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Benign fibro-osseous lesion of the mandible in a Middle Bronze Age skeleton from Southern Russia

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ABSTRACT

A discrete dysplastic lesion of the mandible found in a skeleton of a young adult male of the Middle Bronze Age in the Northern Caucasus/Russia is described. The periapical lesion of the right lower canine alveolus was examined by digital microscopy, plain radiology, and plain and polarizing microscopy. Its macroscopic, radiologic and microscopic characteristics are discussed in reference to different fibro-osseous lesions arising from the odontogenic apparatus and maxillofacial skeleton. Periapical osseous dysplasia was considered to be the most likely diagnosis.

1. Introduction

Fibro-osseous lesions of the jaws are an occasional find in archaeological skeletons (e.g., Bartelink and Wright, 2005; Colard et al., 2008; Craig and Craig, 2013; Silva and Wasterlain, 2010). In most cases, they had already reached quite a large size by the time of death.

In the case of a well-preserved skeleton of an young adult male from the Bronze Age Caucasus, a very small focus of localized bone proliferation on the apex of the alveolus of the right lower canine, suggesting a fibro-osseous process, was found incidental due to postmortem damage of the mandible.

Periapical pathological changes could have various etiologies, the most frequently discussed in the paleopathological literature being inflammatory/reactive processes (granuloma, cysts) following tooth infections (e.g., Dias and Tayles, 1997; Hillson, 1996). Further pathological processes of the periapical region of the alveolus can be of neoplastic origin. As well as malignant entities, such as sarcomas and carcinomas, benign tumors can be observed: ameloblastoma (Carrascal et al., 2013), odontoma (Anderson and Andrews, 1993), and ossifying fibroma (Colard et al., 2008; Silva and Wasterlain, 2010). Dysplastic lesions are represented by fibrous dysplasia (Craig and Craig, 2013), and osseous dysplasia (Bartelink and Wright, 2005).

The distinction between different fibro-osseous lesions is challenging, even in clinical cases, as these intraosseous diseases, although of varying entities, share common features (e.g., Eversole et al., 2008; Slootweg, 2015; Su et al., 1997a,b; see Table 1 for other sources). The diagnosis in archaeological bone is even more complicated, as diagnostic soft tissue is missing, and postmortem destruction alters bone structures.

On the basis of macroscopic, radiographic and microscopic evaluation, this paper will discuss whether the periapical process can be categorized as a fibro-osseous lesion and, if so, which differential diagnosis is the most probable, considering the limitations of working with archaeological bone.

2. Materials and methods

In 2013, a Russian archaeological team excavated the burial ground of Budyonnovsk 10, in the Stavropol region of South Russia (Fig. 1). The extensive cemetery on the left bank of the estuary (liman) of the Mokraya Buivola river, at its confluence into the river Kuma, is located in the steppe zone and comprises more than one hundred burial mounds, mainly dating to the Middle Bronze Age but with some in use until the late Middle Ages.

This study focuses on the skeleton of burial 14 from burial mound 7. It is a single inlet burial in a catacomb, archaeologically dated to the Late Catacomb Culture (app. 2500–2300 BCE). The individual was buried in the chamber in a crouched position on his left side, with his head to the south (Fig. 2). A ceramic incense burner, a bronze knife and some beads were found as funeral gifts in the grave. The burial was covered with its own mound, which is considered to be a sign of the high social status of the individual.

The skeleton is almost complete and very well preserved. A prominent glabella, pronounced mental protuberance of the mandible,

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Table 1
Benign fibro-osseous lesions of the jaws.

