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Case study of an osteolitic lesion in the mandible of an individual from Danilo (Croatia)

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Abstract

Objective
This case study presents an osteolytic lesion on the entire mandibular body in an individual from Danilo (Croatia) (17th–18th centuries AD).

Materials
The individual is an estimated male, with the age of death assessed as 45–49 years.

Methods
Macroscopic, microscopic and radiographic methods were used to evaluate the osteolitic lesion. Cone Beam Computed Tomography scans were also collected.

Results
The lesion displays an irregular yet predominantly ovoid outline. Its internal structure is osteolytic with partially eroded internal septa. The radices of tooth 47 exhibit partial, mild resorption.

Conclusions
The findings indicate that we may be dealing with either an odontogenic keratocyst or ameloblastoma. Considering the age and sex of the individual, the specific location and the radiological characteristics, we suggest odontogenic keratocyst as the most likely diagnosis.

Keywords: mandible, odontogenic keratocyst, ameloblastoma, Danilo

Original article

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Introduction

The majority of studies of the masticatory system in historical populations focus on dental calculus (Forshaw, 2022; MacKenzie et al., 2023), dental caries (Bertilsson et al., 2022; Moles, 2023), periodontal disease (Konig et al., 2010; Vodanović et al., 2012), and/or enamel hypoplasia (Berbesque & Doran, 2008; Towle & Irish, 2020). Large osseous lesions associated with bone remodelling are reported less frequently in the literature. These usually include radicular cysts and/or lateral periodontal cysts of inflammatory origin (Carrascal et al., 2013; Neiburger, 1977; Salama & Hilmy, 1951). In this article, we describe a case of a large mandibular lesion from the archaeological site of Danilo (Croatia). To our knowledge, this is the first report of such an extensive mandibular lesion from the Danilo site.

The remains analysed in this study originate from excavations carried out at the Danilo–Cemetery site, located in the central Dalmatian village of Danilo in Šibenik-Knin County, Croatia. Danilo is situated approximately 10 km from the Adriatic coast, within a valley approximately 10 km long and 1.5 km wide, bordered by low ridges (Figure 1). Of particular interest are the cemeteries uncovered at the site, which span the period from the 5th/6th century AD to the early Modern Period (Brajković et al., 2013; Krnčević, 1994). According to 13th-century records, settlement in the area was sparse and organised, as it is today, into hamlets scattered along the edges of the field (Krnčević, 1994), a pattern also reflected by the multiple small medieval cemeteries identified at Danilo (Krznar et al., 2024). A central burial ground, apparently established as early as Late Antiquity, occupied the area around and to the west of St Daniel's Church both before and after the church was constructed, and part of it remains in use today.

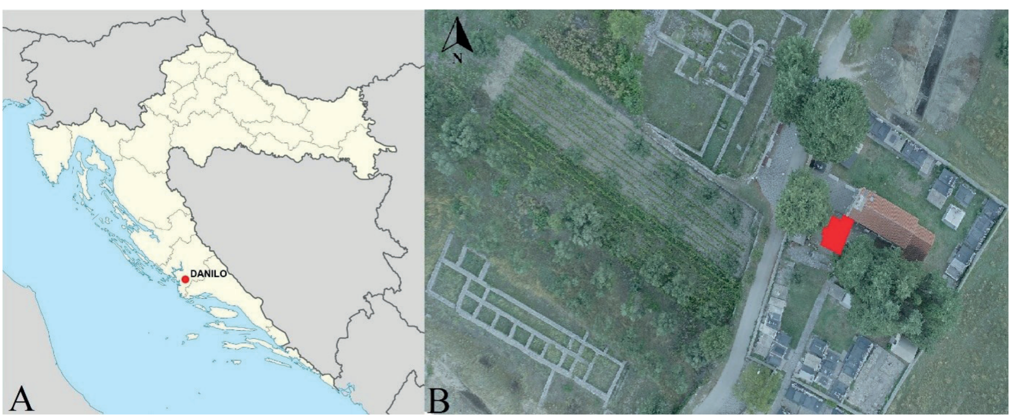

Figure 1. Location of the archaeological site: A – location of Danilo (basemap: Wikimedia Commons); B – aerial view of the cemetery and Stari Šematorij sites with the location of the excavation marked (author: K. Rabiega)

Recent research was initiated at Danilo to investigate changes in settlement patterns from the Roman period to the Middle Ages within this micro-region through remote sensing, the analysis of legacy data, archaeological survey, and excavation (Konestra et al., 2020). A small number of graves has been discovered south of the church, where the modern cemetery is located (Krnčević, 1994; Rabiega et al., 2025). The present case study focuses on Grave No. 2 (G2), which extended beyond the limits of the excavation trench, allowing only its north-western part to be investigated. The grave typology and associated finds indicate that the burials within G2 date to the 17th–18th centuries.

