

Supernumerary teeth and pseudarthrosis of the mandible in a young male from the mediaeval cemetery in Stenjevec

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Bull Int Assoc Paleodont. 2010;4(1):4-10.

Abstract

Anthropological analysis of a young adult male from the mediaeval Stenjevec skeletal series revealed supernumerary teeth on both sides of the mandible, and an un-united subcondylar fracture of the mandible. The first condition is a developmental abnormality, while subcondylar fractures are one of the most frequent fractures of the mandible. Although, the osteological collection of the Department of Archaeology of the Croatian academy of Sciences and Arts consists of nearly 5,500 skeletons, this is the first documented case that exhibits these conditions in Croatian archaeological skeletal series.

Keywords: Supernumerary Teeth; Subcondylar Fracture; Pseudarthrosis; Croatia; Mediaeval Period

Introduction

Supernumerary teeth are a developmental abnormality that affects the number of teeth whose etiology is not yet completely understood. There are several theories explaining how these anomalies develop. According to one theory, supernumerary teeth are created as a result of a dichotomy of the tooth bud (1). Another theory suggests that supernumeraries are formed as a result of local, independent, conditioned hyperactivity of the dental lamina (1,2). Sometimes this condition is related with syndromes such as Gardiner's syndrome, cleidocranial dysostosis, and cleft lip and palate (3).

The frequency of supernumerary teeth varies between 0.1% and 3.6% in the populations studied (4). They are more frequent in permanent dentition than in the primary dentition (5), and they are more common in males than in females (6). Supernumerary tooth may be single or multiple, unilateral or

bilateral, erupted or impacted, and in one or both jaws. In most cases, multiple occurrences are associated with different syndromes.

Supernumerary teeth are classified on the basis of position and form. The most common position of supernumerary tooth is mesiodens, an extra tooth located in the incisor region. Other supernumeraries are paramolar (tooth present beside a molar), disto – molar (tooth present distal to the last molar) and parapremolar (tooth present beside a premolar) (7). Four different morphological types of supernumerary teeth exist. Conical teeth in the shape of a peg; tuberculate teeth with more than one cusp that are barrel shaped and usually invaginated; supplemental teeth resembling normal teeth; and odontome which are a mass of dental tissue that morphologically do not resemble other teeth (8). Odontological complications associated with supernumerary teeth are: failure of eruption, displacement, crowding, adjacent teeth root resorption, and formation of dentigerous cysts (1).

Concerning the subcondylar mandibular fracture - because of their prominent position in the face the mandible and nose are the most frequently fractured bones in the head. The most common sites of fractures in the mandible are (Figure 1): the mandibular body with a prevalence of between 30-40%, the area immediately anterior of the gonial angle (25-31%); the condyle (15-17%) and the symphysis (7-15%). Fractures of the ramus (3-9%), alveolar bone (2-4%) and coronoid process (1-2%) are relatively rare (9).

According to Ellis et al. (10) condylar fractures are divided into three groups:

- 1) condylar head fracture: an intracapsular fracture located at the border between the condylar head and neck;
- 2) condylar neck fracture: a fracture located below the condylar head but on, or above the lowest point of the sigmoid notch;
- 3) condylar base fracture (or subcondylar fracture): fracture in which the fracture line is located below the lowest point of the sigmoid notch.

Fractures in the condyle region are not as complicated as some other types of mandibular fractures because: a) the affected individual can reach and maintain normal dental occlusion and, b) there are two significant reasons for normal bone healing. The first is that condylar displacement is most frequently an angulation that leaves the fractured ends in fairly close approximation, and the second is that the periosteum and the fibres of the capsule of the temporo-mandibular joint remain, at least in part, as sufficient fixation between the bone ends. The possibility of infection, that would significantly complicate the issue, does not exist except in rare penetrating injuries. In most fractures bony union is apparent in less than two months (11).

The primary causes of mandibular fractures - in more than 75% of the cases today are vehicular accidents and interpersonal violence (12).