Name	Classification	Localization	Synonyms	References
Fibrous dysplasia	monostotic or polyostotic	maxilla more frequently affected than mandible	monostotic (MFD) polyostotic (PFD)	De Noronha Santos Netto et al. (2013), Eversole et al. (2008), Jundt 2005, Mohammadi-Araghi and Haery (1993), Riminucci et al. (1997), Sissons and Malcolm (1997), Slootweg (1996, 2013, 2015), Speight and Carlos (2006), Waldron (1985, 1993), Worawongvasu and Songkampol (2010)
Osseous dysplasia	periapical osseous dysplasia	in immediate vicinity of tooth apices, anterior mandible	periapical cemento-osseous dysplasia (PCOD), periapical cemental dysplasia, periapical cementoma	De Noronha Santos Netto et al. (2013), Eversole et al., (2008), Mohammadi-Araghi and Haery (1993), Resnick and Novelline (2008), Slootweg (1996, 2005, 2013, 2015), Speight and Carlos (2006), Su et al. (1997a,b), Waldron (1985, 1993), Wilcox and Walton (1989), Young et al. (1989)
	focal osseous dysplasia	only few adjacent teeth, posterior jaw quadrant	focal cemento-osseous dysplasia (FCOD)	
	florid osseous dysplasia	involves multiple parts of the jaws	gigantiform cementoma, Florid cement-osseous dysplasia (FlCOD)	
Ossifying fibroma	ossifying fibroma juvenile ossifying fibroma	mostly in posterior mandible JPOF: bony walls of paranasal sinuses JTOF: mainly maxilla	cemento-ossifying fibroma (COF), cementifying fibroma juvenile psammomatoid ossifying fibroma (JPOF) juvenile trabecular ossifying fibroma (JTOF)	De Noronha Santos Netto et al. (2013), El Mofty (2002), Eversole et al. (1985, 2008), MacDonald-Jankowski (2009), Mohammadi-Araghi and Haery (1993), Pimenta et al. (2006), Shetty et al. (2010), Slootweg (1996, 2012, 2013, 2015), Slootweg and El Mofty (2005), Speight and Carlos (2006), Su et al., (1997a,b), Waldron (1985, 1993), Worawongvasu and Songkampol (2010)

narrow greater sciatic notch and narrow sub-pubic angle indicate the individual is male (Buikstra and Ubelaker, 1994; Ferembach et al., 1979). For age estimation, dental eruption and development (Ubelaker, 1978; AlQahtani et al., 2010) as well as epiphyseal closure (Ferembach et al., 1979; Webb and Suchey, 1985) were considered, suggesting an age between 22 and 25 years.

Pathological changes are mostly visible as abnormal porosity and plaques of porous new bone on the cranium and several postcranial elements. The cranial bones show porous new bone particularly in the attachment areas of the temporalis muscle, but also of the facial muscles, and the skull base. All internal surfaces of the cranium show remnants of porous new bone, as well as the orbits and nasal cavity. Both orbital roofs demonstrate cribra orbitalia. In the postcranial skeleton, abnormal porosity and new bone formation are evident in the thorax (sternum, internal surfaces of right and left ribs), the right scapula, pelvic bones of both sides, proximal parts of both femora, and the shaft of the left femur. The 12th thoracic vertebra shows a large lesion destroying the dorsal rim of the lower plate, possibly of inflammatory origin.

The periapical lesion of the right lower canine alveolus was examined by digital microscopy, plain radiology, and plain and polarizing microscopy. Radiographically, the mandibular lesion was evaluated for its predominant appearance (radiolucent, radiodense, mixed), and its transition to the surrounding bone (demarcated or merging with adjacent bone) using plain radiography (Faxitron 43805N by Hewlett-Packard). Digital microscopy (Hirox KH-870031) was applied to obtain a detailed image of the outer appearance of the lesion within the mandibular body.

Four 60-µm thick sections of the mandible in the sagittal plane in the region of the alveolus of tooth 43 were prepared and subjected to plain and polarizing microscopic analysis (Leica Microscope DM R). They were assessed for (1) osteoclastic and osteoblastic processes, and (2) presence and nature of mineralized tissue within the lesion.

3. Results

3.1. Macroscopic examination

In general, the maxillary and mandibular dentition is healthy (Fig. 3). However, periodontal disease is present as abnormal porosity along all maxillary and mandibular alveoli, especially pronounced at the alveolus of the left maxillary canine. Tooth 63 (a retained canine) is still in place, and tooth 23 is displaced and lays posterior to tooth 21 and 22 (numbering of teeth after Fédération Dentaire Internationale).

Moderate calculus deposits are visible on the crowns of the lower teeth. Dental wear is not severe but is most apparent in the first incisors, with additional wear on their lingual surfaces due to overbite. Exposure of dentin on the crowns of several teeth, including 43, is visible, but in no case is the pulp channel opened. Slight hypercementosis is present on the roots of several teeth, as is small enamel chipping, particularly of the lower incisors. There is slight expression of transversal enamel hypoplasia on multiple teeth, with enamel hypoplastic pitting also occurring. There is no evidence of caries on any of the teeth. No further periapical lesions than the discussed one are present.

Post-mortem breakage of the mandible occurred in the region of the right second incisor. It reveals an approximately 5 × 5 mm large conglomeration of bone plaques enclosing bulky trabeculae located within loose trabecular bone inferior to the alveolus of tooth 43 (Figs. 4, 5 A). This conglomeration seems to adhere to the apex of the alveolus and to the buccal wall of the mandible. In the region of this process, neither the outer surfaces of the mandible, nor the root of the tooth show any indicative changes. Apart from a slight hypercementosis of the root, no signs of resorption or adhering tissue are visible.