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A circular depression at the spinoglenoid notch of a prehistoric Andean scapula: Plausible evidence of suprascapular nerve entrapment by a paralabral cyst

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ABSTRACT

While intraosseous cysts have been described in the paleopathological literature, it is rare to find reports concerning effects of soft tissue cysts, although they are relatively common in clinical contexts. Here we present plausible evidence of an extraosseous paralabral cyst, seen in an adult scapula from a Late Intermediate period commingled tomb (ca. AD 1200) at the northern highland site of Marcajirca, Ancash, Peru. The scapula demonstrated a smooth-sided concave depression at the spinoglenoid notch. The depression was notable for its regular appearance, with no bone deposition or destruction. Rather than reflect an intraosseous pathology, the defect likely resulted from pressure erosion from a space-occupying mass. A narrow strip of flattened bone connected the depression to the posterior-superior aspect of the glenoid. The location and morphology of the depression and its connection with the glenoid are consistent with the effects of a paralabral cyst that arose secondary to a tear of the posterior-superior glenoid labrum. A labral tear may act as a one-way valve permitting fluid to flow along a path of least resistance, often to the spinoglenoid notch. A cyst at the spinoglenoid notch would compress the suprascapular nerve, causing weakened function of infraspinatus and its eventual atrophy.

1. Introduction

Though cysts are clinically common, their effects on human skeletal remains have infrequently been described in the paleopathological literature. While intraosseous cysts have occasionally received attention, there are few reports detailing the effects of extraosseous cystic masses that occur in soft tissue. Paralabral cysts of the posterior shoulder often arise subsequent to a posterior-superior tear of the glenoid labrum, which allows joint fluid to extrude into the adjacent soft tissues, where it moves along a path of least resistance. Often progressive in their pathology, these space-occupying masses are most commonly found at the spinoglenoid notch, where they compress the neurovasculature and can cause pressure erosion of the subjacent bone. The most common presentation of patients with paralabral cysts is shoulder pain, weakness in external rotation of the glenohumeral joint (GHJ), and eventual atrophy of the muscle infraspinatus.

This investigation describes a circular, concave depression at the spinoglenoid notch of a scapula recovered from Marcajirca, a highland site located on a steep mountain slope in Ancash, Peru (Fig. 1). This site consists of residential, public, and funerary areas (Ibarra Asencios, 2009). Ongoing investigations have found commingled human skeletal remains in 22 funerary caves and 35 walled tombs (*chullpas*), some of which have been archaeologically tested. Radiocarbon dates of wood samples from tomb roofs (^{14}C date of 865 ± 40 BP, Cal 875 to 742 BP, YU-865, wood) and skeletal remains (^{14}C date of 840 ± 40 BP, Cal 796 to 717 BP, LTL-3853 A, human tooth; ^{14}C date of 430 ± 15 BP, Cal 512 to 499 BP, UCI-185296, human phalanx) place the *chullpas* within the Late Intermediate Period (AD 1075–1450), a volatile time in the Andes (Arkush and Tung, 2013). At Marcajirca, volatility is suggested by the defensive site location, walls along the borders of the site, the presence of slingstones and maces, and evidence of cranial trauma and trepanations (Titelbaum et al., 2013; Verano et al., 2016).

The purpose of this report is to perform a differential diagnosis of the depression, explain how it arose, and discuss how it would have affected the individual, with consideration of the anatomy of the posterior shoulder.

2. Materials and methods

Six commingled *chullpas* at Marcajirca have yielded a total of 306 (145 right, 161 left) scapulae, representing a minimum number of 111 adult and 50 subadult individuals. Adult bones were identified as having complete epiphyseal fusion (Scheuer and Black, 2000). The scapulae were in reasonably good condition, with variable damage to