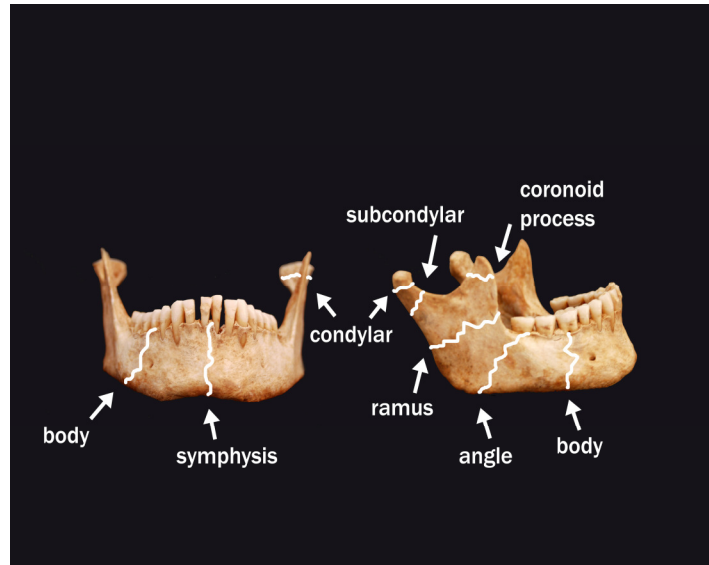


Figure 1. Sites of mandible fractures.

Materials and methods

The skeletal material analyzed in this report was recovered from Stenjevec. Stenjevec is an early Croatian cemetery on the outskirts of Zagreb. Excavation of the cemetery began in 1983, and continued with interruptions until 1997. Archaeologists from the Archaeological Museum in Zagreb excavated a total of 193 graves. The majority of inhumations were oriented east–west (with the head facing east) with the deceased placed on their backs and (in most cases) arms extended along the body. As this was a Christianized population grave goods were rare and consisted primarily of various types of jewellery that were part of the female attire. On the basis of these artefacts use of the cemetery was dated between the 11th to 13th centuries. In terms of cultural affiliation, the cemetery belongs to the mediaeval Bijelo Brdo culture (13).

Skeletons from 169 graves were available for anthropological analysis. Since some graves had multiple burials, the total sample consisted of 185 skeletons: 58 males, 52 females and 75 subadults. The sex and age-at-death of the recovered individuals was determined with the following criteria. Pelvic (14) and cranial morphology (15) were criteria used for sex estimation, and when these elements were missing, discriminant functions for the femur and tibia were used (16, 17). Adult age at death was estimated using pubic symphysis morphology (18) and dental wear (19). In subadult remains, age-at-death was determined using epiphyseal fusion, diaphyseal lengths, and dental eruption criteria (20, 21, and 22).

The cranial and pelvic morphology of the individual with supernumerary teeth and mandible fracture indicates that this individual was a male, and the level of epiphyseal fusion and dental eruption criteria places him between 18 and 20 years at the time of his death.

Results

As the mandible of this young male exhibited slight bilateral postmortem damage from the canine to the first molar, detecting the supernumerary teeth was easy and did not require radiological analysis. An extra unerrupted tooth, located between the two premolars (Figure 2), was present on both sides of the mandible. Both supernumeraries had only partially developed roots but complete crowns. The right supernumerary has a root 1.0 mm in height, while the left has a root of 1.5 mm. The teeth are the same shape as regular premolars, but their crowns are smaller by approximately 2 mm. According to classification on the basis of form and position these teeth represent supplemental parapremolars. Complications such as displacement of normal teeth, crowding or dentigerous cysts were not noted.

This individual also exhibits a subcondylar fracture on the left side of his mandible that completely separated the condyle from the mandibular ramus (Figure 3). The fracture line is located 10 mm below the lowest point of the sigmoid notch and is 26 mm long. New bone formation is located on both the outer and inner sides of the left ramus. The fragment is completely separated from the rest of the mandible with both elements exhibiting closed margins and no bone union. The morphological appearance of the fracture is consistent with non-union or pseudarthrosis.

The individual also has chipped teeth (antemortem damage to the crown of the tooth) on the left side of his maxilla and mandible (Figure 4). Small pieces of enamel are missing on the buccal sides of the left maxillary canine, both maxillary premolars, and the first maxillary molar, as well as on the labial side of the left mandibular first molar. The greatest amount of damage is noted on the molars: the maxillary first molar lacks a surface of approximately 8×7 mm, while the mandibular first molar is missing an area of approximately 7×6 mm.

This individual also exhibits as well healed antemortem fracture of the left superior articular facet of the first cervical vertebra (Figure 5). There is a healed fracture line approximately 11 mm long that passes transversely across the entire surface of the superior articular facet. No evidence of trauma is noted on the left occipital condyle.



