ORTHODONTIC STATUS OF A SARMATIAN MAN FROM THE FOURTH CENTURY A.D.

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Rezumat. Acest articol prezintă studiul paleodontologic al unor rămășițe umane dintr-un sit arheologic de la marginea Timișoarei, datând din secolul IV dHr și atribuite unui bărbat de origine sarmată. Scheletul a fost îngropat în decubit dorsal, cu mâinile pe lângă corp și picioarele încrucișate, sugerând un ritual de inhumație. Inventarul de inhumare cuprindea fragmente dintr-un pahar de sticlă, o fibulă de argint, o monedă de bronz cu legenda indescifrabilă și o lamă de cuțit de fier, artefacte specifice unui individ din clasa nobiliară.

Studiul nostru prezintă o analiză dentară și ortodontică a fragmentelor de maxilar, având aproape toți dinții prezenți, în lumina celor mai noi cunoștiințe cu privire la etiologia malocluziilor. Am beneficiat de investigații imagistice de tip computer tomograf și software de reconstrucție radiologică, oferind date suplimentare în sprijinul unui diagnostic și plan de tratament ipotetic cât mai complet.

Anomalia prezentată este o ocluzie inversă unilaterală cu deficit minor de spațiu la nivelul dinților frontali inferiori. Nu au fost găsite elemete de patologie dentară, dinții fiind indemni de carie, însă cu edentația molarului prim inferior dreapta, ceea ce a dus la o ușoară migrare mezială a molarului doi inferior dreapta. Statusul dentar bun confirmă teoria unui statut nobiliar al defunctului.

În concluzie, rezultatele acestui studiu sugerează faptul că malocluziile existau și în timpuri mult mai îndepărtate de zilele noastre, acestea nefiind în niciun caz un fenomen recent.

Cuvinte cheie: paleodontologie, ortodonție, malocluzie, dentar, arheologie.

1. Introduction

The study of skeletal and dental features of old specimens is of utter importance, as it allows us a glimpse into our past as humans and it gives us a chance to find out important data about the health, diet and habits of people we may have limited recorded writings from.

The dental status of an individual may shed some light onto the importance of health care of people from that particular period of time, of tools and materials used for this purpose and of their diet.

With regards to orthodontic anomalies, we are still trying to comprehend the full picture of their causes and development in human population. That is why any findings of orthodontic anomalies from such a distant period of time is very interesting to investigate, especially since the hypothesis that orthodontic problems are more frequent in modern times is very debatable, as there are many studies that suggest otherwise[1].

The difficulty in studying fossil jaws and teeth comes from the fact that most of the times they are fractured or distorted by the ground they are buried in and teeth may also be lost. Authors even suggest that paleodontological investigations are more appropriate for orthodontic anomalies affecting only one tooth or a group of teeth because of the scarcity of complete jaws[2].

The jaws analyzed in this study were found in one of the archaeological sites of Freidorf [3], quartier of the city of Timişoara, Timiș County, România. Based on the anthropological report the skeleton belonged to a man. The skull had been crushed, probably during a burial ritual, leaving only the jaws accessible for investigation (**Fig. 1–4**).

The human remains are housed in the National Museum of Banat from Timișoara. All necessary permits were obtained for this study which complies with all relevant regulations.

2. Material and Method

The cranial remains were analyzed from an orthodontic perspective and were investigated using CT scanning (GE Healthcare Bright Speed 16 Slice CT) with help of Planmeca's Romexis software (**Fig. 5**).

Analysis of occlusion, crowding, attrition and arch symmetry was performed, as well as dental analysis and radiological inspection of the roots and bone.

The occlusion was evaluated using Angle's classification, from a sagital, transverse and vertical point of view[4].

Crowding was assessed according to Proffit's method[5], by measuring the mesial-distal width of each tooth and substracting the circumference of the arch, excluding the molars. The measurement was done using an orthodontic caliper.

Attrition was evaluated using Molnar's scale[6] and arch symmetry was assessed in relation to the mid-palatal suture on the upper arch and related to the mentoneal symphysis on the lower arch.