Material and Methods

During the 2024 excavation season, an almost complete skeleton of an adult male (G2 SJ98 U-57/U-59) exhibiting pathological changes in the mandible was excavated at Danilo (Croatia). The skeletal remains included the skull and mandible, both humeri, the left ulna, all vertebrae, ribs, the left scapula, and the right hip bone. The remains were in a good state of preservation. The material was initially examined in the field laboratory at Danilo during the excavation season, while the skull and mandible were subsequently prepared for detailed analyses in specialist laboratories in Poland.

Macroscopic, microscopic, and radiographic methods were used to evaluate the osteolytic lesion. Radiographic examinations were performed at the Department of Dental and Maxillofacial Radiology, Medical University of Warsaw. Cone Beam Computed Tomography (CBCT) scans were acquired using a Papaya3D+ system (Genoray, Seoul, Korea). The scan parameters were as follows: 70 kVp, 7 mA, field of view (FOV) 160 × 160 × 80 mm, voxel size 0.2 mm, and voxel spacing 0.2 mm. The CBCT images were evaluated by a dentomaxillofacial radiologist with 14 years of experience in dental radiology.

Results

The sex of the individual was estimated using both the method proposed by Ferembach et al. (1980) and the more recent method developed by Brůžek (2002), which involves three stages: scoring the pelvic traits, assessing their morphology, and determining sex based on five pelvic features. Sex was also assessed through the morphological evaluation of the skull following the standards of Buikstra and Ubelaker (1994).

Age-at-death was estimated based on morphological changes to the auricular surface of the ilium and the pubic symphysis (Brooks & Suchey, 1990; Buikstra & Ubelaker, 1994; White & Folkens, 2000). According to these criteria, the individual was identified as a male aged between 45 and 49 years at death.

The following teeth are preserved in the mandible: the left canine (33), the left first (34) and second (35) premolars, and the right second molar (47). The alveoli of the remaining anterior teeth remain open, whereas those of the posterior teeth on the left side are completely obliterated. On the right side, all teeth are missing except for tooth 47, as the entire right mandibular body is affected by an extensive osteolytic lesion. The crown of tooth 47 is severely destroyed and appears to have been “burst” from within (Figure 2).

Figure 2. Mandible of individual G2 SJ98 U-57/U-59 with an osteolytic lesion on the right side

In the maxillary dental arch, only the teeth on the right side are preserved: the first (14) and second (15) premolars, and the first (16) and second (17) molars. On the left side, only the second incisor (22) and canine (23) remain. Some of the alveoli on the left side are completely obliterated. The posterior teeth on the right-side exhibit extensive dental calculus deposits on both the buccal and palatal surfaces.

The mandible exhibits a unilateral lesion involving the entire right body of the mandible at the level of the molars, extending into the gonial region and corresponding to the edentulous alveolar segment formerly occupied by teeth 43–46. The lesion has an irregular but predominantly ovoid outline. Its internal structure is osteolytic, with partially eroded internal septa. The lesion measures approximately 41.4 × 22.3 × 22.1 mm in the mesiodistal, craniocaudal, and buccolingual dimensions, respectively. It perforates the cortical bone, producing focal discontinuities along the inferior border, buccal cortex, and alveolar crest of the mandible, while the remaining margins are well defined and surrounded by a rim of reactive osteosclerosis. The roots of tooth 47 project into the posterior aspect of the lesion and exhibit mild, partial resorption. Owing to its mass effect, the lesion displaces the inferior alveolar canal superiorly and buccally. The mental foramen is displaced posteriorly relative to the contralateral side and opens at the level corresponding to the anatomical positions of the missing teeth 45 and 46.

