.W., Osterholtz, A.J., 2010. Chapter 12. Analysis of the PHR: methods and data collection. In: Perry, E.M., Stodder, A.L.W., Bollong, C.A. (Eds.), *Animas La Plata Project Volume XV – Bioarchaeology*. SWCA, Phoenix, pp. 243–278.
- Todd, T.W., 1920. Age changes in the pubic bone. I. The white male pubis. *American Journal of Physical Anthropology* 3, 285–334.
- Todd, T.W., 1921. Age changes in the pubic bone. *American Journal of Physical Anthropology* 4, 1–70.
- Walker, C.M., 2006. The bioarchaeology of newly discovered burial caves in the Sierra Tarahumara. Ph.D. Dissertation, Department of Anthropology, University of Oregon.
- Walker, P.M., 2001. A bioarchaeological perspective on the history of violence. *Annual Review of Anthropology* 30, 573–596.
- Wescott, D.J., 2000. Sex variation in the second cervical vertebra. *Journal of Forensic Sciences* 45, 462–466.
- White, T.D., 1992. Prehistoric Cannibalism at Mancos 5MTUMR-2346. Princeton University Press, Princeton.
- White, T.D., Folkens, P.A., 2000. *Human Osteology*, 2nd ed. Elsevier Academic Press, San Diego.
- White, T.D., Black, M.T., Folkens, P.A., 2011. *Human Osteology*, 3rd ed. Elsevier Academic Press, San Diego, California.
- Zingg, R.M., 1940. Report on Archaeology of Southern Chihuahua. Contributions to the University of Denver, Center of Latin American Studies, No. 1, Denver.