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[1] Mockers, Aubry, Mafart, 2004; Vodanović *et alii*, 2012; Sarig *et alii*, 2013.
[2] Vodanović *et alii*, 2012.
[3] The archaeological site has the RAN code 155252.05 and the human remains discussed in this article belong to grave UA266.
[4] Andrews, 1972, p. 296-309.
[5] Proffit, 2000, p. 435-439
[6] Molnar, 1971, p. 175-189.

Fig. 1. Frontal view, note the tilting of UL2 and right lateral crossbite.

Fig. 2. Left lateral view, note the perfect class I occlusion.

Fig. 3. Right lateral view, note the crossbite and mesial inclination of LR7.

Fig. 4. Right lateral view of mandible, note the bone remodeling of the LR6 socket.

3. Results

The skull remains were well preserved, without excessive brittleness of the bone.

The maxilla had the following missing teeth: UR2, UR1, UL1, and the UL8 which were all lost post-mortem. No caries were found on any of the present teeth.

The horizontal ramus of the mandible was complete, the right vertical ramus as well, having the condyle and the coronoid process present while the left coronoid process was fractured.

The teeth on the lower jaw were all present, except for the LR6 which had been lost during the subject's lifetime but relatively close to the time of death, as the alveolar bone had undergone some remodeling but not complete.

We cannot know the cause for the loss of the LR6, but considering that the rest of the teeth were caries-free, we could reasonably assume that it may have been lost due to trauma.

Fig. 5. CT scan.

The LR7 has a minor mesial inclination, causing a premature contact point with the disto-labial cusp of the UR6.

All other teeth were present and again, no caries were found on the lower teeth either.

On examination, the teeth presented minor calculus deposits, mostly interproximally but also on the labial and lingual surface and we may conclude that the individual had an overall good oral hygiene, which, in those days, could be something quite remarkable.

The jaws presented with molar and canine class I according to Angle's classification. As the UR2, UR1 and UL1 are missing, it is impossible to describe the overjet and overbite of our patient, but by the appearance of the rest of the front teeth and their occlusion it is very likely that the patient presented with minimal overbite and overjet, if not for an edge to edge contact on the incisors (**Fig. 1**).

Judging by the appearance of the mid-palatal suture, the UR1 and UL1 were slightly deviated to the left, as was, probably, the upper midline. The UL2 had a protrusive inclination, with increased labial torque, most likely trying to compensate dento-alveolarly for the narrow skeletal base of the maxilla (**Fig. 1**).

The upper dental arch was well aligned while minor crowding was present in the lower arch. The space required in the lower arch was measured to 3.5 mm.

All teeth suffered attrition of maximum grade 2 on Molnar's scale, with the heaviest attrition on the molars.

The radiological investigation showed normal bony contour as well as normal root morphology.

4. Discussion

The appearance of the jaws is typical of a narrow maxilla on a normal sized mandible. Because the fragments of the maxilla are insufficient for any lateral cephalometric measurements, we can only assume that the main reason for the malocclusion is the narrow maxilla, as it appears on inspection.

The mild midface retrusion of the individual also gives the impression of a prognathia, although in reality the mandible could be normal or even smaller than normal[7].

The maxillary retrusion can also be associated with choanal stenosis, reduction in nasopharyngeal space and palat deformity, such as narrow or high-arched palate.

[7] Ranu, Rabb, 2012.

These anomalies may cause respiratory compromise or obstructive apnea early in life or as an adult.

The causes for an underdevelopment of the maxilla are multiple, so the diagnosis of this particular case could be related to a low tongue position, oral breathing[8] or even adenoid hypertrophy.

Judging by the appearence of the jaw fragments, this individual may well have suffered from adenoid hypertrophy causing him to breath through his mouth, leading to midface retrusion, underdevelopment of the maxillary sinuses, low posture of the tongue and crossbite.

Or, the chain of causes could have been completely reversed, as follows: the low tongue posture could have caused the maxillary retrusion and narrow arch, therefore causing the unilateral posterior crossbite.

The orthodontic hypothesis could go on even further assuming there was sleep apnea involved and possibly even snoring.

Because of the crossbite, we can also assume there was muscle dysfunction involved. Alarcon and collaborators' study revealed that the posterior temporal muscle on the noncrossbite side was more active than that of the same side in subjects with crossbite at rest position and during swallowing. The activity of both anterior digastric muscles was higher in subjects with crossbite during swallowing. Moreover, during chewing the masseter muscle was less active in patients with crossbite than in the subjects in the control group[9]. Kecik and collaborators found similar results in their studies[10].