Radiographic assessment also revealed a discrete linear radiolucency consistent with a fracture line traversing the lesion. No reparative osseous changes, such as periosteal callus formation, cortical bridging, or bone remodelling, were identified. Collectively, these findings favour a post-mortem defect rather than an antemortem traumatic fracture. No additional pathological changes affecting the mandible were observed (Figures 3–4).

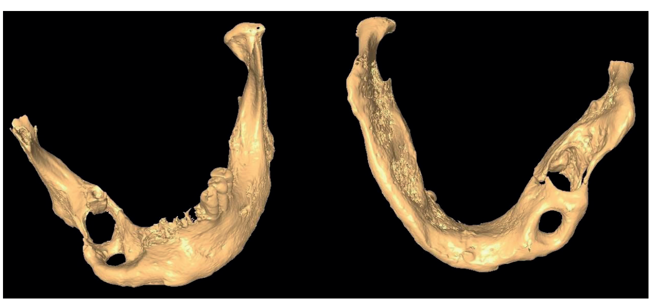

Figure 3. Volume rendering reconstruction of the mandible. To the left is shown anterior view, while on the right the view of the mandible is partly inferior and posterior

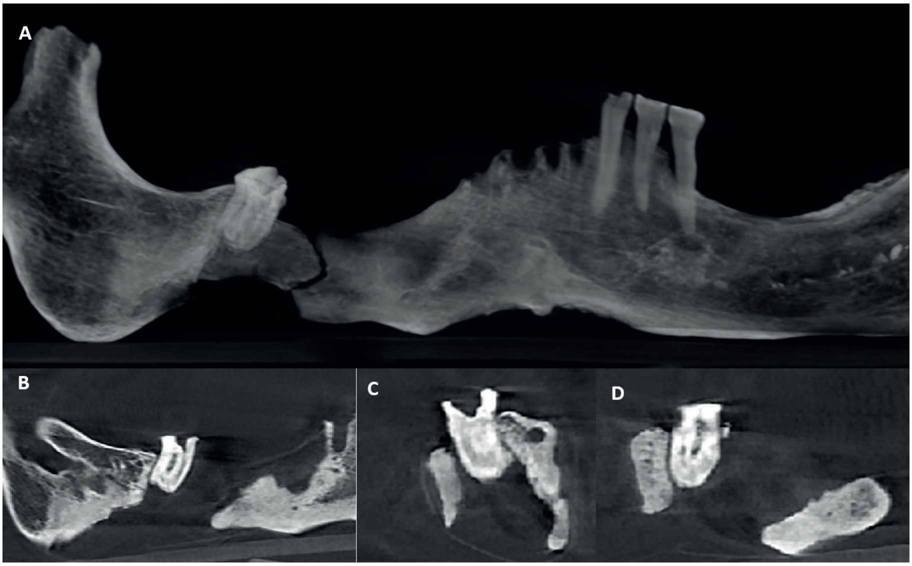

Figure 4. Radiographic image of the osteolytic lesion in three projections: A) panoramic reconstruction, B) oblique slice, C) coronal slice, D) sagittal slice

Discussion

As is often the case with archaeological material, a definitive differential diagnosis is not possible. The principal diagnostic considerations are odontogenic keratocyst and ameloblastoma. Less likely diagnoses include a radicular cyst (Deshmukh et al., 2014), central giant cell granuloma (Butel et al., 2018), adenomatoid odontogenic tumour (More et al., 2013), ameloblastic fibroma (de Castro et al., 2014; Vij & Vij, 2013), and calcifying epithelial odontogenic tumour (Singh et al., 2011).

Radicular cysts rarely enlarge to the extent observed in the present case (Deshmukh et al., 2014). A diagnosis of central giant cell granuloma is considered unlikely, as approximately 75% of cases occur in children and young adults, with the highest incidence during the first three decades of life (Butel et al., 2018). Adenomatoid odontogenic tumour occurs predominantly during the second and third decades of life, exhibits a marked female predilection (approximately 2:1), and most commonly arises in the anterior maxilla, where it is typically associated with an unerupted canine (More et al., 2013). It is estimated that adenomatoid odontogenic tumours account for 2.2% to 8.6% of all odontogenic tumours. Ameloblastic fibroma is a rare (<2%) benign mixed odontogenic tumour composed of ameloblast-like epithelial strands embedded within a dental papilla-like mesenchyme. Most cases occur during the first two decades of life (mean age approximately 15 years), without a clear sex predilection, and show a marked preference for the posterior mandible, frequently surrounding an impacted or unerupted tooth (de Castro et al., 2014; Vij & Vij, 2013). Calcifying epithelial odontogenic tumour (CEOT, or

Pindborg tumour) is a rare benign epithelial odontogenic neoplasm, accounting for approximately 0.4–3% of all odontogenic tumours (Singh et al., 2011).

