

SHORT REPORT

Differential Diagnosis of an Unusual Tibial Pathology from Peru

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ABSTRACT During an osteological analysis of human skeletal remains from the site of Punta Lobos (Huarmey Valley, northern coastal Peru), an unusual erosive lesion of the cortex with periosteal reaction was observed on a right tibia. The authors undertook a review of paleopathological and medical literature to arrive at a differential diagnosis. The lesion is determined to be a non-malignant growth, possibly a large periosteal ganglion, though a diagnosis of periosteal chondroma (a benign neoplasm) or other uncommon neoplasm could not be definitively ruled out. Copyright © 2010 John Wiley & Sons, Ltd.

Key words: neoplasm; Peru; tibia

Introduction

In 1998, a Peruvian archaeology team uncovered human remains at a site called Punta Lobos, a small spit of land at the edge of the Pacific Ocean near the mouth of the Huarmey River in northern Peru. Later osteological analysis indicated a minimum number of individuals (MNI) of 178 men and boys of various ages, from as young as 8 to approximately 60 years at the age of death¹. Calibrated radio-carbon dating places the remains at AD 1250–1300. The context of the find and the presence of sharp force trauma in the neck region of many individuals indicate the site was the location of an ancient massacre (Phillips & Verano, 2005; Verano, 2007). Numerous additional pathologies not related to the cause of death were noted among the skeletal remains, including a large lesion with periosteal bone growth located on the anterior of a right tibia. This paper discusses potential diagnoses of this unusual pathology.

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¹A few juveniles had preserved hair, which was cut very short and others had preserved clothing in the form of loincloths. These two features, along with absence of any identifiably female remains led to the assumption that all Punta Lobos victims were male. This conclusion was later supported by an analysis which found male DNA in all of the juvenile hair samples from which DNA was successfully extracted (Scola, 2004).

Material

The lesion was observed in Entierro (Burial) 77, which consisted of the incomplete remains of a single adult. Missing elements were the right arm, left forearm, both hands and the right os coxae and upper leg. Based on pelvic morphology and overall skeletal robustness, E77 was a male individual. An age range of 45–55 years was determined primarily by pubic symphyseal morphology (Brooks & Suchey, 1990), which was supported by the auricular surface morphology (Lovejoy *et al.*, 1985). In addition to the tibial lesion, several pathologies, two of which were traumatic in origin, were noted in E77: (1) a healed fracture of the acromion process of the left scapula with attendant arthritis of the left shoulder joint, (2) a healed fracture of the left femoral neck with some displacement of the femoral head leading to moderate deformation of the both the head and the left acetabulum and (3) a general inflammation of the frontal bone.

Description of the lesion

The lesion was located on the medio-ventral aspect of the proximal diaphysis of the right tibia and appeared to mark the location of a large soft-tissue mass lying between the external cortex and the periosteum. The soft-tissue mass has since decayed,

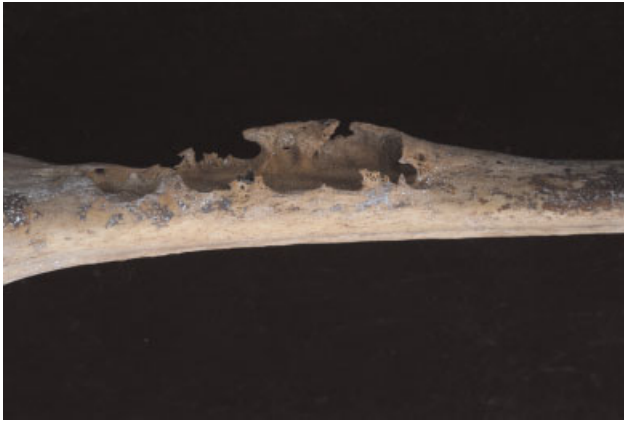


Figure 1. Photo of the right Tibia of E77 (proximal is left). Note periosteal bone growth is greatest on the distal and medial margins of the lesion. Photo by JWV.

leaving a large (12 cm × 3 cm) lesion characterised by saucerisation of the underlying cortex and periosteal reaction in the form of speculated bone growth forming a partial shell around the lesion, predominantly at the medio-distal margin (Figures 1 and 2). There appears to be a little thinning of the tibial cortex in the area of the lesion, but there is no perforation into the medullary cavity. Unfortunately, neither the degree of cortical thinning nor the presence of endosteal sclerosis could be determined because of a lack of access to radiography at the field site where analysis was conducted.