A review of the literature presented does not indicate a clear association between malocclusions and temporo-mandibular disorder (TMD) but the results of the aforementioned studies suggest a higher risk of the prevalence of TMD in patients with unilateral posterior crossbite, so we can assume TMD as well in our case[11].

When discussing malocclusion and function we must also acknowledge previous studies which have found weak links between function and alignment of arches, such as McNamara and Egermark-Eriksson[12].

The cause as well as frequency of malocclusion in terms of ancient and modern populations has caused wide debate among orthodontists and anthropologists alike[13].

There is still much discussion going on around these topics as well as multiple theories that are yet to be proven. One of the most common thesis is that malocclusion is a sign of civilization[14] and that once humans have switched to a more softer diet con-

[8] Occasi *et alii*, 2018.
[9] Alarcón, Martin, Palma, 2000.
[10] Kecik, Kocadereli, Saatci, 2007.
[11] Saiffuddin *et alii*, 2003; Wozniak, Szyszka-Sommerfeld, Lichota, 2015; McNamara *et alii*, 1995; Mohlin *et alii*, 2007; Egermark-Eriksson *et alii*, 1990.
[12] McNamara *et alii*, 1995; Egermark-Eriksson *et alii*, 1990.
[13] Molnar, 1971; Lindsten, Ogaard, Larsson, 2002; Corruccini *et alii*, 1990; Townsend *et alii*, 2009; Normando *et alii*, 2011.
[14] Mockers, Aubry, Mafart, 2004; Corruccini, 1984; Harper, 1994.

taining less fibre, the dental wear has decreased causing crowding of the teeth, which was the support of Begg's treatment philosophy in the late 20th century for extracting teeth in order to align.

Also, the softer diet has needed less muscle function which, in turn has led to a decrease in jaw development, hence causing malocclusion[15]. This would be a theory supporting the use of appliances that would expand the jaws in order to align the teeth.

Both these theories are based on the environmental factors which lead to malocclusion[16].

However, many studies have come up with different conclusions, such as genetic predisposition towards orthodontic anomalies[17]. But it seems that genetic studies need to be improved as well. A major issue of concern in many twin studies for example, has been the accuracy of zigosity[18] determination.

The more recent field of orthotropics suggests that environmental factors cause malocclusion and that genes decide its pattern[19] and postulates that we should be able to accommodate 32 well aligned teeth. It believes that teeth have the ability to align themselves if the face grows well and argues that it does so for all 4629 different species of mammals.

The discussions around each theory could continue but there is still insufficient data to fully understand the complexity of the phenomenon.

Whatever the cause of the malocclusion, this case is an interesting find that is worth being analyzed even though we only have the fragmented part of the maxillary, especially since, as far as we know, there is no previous record of crossbite in an ancient or medieval case[20].

All of the sudden, the 4th century sarmatian man seems closer to us. Though we cannot put a face to the bones, we can almost put a diagnosis and treatment plan to the maxillary fragments. We can almost picture the sarmatian noble man, with midface retrusion, assymmetrical appearance of the masseter muscles and pain in his jaw joints, with snoring because of sleep apnea and having dark circles under his eyes from lack of sleep. It is rather fascinating how the study of small fragments of human remains from archaeological sites can almost bring back an image of a long ago buried man.

5. Conclusions

Our case has an unknown etiology of malocclusion but does not support the theory that ancient or medieval skulls had better inter or intra-arch relations. Of course, more research is needed in the field of paleodontology, where all well preserved skulls or jaws are precious pieces in a yet to be solved puzzle.

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[15] Rose, Roblee, 2009.
[16] Mockers, Aubry, Mafart, 2004.
[17] Vodanović *et alii*, 2014; Lindsten, Ogaard, Larsson, 2002; Corruccini *et alii*, 1990; Townsend *et alii*, 2008; Normando *et alii*, 2011.
[18] Townsend *et alii*, 2009.
[19] Mew, 2009.
[20] Vodanović *et alii*, 2012; Molnar, 1971; Mockers, Aubry, Mafart, 2004; Harper, 1994; Fiorin *et alii*, 2017; McKeever, Sutcliffe, 2013.

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