Odontogenic keratocysts most frequently arise within the mandibular body and ramus (Borghesi et al., 2018). The lesion is most commonly detected in patients aged 20–50 years and shows a male-to-female predilection of approximately 2:1 (Atwal et al., 2019; Bello et al., 2016). The age, sex, and lesion location in the individual from Danilo are consistent with the reported epidemiological data for this condition. Clinically, these lesions may remain asymptomatic for prolonged periods and are therefore most often identified on radiographic examination.

Radiographically, odontogenic keratocysts present as solitary, round to ovoid radiolucent osteolytic lesions with well-defined margins and a surrounding sclerotic border (Borghesi et al., 2018). In larger lesions, the peripheral sclerotic rim may become attenuated or may be entirely absent (Koppula et al., 2015). Odontogenic keratocysts typically arise within the cancellous bone; however, as they enlarge, they may expand and compromise the integrity of the surrounding cortical bone. In more advanced cases, internal septations may develop, resulting in a multilocular radiographic appearance (Batra et al., 2024). Large odontogenic keratocysts may exert a mass effect, leading to displacement of adjacent teeth, deflection of the mandibular canal, and expansion of the bone. Root resorption is occasionally observed and corresponds to the radiological findings in the present individual, which demonstrate mild resorption of the roots of tooth 47.

Multiple odontogenic keratocysts are a characteristic feature of the Gorlin–Goltz syndrome (Abdi et al., 2016). Until the 2022 revision, the World Health Organization classified odontogenic keratocysts as a benign neoplasms, a designation based primarily on the frequent identification of pathogenic PTCH1 mutations in the lesional epithelium. However, the 2022 (5th edition) update reclassified it as a developmental cystic lesion (Soluk Tekkesin & Wright, 2022; WHO, 2022).

A diagnosis of odontogenic keratocyst has been reported in only a few individuals from historical periods, including a case from Egypt dated to approximately 2800 BC (Salama & Hilmy, 1951), a prehistoric American Indian individual (Neiburger, 1977), and a male individual from Santa Magdalena d'Empúries (Chimenos-Küstner & Agustí-Farjas, 2006). The characteristics observed in the present case are consistent with those reported for odontogenic keratocysts in the palaeopathological literature. However, the interpretation of these historical cases was based solely on radiographic and macroscopic findings, without histological confirmation. In the reported cases, particular attention was drawn to pathological changes involving the mandibular ramus. These lesions were osteolytic in nature and exhibited a multilocular appearance. No evidence of an acute inflammatory process, such as irregular bone resorption or reactive new bone formation, was observed. Instead, the lesions were considered more consistent with a benign but locally aggressive odontogenic lesion than with an abscess or post-traumatic pathology (Chimenos-Küstner & Agustí-Farjas, 2006; Neiburger, 1977; Salama & Hilmy, 1951).

Another disease entity that could explain the Danilo case is ameloblastoma. These are classified as benign odontogenic neoplasms with locally aggressive behaviour and represent the most common odontogenic tumours associated with impacted teeth (Soluk Tekkesin & Wright, 2022; WHO, 2022). They typically originate from the odontogenic epithelium of the dental lamina but may also arise from the epithelial lining of odontogenic keratocysts (Kumar et al., 2022).

Ameloblastomas most commonly occur in the mandible and show a higher prevalence in males than in females (Ghai, 2025; Vila et al., 2025). They are most frequently diagnosed between the second and fourth decades of life. It is estimated to account for approximately 10% of neoplasms of this type. Radiologically, ameloblastomas typically present as well-demarcated osteolytic lesions with a surrounding sclerotic margin (More et al., 2012). They may exhibit either unilocular or multilocular radiographic patterns (Ranchod et al., 2021).