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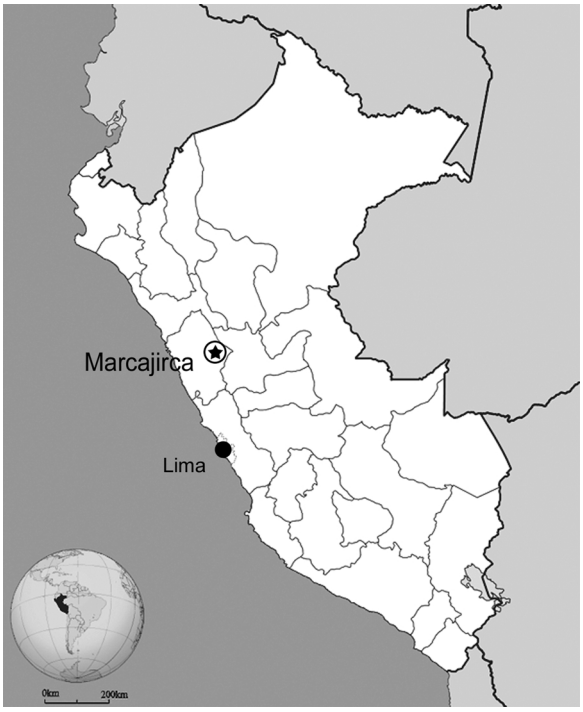

Fig. 1. Location of Marcajirca, Peru. Modified from Huhsunqu (2009).

the bodies.

Each bone was inspected for bone formation/loss, abnormalities of shape/size, fractures, developmental anomalies, and degenerative changes, in accordance with Buikstra and Ubelaker (1994). For adult bones, relative age was assessed by the absence/presence of degenerative joint disease (Aufderheide and Rodriguez-Martin, 1998). Although sex could not be determined with certainty, consideration was given to differences of size and robusticity among the sample, since sexual dimorphism has been observed at other Prehispanic sites in Peru (Verano, 1997; Farnum and Benfer, 2004; Verano, 2003; Titelbaum and Verano, 2017). Radiography was not available at the time of investigation.

3. Results

During analysis, it was noted that one partial adult left scapula demonstrated a pathological circular depression. Though the scapula was missing a portion of its body and medial border due to postmortem damage, the remainder was in good condition. Based on size, robusticity, epiphyseal fusion, and lack of degenerative changes, the scapula was likely from a young adult male. No other skeletal elements could be positively associated with the individual.

3.1. Description of the pathology

The lesion was a circular, smooth-sided, concave depression on the posterior-lateral aspect of the scapula. Located between the base of the scapular spine and the glenoid rim at the spinoglenoid notch, it measured approximately 18 mm in diameter and 5 mm deep. There was no evidence of bone deposition, bone destruction, or increased vascularization (Fig. 2). In addition to the concavity, there was a narrow strip of flattened bone that extended between the depression and the posterior-superior edge of the glenoid rim (Fig. 3). Aside from the depression and the shallow extension to the glenoid rim, no other pathological changes were observed.

Fig. 2. Left scapula with circular depression at the spinoglenoid notch.

4. Differential diagnosis

Other than the actual concavity, the defect was notable for the lack of pathological changes. The regularity of the cortex argues against intraosseous and inflammatory pathologies, the lack of bone remodeling and degenerative changes does not suggest a healed fracture or joint disease, and the defect bears no similarity to known developmental anomalies.

Rather than reflect a pathological process intrinsic to bone, it is more likely the lesion reflects a response to the presence of a space-occupying mass. Indeed, the most likely cause of the depression was pressure erosion from a slow-growing, chronic mass (Monsees et al., 1985). Pressure from a mass may stimulate subperiosteal osteoclastic activity, especially when in proximity to the periosteum (Ragsdale et al., 2017). The osteoclastic activity is accompanied by endosteal osteoblastic deposition, and the result is that the pressure erosion appears as a smooth, shallow, and well-defined defect. In imaging, margins of pressure erosions are often sclerotic, attesting to bone remodeling over a long period of time (Monsees and Murphy, 1985). Importantly, pressure is exerted on the underlying bone without disrupting the periosteum or causing cortical destruction.

There are various pathologies that can lead to pressure erosion. However, in a clinical context, when a space-occupying mass is observed at the spinoglenoid notch, the most likely conditions to consider are hematomas, arterial aneurysms, venous varices, tumors, and cysts (Blankenbaker and Davis, 2016).

4.1. Hematoma

Hematomas form when blood extravasates from a vessel into surrounding tissue, which may lead to swelling and compression of adjacent structures. Typically, hematomas arise secondary to trauma, but can also occur spontaneously (e.g., Heller et al., 2000). Blood vessels usually repair fairly quickly through clotting, however if the bleed persists, the hematoma will continue to enlarge. In the present case, a