Discussion

Despite its large size, the lesion was determined to be benign based on the intact cortex, the lack of



Figure 2. Photo of right tibia (proximal is right) showing the intact external cortex. Photo by JWV.

perpendicularly oriented new bone growth (indicative of an osteosarcoma) and the tendency for malignant periosteally-located chondroid tumours to invade the cortex (Boriani *et al.*, 1983; Brien *et al.*, 1999; Robbin & Murphey, 2000). Numerous conditions were investigated as possible diagnoses, including ossified subperiosteal hematoma, several kinds of bone cyst and many varieties of benign neoplasm affecting the periosteum. Two possible diagnoses for the tibial lesion are suggested by the subperiosteal location, the saucerisation of the external cortex and the nature of the new bone growth: (1) periosteal chondroma and (2) periosteal ganglion. Periosteal chondroma is a rare, benign neoplasm that originates in the periosteum which has also been referred to as parosteal and juxtacortical chondroma. It is a rare condition, accounting for around only 1% of all chondroid tumours (Brien *et al.*, 1999). Periosteal chondromas produce saucerisation (pressure erosion) of the cortex with a cuff or buttress of newly formed bone at one end, both features which are characteristic of E77's lesion (Bauer *et al.*, 1982; Brien *et al.*, 1999). Periosteal chondromas tend to occur in the hands, feet and proximal metaphyses, although they can also be found elsewhere in the body, and they are more common in males. Arguing against a diagnosis of periosteal chondroma is the age distribution of the neoplasm; in modern times it most commonly occurs in those under 30 years of age, though older patients are reported. The small size (<8 cm) of tumours reported in the literature is also contradictory to the diagnosis of this lesion as a periosteal chondroma (Boriani *et al.*, 1983; Nguyen & Burk, 1995; Robbin & Murphey, 2000). E77's lesion is larger than the reported size ranges for either periosteal chondroma or periosteal ganglion, but Ortner & Ragsdale (2005) point out that medical literature records the appearance of tumours and tumour-like growths of people who are referred to treatment, while archaeologically derived cases are commonly untreated cases. Thus, it is possible that paleopathological examples will be of greater size than clinically reported instances of tumours.

Periosteal ganglia are thought to be caused by mucoid degeneration of the periosteum, possibly as a secondary reaction to trauma (Kobayashi *et al.*, 1996; Valls *et al.*, 1997). Periosteal ganglia have a predilection for the lower extremity, particularly the proximal shaft of the tibia, and are more common in males and older individuals (Abdelwahab *et al.*, 1993; Okada *et al.*, 1996; Valls *et al.*, 1997). Several authors have noted the proximity of many reported periosteal ganglia to the pes

anserinus and its bursa² but did not find conclusive evidence to link the condition with bursitis. A full understanding of the pathogenesis of periosteal ganglion remains unclear, though the potential link between the lesion and trauma is intriguing, because of the presence of other traumatic injury in E77's skeletal remains. Like periosteal chondromas, periosteal ganglia produce saucerisation of the external cortex without expansion into the medullary cavity (Benedetti *et al.*, 1996; Okada *et al.*, 1996; Valls *et al.*, 1997). Valls and colleagues (1997) claim that thick spicules of periosteal bone formation arising from the cortex are common. Again, this fits with the morphology of the lesion in question. As is the case with periosteal chondromas, reported periosteal ganglia tend to be smaller than the lesion observed in E77.

A more secure diagnosis of the lesion in question is difficult as much of the difference between periosteal chondroma, periosteal ganglion and other neoplasms lies in the histopathological features of the soft-tissue mass which is not available in this case. Additionally, each of the possible diagnoses is reported to be very rare, so a diagnosis based on highest prevalence will not be of much use. The saucerisation of the external cortex with an interrupted, partially encompassing periosteal reaction are features common to both periosteal chondromas and ganglia in clinical descriptions. Unfortunately, these descriptions do not include photographs or clear radiographs of dry bone specimens. The emphasis for medical professionals is diagnosis without invasive procedures, primarily through radiography and MRI, but the lack of simple photographs of the actual appearance of the cortical erosion and periosteal new bone at the time of surgical excision hinders paleopathological diagnosis. Therefore, our determination was based on the bony features of E77's lesion, along with the common age range and locations of the two neoplasms. The older age range for patients with periosteal ganglia and its frequent appearance in the proximal tibia suggest that this may be the likelier of the two diagnoses. The diagnosis of a periosteal chondroma cannot be excluded, however, as it has been found in the tibia and in older patients.

Conclusions

Periosteal ganglia and periosteal chondroma are extremely rare disorders, not often reported in medical

literature, much less in the literature of paleopathology. No other clinical or paleopathological description of any condition considered as a potential diagnosis fits the description of the lesion observed in E77's remains as well as periosteal ganglion and periosteal chondroma. However, considering their rarity and given the limitations of paleopathological diagnosis based entirely on macroscopic examination, a diagnosis other than these two conditions cannot be excluded. A review of the paleopathological literature found no case resembling the lesion in question. From a review of the medical literature, it appears periosteal location is a rarely occurring variant for a variety of neoplasms and so it may be that the lesion described here represents an uncommon variant of an otherwise more common tumour or tumour-like lesion.

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²The pes anserinus is the insertion of the combined tendon of sartorius, gracilis and semitendinosus muscles.

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