Although ameloblastomas generally grow slowly, they can eventually reach considerable size and, in rare cases, produce a pronounced mass effect on adjacent structures (Lovásová et al., 2021). They are capable of causing cortical bone resorption and invading adjacent soft tissues. Root resorption of adjacent teeth is a frequent radiographic finding (Struthers & Shear, 1976). They may also displace the mandibular canal and compromise its cortical boundaries (Evangelista et al., 2021).

Only a few cases of ameloblastoma in historical populations have been described in the literature, including examples from South America (550–850 CE) (Bartelink & Wright, 2011), Italy (5th–6th century BCE) (Capasso et al., 2001), and Italy (17th–19th centuries CE) (Cilli & D'Anastasio, 2017). The most characteristic features of the lesion observed in the present case include its localisation in the posterior mandible (angle and ramus region), marked bony expansion resulting in cortical "ballooning," a multilocular appearance, extensive osteolysis, and thinning and remodelling of the cortical bone with partial preservation of its continuity. The well-defined lesion margins suggest a slow, chronic pathological process.

As only skeletal remains are available, assessment of the functional impact of the lesion is inherently limited. Nevertheless, it is reasonable to assume that the extensive osseous changes observed in the individual from Danilo adversely affected overall well-being and daily functioning. The destruction of the mandible was accompanied by the loss of teeth on the right side, which likely resulted in difficulties with mastication, swallowing, and possibly speech. Given the extent of the lesion, facial swelling and deformity may also have been present. Furthermore, a lesion of this size could have caused paraesthesia or hyperesthesia within the distribution of the inferior alveolar nerve (Vincent's sign), reflecting compression or involvement of the neurovascular bundle (Otto et al., 2009).

The present study has certain limitations. First, it should be noted that the diagnosis is based solely on archaeological skeletal material. No soft tissues are preserved that could definitively confirm the diagnosis. Therefore, in the absence of histopathological examination – which is not always feasible in archaeological contexts – differentiating between ameloblastoma and certain extensive odontogenic cysts can be particularly challenging. In archaeological and historical contexts, diagnosis is usually based primarily on morphological and radiological evidence, which increases the uncertainty of interpretation

(Table 1). A second limitation is the small number of reported cases from historical populations and, consequently, the limited comparative material available for the individual from Danilo. This means that, based on the available evidence, this represents the most likely diagnosis, although alternative explanations cannot be excluded.

Table 1. Comparison of characteristics of ameloblastomas and keratocytes as identified here as two probable diagnoses

Feature	Ameloblastoma	Keratocytes
Location in the mandibular ramus	Yes	Yes
Osteolysis	Yes	Yes
Multilocular appearance	Common	May occur
Well-defined margins	Yes	Yes
Slow growth	Yes	Yes
Local aggressiveness	Yes	Yes
Root resorption	Common	May occur
Mass effect	May occur	Common

Conclusions

Studies of pathological conditions observed in archaeological material are valuable as they allow the investigation of disease patterns and abnormalities in past populations. This study describes a probable case of an odontogenic keratocyst in a male individual aged 45–49 years at death. To the best of our knowledge, this represents the first case of such extensive mandibular bone changes recorded at the examined site in Danilo (Croatia). Further research is needed at archaeological sites where similar mandibular changes are observed, to allow for meaningful comparative analysis.

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Author contributions

JT – research concept and design, conducting biological research, writing the article, final approval of the article, AK – conducting archaeological research, writing the article (archaeological section), FW – conducting archaeological research, KR – conducting archaeological research, writing the article (archaeological section), TB – conducting archaeological research, PR – radiographic examinations, critical revision of the article.

Ethics statement

The human remains are curated at the Institute of Biological Sciences, Cardinal Stefan Wyszynski University, Poland. Research on the presented material did not require ethics committee approval.

Data availability statement

Data are available from the corresponding author upon reasonable request.

Financial disclosure

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Conflict of interest

Co-author Jacek Tomczyk is the President of the Polish Anthropological Society (Polskie Towarzystwo Antropologiczne) of which Anthropological Review is a flagship journal. He was not involved in the editorial handling of this article.

