



## Case study

# A rare case of os odontoideum from an Early Intermediate period tomb at the Huacas de Moche, Peru<sup>☆</sup>

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## ABSTRACT

Os odontoideum is an uncommon vertebral anomaly where there is a smoothly corticated ossicle independent from a shortened odontoid peg. An example of os odontoideum was observed in an Early Intermediate period skeleton excavated from the Huacas de Moche (Moche IV, AD 400–700), Peru. The affected individual is a middle adult male who presents additional minor developmental anomalies of the axial skeleton. This individual was interred with a middle adult female who also has developmental anomalies of the axial skeleton, including block cervical vertebra (Klippel–Feil). Os odontoideum is infrequently reported in the medical literature and there continues to be debate about whether it is acquired or congenital. Unlike clinical cases, archaeological cases present an opportunity to examine the entirety of the skeleton. In the present case, there does not appear to be macroscopic or radiographic evidence for a healed fracture, and since the individual has multiple minor axial developmental anomalies, a congenital etiology is plausible. This case is the first to be described from the archaeological context of South America and one of few paleopathological examples worldwide.

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## 1. Introduction

Os odontoideum is an uncommon vertebral anomaly where there is a smoothly corticated ossicle independent from a shortened odontoid peg. Although Giacomini first described the case in 1886 (Giacomini, 1886), there continues to be debate about the etiology of the condition in the clinical literature: some posit that it is acquired, while others suggest that it may also be congenital. Part of the challenge is that the condition is often asymptomatic and discovery is incidental. As such, this condition is infrequently reported and incidence is unknown.

An example of os odontoideum was observed in an Early Intermediate period skeleton excavated from a tomb at the Huacas de Moche, in the Moche Valley, Peru (Moche IV, AD 400–700) (Fig. 1). This case is the first to be described from the archaeological context

of South America and one of four reported archaeological examples worldwide. The purpose of this investigation is to describe the condition, attempt to understand the etiology of the present case, and discuss the implications of the diagnosis.

## 2. Materials & methods

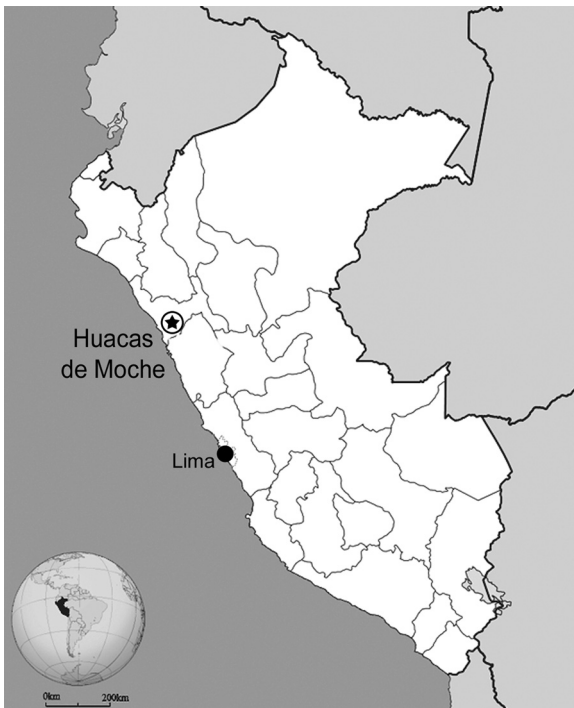
Archaeological excavation in Ladera Sur, an elite residential sector at the Huacas de Moche revealed a pit burial that contained the well-preserved skeletal remains of two adults, extended on their backs on north–south axes (Fig. 2) (Armas et al., 2006). Copper artifacts were found in the mouths of both individuals, and each of their hands held a copper artifact and a pottery fragment. Grave inclusions consisted of several spindle whorls and 16 ceramic vessels, including a stirrup spout bottle with feline imagery and two prisoner effigy vessels. The ceramic vessels correspond to Moche IV (Larco Hoyle, 1948) and date between AD 400–700 (Chapdelaine, 2002). The two individuals received typical elite Moche burial treatment.

Each skeleton was inspected for developmental variations and evidence of pathological conditions, such as infection, joint disease, abnormal size or shape, bone addition or loss, and trauma. Sex was assigned based on dimorphic features of the skull and os coxae (Buikstra and Ubelaker, 1994; Phenice, 1969). Age was estimated on the basis of age-related changes of pubic symphysis and the

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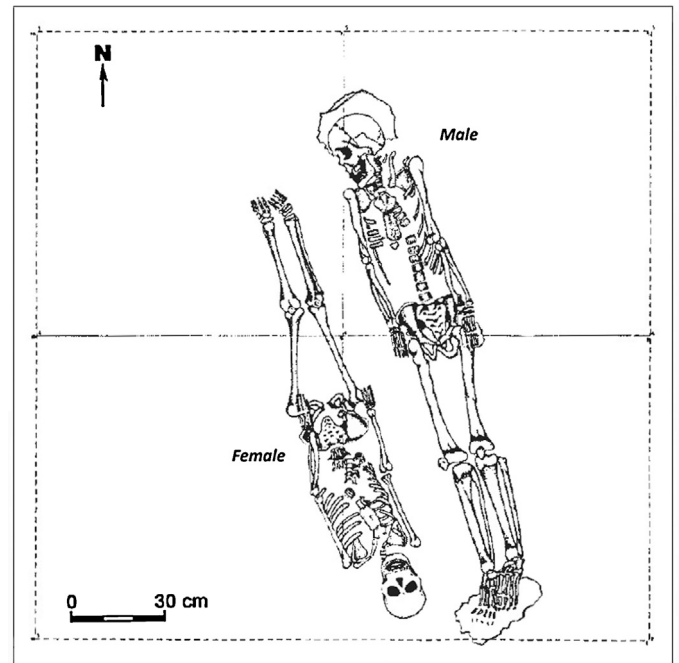


**Fig. 1.** Location of the Huacas de Moche, Peru. Modified from [Huhsunqu \(2009\)](#).

auricular surface ([Todd, 1921](#); [Brooks and Suchey, 1990](#); [Suchey and Katz, 1986](#); [Meindl and Lovejoy, 1989](#) [Meindl and Lovejoy, 1989](#)). Radiographs were taken of the second cervical vertebra of both individuals.

### 3. Results

Based on cranial and pelvic morphology ([Buikstra and Ubelaker, 1994](#); [Phenice, 1969](#)), one individual is a middle adult male (ca. 35–45 years old) with his head to the north, and the other is a middle adult female (ca. 30–40 years old) with her head to the south.



**Fig. 2.** Illustration of the burials in situ. Modified from [Armas et al. \(2006\)](#).

Both individuals demonstrate numerous developmental variations of the axial skeleton, including border shifting and rare anomalies of the second cervical vertebra (C2). Presented here is a description of the male individual.

#### 3.1. The male

The male skeleton has pronounced muscle attachment sites on the upper and lower limbs. His teeth are worn, with minor accumulation of dental calculus and no carious lesions. The upper third molars are congenitally absent. There is distal symphalangism in the fourth and fifth digits of both feet. Remodeling periosteal



**Fig. 3.** C2 vertebra with shortened or hypoplastic dens and separate ossicle. Anterior view.

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