Figure 2. Left mandibular unerrupted parapremolar.



Figure 3. Subcondylar fracture of the left side of the mandible.

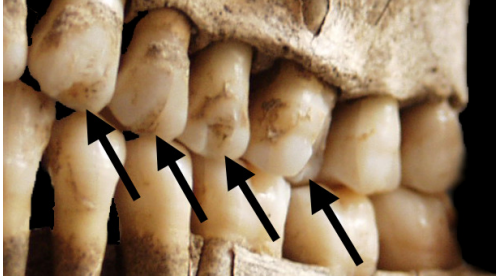


Figure 4. Chipped teeth of the left side of the maxilla.



Figure 5. Fracture of the first cervical vertebrae.

Discussion and conclusion

Dentists today are familiar with supernumerary teeth as a developmental abnormality that appears in both jaws. Usually, they come across such cases when problems with teeth displacement, crowding, or failure of eruption occur. The young male from Stenjevec in all likelihood wasn't even aware of his condition, as the previously mentioned complications are not noted in his mandible. Of interest is the fact that this is the first case of supernumerary teeth noted in the osteological collection of the Department of Archaeology of the Croatian Academy of Sciences and Arts, a collection that currently holds approximately 5,500 skeletons. A simple explanation lies behind the low frequency of individuals with supernumerary teeth – most jaw bones in this collection are well preserved and were not X-rayed. The frequency of supernumerary teeth would, no doubt, increase if all of these bones were to be radiologically analysed. This case was discovered by purely accident, simply because of the fact that the mandible was damaged postmortem.

The mandible fracture represents a completely different situation. This was, without doubt, a very painful injury additionally complicated by non-union of the separated bony elements. Individuals with this complication often suffer from infection, pain, and in some cases even trismus (the inability to normally open the mouth) that can result in malnutrition, deformity, and permanent disability (23).

In cases where there are no additional complications fracture repair begins within a few hours of the injury being sustained, and the various phases of fracture healing proceed without interruption until, depending on the age, sex, and health of the individual, complete union is achieved. However, it is important to note that even minor disturbances during the earlier stages of healing can delay or stop regeneration. The most common causes of non-union are faulty fixation of the fracture site, infection, interposition of other tissue between the broken ends, and inadequacy of innervation and vascular supply.

Non-union of mandibular fractures is fairly infrequent in modern clinical cases. Analysis of 1,432 mandibular fractures recorded in North American patients treated from 1994 to 1998 had non-union as a complication in just 25 cases (or 2.8%). The condylar region was affected in 2 cases giving a frequency of non-union fractures for this area of the mandible of 8.0%. Of interest is the fact that the

majority of individuals (20/25) with this complication were as is the case in our example, males and the most common cause of the fracture was interpersonal violence - in 77% of the cases. Accidents in the form of falls accounted for just 9% (23).

Besides the mandibular condylar fracture the individual from Stenjevec exhibits chipping of five tooth crowns – all on the left side, as well as a healed fracture of the left superior articular facet of the first cervical vertebra. Careful analysis of the remainder of the well-preserved skeleton revealed no other fractures. The total pattern of injuries in this individual is therefore compatible with both a scenario in which his injuries were caused by interpersonal violence, and one in which the injuries were caused by an accident such a fall. Of these two, the accident scenario seems slightly less probable. In analysis of skeletal material accidents involving falls are usually accompanied by fractures of the distal radius – the reason being that the falling individual attempts to break his fall with his outstretched hand and thus fractures the distal part of his radius. If the injuries suffered by the male from Stenjevec (all of which involve the left facial and upper neck region) were the result of a fall it would have to have been a very unexpected fall, one in which he did not even have the time to outstretch his hand. The interpersonal violence scenario is slightly more realistic because: 1) interpersonal violence is the leading cause of non-united mandibular fractures today, and 2) the fracture is located on the left side. Injuries to the left frontoparietal region are usually interpreted in bioarchaeological and forensic analysis as the result of single face-to-face fighting with a right handed opponent (24,25).

Whatever the cause of his injuries, there is little doubt that non-union of the mandibular fracture profoundly affected the quality of life of the young male from Stenjevec. In modern settings, with modern surgical care, this complication is accompanied with infection, pain, trismus, and emotional depression all of which can lead to malnutrition and deformity (23). There is little doubt that the consequences of such an injury during the medieval period were dire, and there is a good chance that the young age-at-death of this individual was related to this injury.

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