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References

Abdi, I., Talesh, K. T., Yazdani, J., Meshikn Fam, S. K., Ghavimi M. A., & Arta, S. A. (2016). The effect of ameloblastoma and keratocystic odontogenic tumor on the displacement pattern of inferior alveolar canal in CBCT examinations. *Journal of Dental Research, Dental Clinics, Dental Prospects*, 10(3), 155–161. https://doi.org/10.15171/joddd.2016.025

Atwal, A., Cottom, H., Doyle, P., & Sandler, J. (2019). Surgical/Orthodontic management of a large mandibular odontogenic keratocyst. *Dental Update*, 46(5), 473–479.

Bartelink, E. J., & Wright, L. E. (2011). Benign mandibular tumours: two case studies from the Maya Lowland Site Tikal, Guatemala. *International Journal of Osteoarchaeology* 21(3), 351–359. https://doi.org/10.1002/oa.1135

Batra, M., Mohod, S., Sawarbandhe, P. A., & Dadgal, K. V. (2024). Multilocular radiolucent pathology in the body and ramus of the mandible: A case report. *Cureus*, 16(7), e63722. https://doi.org/10.7759/cureus.63722

Bello, IO. (2016). Keratocystic odontogenic tumor: A biopsy service's experience with 104 solitary, multiple and recurrent lesions. *Medicina Oral Patologia Oral y Cirugia Bucal*, 21(5), e538e546. https://doi.org/10.4317/medoral.21181

Berbesque, J. C., & Doran, G. H. (2008). Brief communication: physiological stress in the Florida Archaic – enamel hypoplasia and patterns of developmental insult in early North American hunter-gatherers. *American Journal of Physical Anthropology*, 136(3), 351–356. https://doi.org/10.1002/ajpa.20816

Bertilsson, C., Borg, E., Sten, S., Hessman, E., Sjöblom, H., Lingström, P. (2022). Prevalence of dental caries in past European populations: a systematic review. *Caries Research*, 56(1), 15–28. https://doi.org/10.1159/000522326

Borghesi, A., Nardi, C., Giannitto, C., Tironi, A., Maroldi, R., Di Bartolomeo, F., & Preda, L. (2018). Odontogenic keratocyst: imaging features of a benign lesion with an aggressive behaviour. *Insights Imaging*, 9(5), 883–897. https://doi.org/10.1007/s13244-018-0644-z

Brajković, T., Krnčević, Ž., & Podrug, E. (2013). *Arheološki vodič po Danilu* (1 ed.). Šibenik City Museum. ISBN 978-953-6844-33-3.

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.

Brůžek, J. (2002). A Method for visual determination of sex using the human hip bone. *American Journal of Physical Anthropology*, 117(2), 157–168. https://doi.org/10.1002/ajpa.10012

Buikstra, J. E., & Ubelaker, D. H. (1994). *Standards for data collection from human skeletal remains*. Arkansas Archeological Survey Research Series, No. 44: Fayetteville.

Butel, A., Di Bernardo, G., & Louvet, B. (2018). Central giant cell granuloma: a case report. *Journal of Oral Medicine and Oral Surgery*, 24(1), 24–28. https://doi.org/10.1051/mbcb/2017024

Capasso, L., La Verghetta, M., Caramiello, S., Di Domenicantonio, L., D'Anastasio, R., & Michetti, E. (2001). *Patologia neoplastica nella mandibola (Ameloblastoma) in unsoggetto della necropoli italica di Opi-Val Fondillo (L'Aquila, VI-V sec. a.c.)* (in Italian). Poster. XIV Congresso degli Antropologi Italiani (September 2001; Croce di Magara, Spezzano Piccolo, Cosenza): 208. Publisfera (Cosenza).

Carrascal, S., Chimenos-Küstner, E., Isidro, A., & Malgosa, A. (2013). Cystic mandibular lesion in the antiquity. A rare finding. *International Journal of Osteoarchaeology*, 23(3), 319–323. https://doi.org/10.1002/oa.1251

de Castro, J. F., Correia, A. V., Santos, L. A., Guerra, L. A., Ramos-Perez, F. M., Perez, D. E. (2014). Ameloblastic fibroma: A rare case appearing as a mixed radiographic image. *Journal of Clinical and Experimental Dentistry*, 6(5), e583–587. https://doi.org/10.4317/jced.51471

Chimenos-Küstner, E., & Agustí-Farjas, B. (2006). Probable keratocyst in a mandible from the late Roman era. *Dentomaxillofacial Radiology*, 35, 60–64. https://doi.org/10.1259/dmfr/66396640

Cilli, J., & D'Anastasio, R. (2017). A historical case of an ameloblastoma, from southern Italy. *International Journal of Paleopathology*, 16, 22–26. https://doi.org/10.1016/j.ijpp.2017.01.003

Deshmukh, J., Shrivastava, R., Bharath K. P., & Millikarjuna, R. (2014). Giant radicular cyst of the maxilla. *BMJ Case Reports*. https://doi.org/10.1136/bcr-2014-203678

Evangelista, K., Cardoso, L., Toledo, Í., Gasperini, G., Valladares-Neto, J., Cevidanes, L. H. S., Ruellas, A. C. O., & Silva, M. A. G. (2021). Directions of mandibular canal displacement in ameloblastoma: A computed tomography mirrored-method analysis. *Imaging Science in Dentistry*, 51(1), 17–25. https://doi.org/10.5624/isd.20200132

Ferembach, D., Schwidetzky, I., & Stoukal, M. (1980). Recommendations for age and sex diagnoses of skeleton. *Journal of Human Evolution*, 9, 517–549. https://doi.org/10.1016/0047-2484(80)90061-5

Forshaw, R. (2022). Dental calculus – oral health, forensic studies and archaeology: a review. *British Dental Journal*, 233(1), 961–967. https://doi.org/10.1038/s41415-022-5266-7

Ghai, S. (2022). Ameloblastoma: an updated narrative review of an enigmatic tumor. *Cureus*, 14, e27734. https://doi.org/10.7759/cureus.27734

Konestra, A., Welc, F., Vrkljan, G. L., Brajković, T., & Gračanin, P. A. (2020). Multidisciplinarna istraživanja topografije i krajolika antičkoga Ridera (Danilo, Šibenik) – Pilot kampanja 2019. Godine. *Annales Instituti Archeologici*, 16, 295–297.

Konig, J., Holtfreter, B., & Kocher, T. (2010). Periodontal health in Europe: future trends based on treatment needs and the provision of periodontal services – position paper 1. *European Journal of Dental Education*, 14(s1), 4–24. https://doi.org/10.1111/j.1600-0579.2010.00620.x

Koppula, S. K., Kumar, A., Nandi, D., & Choudhary, A. (2015). Large keratocystic odontogenic tumor of the mandible. *Journal of Indian Academy and Oral Medicine and Radiology*, 27(2), 259–263. https://doi.org/10.4103/0972-1363.170153

Krnčević, Ž. (1994). Novi srednjovjekovni nalazi iz Šematorija na Danilu. *Vjesnik za Arheologiju i Historiju Dalmatinsku*, 86, 275–286.

Krznar, S., Krnčević, Ž., & Turkalj, K. (2024). Luguše and Eraci – two early medieval cemeteries on the edge of Danilsko Polje. *Annales Instituti Archeologici*, 20(1), 194–217. https://doi.org/10.33254/aia.20.1.12

Kumar, V. M., Chakravarthy, A., Sathyanarayana, R., Raghu, K., & Reddy, C. D. (2022). Hybrid ameloblastoma arising from a treated odontogenic keratocyst of the mandible. *Indian Journal of Otolaryngology and Head & Neck Surgery*, 74(Suppl 3), 6180–6188. https://doi.org/10.1007/s12070-021-02889-y

Lovásová, K., Borza, B., Kizek, P., Almaši, M., Kachlík, D., & Hodorová, I. (2021). A case of giant ameloblastoma: destructive effect on the facial skeleton and soft tissues of the head and neck. *Journal of International Medical Research*, 49(10), 3000605211050185. https://doi.org/10.1177/03000605211050185

MacKenzie, L., Speller, C. F., Holst, M., Keefe, K., & Radini, A. (2023). Dental calculus in the industrial age: Human dental calculus in the post-medieval period, a case study from industrial Manchester. *Quaternary International* 653/654, 114–126. https://doi.org/10.1016/j.quaint.2021.09.020

Moles, A.C. (2023). Dental disease reflects differential diets and changes in consumption over time at Knossos. *International Journal of Osteoarchaeology* 33(2), 207–220. https://doi.org/10.1002/oa.3199

More, C., Tailor, M., Patel, H. J., Asrani, M., Thakkar, K., & Adalja, C. (2012). Radiographic analysis of ameloblastoma: a retrospective study. *Indian Journal of Dental Research*, 23(5), 698. https://doi.org/10.4103/0970-9290.107436

More, C. B., Das, S., Gupta, S., & Bhavsar, K. (2013). Mandibular adenomatoid odontogenic tumor: radiographic and pathologic correlation. *Journal of Natural Science, Biology and Medicine*, 4(2), 457–462.

Neiburger, E. J. (1977). A mandibular cyst like lesion in a prehistoric American Indian. *Oral Surgery, Oral Medicine, Oral Pathology*, 43(4), 528–529. https://doi.org/10.1016/0030-4220(77)90103-7

Otto, S., Pautke, C., Opelz, C. (2009). The role of inferior alveolar nerve involvement in bisphosphonate-related osteonecrosis of the jaw. *Journal of Oral and Maxillofacial Surgery*, 67(3), 589–592. https://doi.org/10.1016/j.joms.2008.09.028

Rabiega, K., Konestra, A., Krnčević, Ž., Brajković, T. (2025). Multidisciplinary research into the topography and landscape of Roman Rider (Danilo, Šibenik, Croatia) – first results of the excavations near St. Daniel's church and new data on the medieval cemetery at Šematorij site. *Saeculum Christianum*, 32(2), 280–297. https://doi.org/10.21697/sc.2025.32.2.21

Ranchod, S., Titinchi, F., Behardien, N., & Morkel, J. (2021). Ameloblastoma of the mandible: analysis of radiographic and histopathological features. *Journal of Oral Medicine and Oral Surgery*, 27(6). https://doi.org/10.1051/mbcb/2020051

Salama, N., & Hilmy, A. (1951). An ancient Egyptian skull and a mandible showing cysts. *British Dental Journal*, 90, 17–18.

Singh, N., Sahai, S., Singh, S., & Singh, S. (2011). Calcifying epithelial odontogenic tumor (Pindborg tumor). *National Journal of Maxillofacial Surgery*, 2(2), 225–227. https://doi.org/10.4103/0975-5950.94489

Soluk-Tekkesin, M., & Wright, J. (2022). The World Health Organization classification of odontogenic lesions: A summary of the changes of the 2022 (5th) Edition. Turk. *Patoloji Dergisi*, 38(2), 168–184. https://doi.org/10.5146/tjpath.2022.01573

Struthers, P., & Shear, M. (1976). Root resorption by ameloblastomas and cysts of the jaws. *International Journal of Oral Surgery*, 5(3), 128–132. https://doi.org/10.1016/s0300-9785(76)80061-0

Towle, I., & Irish, J. D. (2020). Recording and interpreting enamel hypoplasia in samples from archaeological and palaeoanthropological contexts. *Journal of Archaeological Sciences*, 114. https://doi.org/10.1016/j.jas.2020.105077

Vodanović, M., Peroš, K., Zukanović, A., Knežević, M., Novak, M., Šlaus, M., & Brkić, H. (2012). Periodontal diseases at the transition from the late antique to the early mediaeval period in Croatia. *Archives of Oral Biology*, 57(10), 1362–1376. https://doi.org/10.1016/j.archoralbio.2012.04.003

Vij, R., & Vij, H. (2013). Ameloblastic fibroma: an uncommon entity. *BMJ Case Reports* https://doi.org/10.1136/bcr-2013-010279

Vila, S., Oster, R. A., James, S., Morlandt, A. B., Powell, K. K., & Amm, H. M. (2025). A Retrospective analysis of 129 ameloblastoma cases: clinical and demographical trends from a single institution. *Journal of Racial and Ethnic Health Disparities*, 12(3), 1612–1620. https://doi.org/10.1007/s40615-024-01993-3

White, T. D., & Folkens, P. A. (2000). *Human osteology* (1 ed.). Academic Press, San Diego.

WHO (2022), *World Health Organization Classification of Odontogenic Lesions: A Summary of the Changes of the 2022* (5th ed.). https://tumourclassification.iarc.who.int/chapters/52 [Accessed July 2026]