ANATOMICAL AND RADIOLOGICAL COMPARATIVE STUDY OF VISUALIZING THE ANATOMICAL STRUCTURES IN PANORAMIC RADIOGRAPHS

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Cuvinte cheie: *ortopantomograf, repere, studiu comparativ, implante dentare, opacitate, transparență, linii de condensare*

Abstract: *This anatomical and radiological comparative study is aimed at the identification of normal bone maxillary structures or occurring malformations, in order to designate the area in which dental implants can be applied.*

Rezumat: *Studiul comparativ anatomo-radiologic îşi propune identificarea formaţiunilor normale osoase maxilare sau a unor eventuale malformaţii cu scopul stabilirii traseului de aplicare a implantelor dentare.*

INTRODUCTION

The anatomical-radiological comparative study is instrumental to the in-depth knowledge of the anatomical structures rendered by panoramic radiography. The identification of the normal anatomical structures enables one to identify the deviations from the norm which panoramic radiography can render evident. The study employs panoramic radiographs and specific anatomical structures found on the anatomically-prepared bone skull.

The orthopantomograph is a radiographic system which functions on the principle of moving a slit-like beam of radiations that cover both dental arches in a continuous movement, from one extremity to the other. The panoramic radiograph exposure lasts about 15 seconds. The three-axe-rotation panoramic radiographs offer the dentist information about the anatomy of the superficial regions around the mouth, as well as of the deeper ones of the head and of the neck.

The OPT renders evident the maxilla and the mandible, the arches, the tooth, the edentate ridges, as well as the nearby formations to which the teeth are functionally connected (such as ATM), along with those that may have pathological implications on nearby structures: the maxillary sinuses, the mandible canal, the nasal cavity.

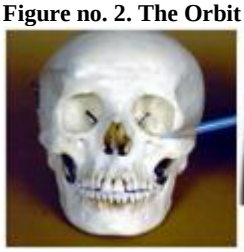
The radiograph is subdivided into two regions: an upper oral-maxillary-facial region and a lower cervical-mandible one.

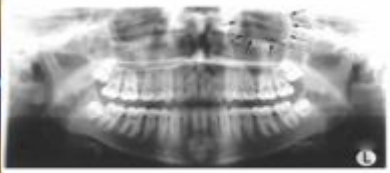
The upper oral-maxillary-facial areas feature:

- The **two maxillary sinuses**, each of them situated in a semi-maxillary and being radiotransparent, delimited by thin radio-opaque lines. They are interconnected with the orbits and the nasal fosses, as well as adjacent to the roots of the teeth (apexes). Quite frequently, the sinus extends to the areas from which teeth had been extracted. However, even under normal circumstances, towards the mental tuberosity, the margin of the maxillary sinus appears as a thin radio-opaque line.
- **The Orbit** is radiographically evinced as a circular radiotransparent area above the maxillary sinus, delimited by a thin radio-opaque line.

Figure no. 1. Sinus

Figure no. 2. The Orbit





- Below the infraorbital ridge, above the canine fosse, there is the **infraorbital (suborbital) foramen**, the exteriorization of the infraorbital canal
- **The Nasal fossa, or the nasal cavities.**Situated in the center of the facial skeleton, these are in the vicinity of the orbits, the anterior, frontal, ethmoidal, and sphenoid maxillary sinuses.
- **The incisive foramen** is an opening found on the median

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line of the hard palate, behind the central incisors, which corresponds to the incisive bone that derives from the intermaxillary plate.

Figure no. 3. The Infraorbital

Figure no. 4 The Nasal fossa

Figure no. 5. The incisive foramen

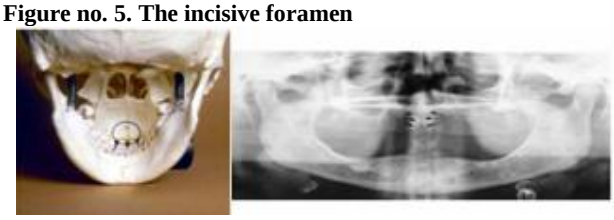
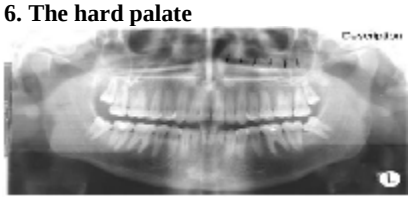


Figure no. 6. The hard palate



- **The hard palate** is revealed in the panoramic radiograph as a thick radio-opaque band. Sometimes, a double line gets observed, resulting from the superimposition of the image of counterlateral phantom, which appears as a line above the hard palate proper. 5% - 10% of the population features a thickened palatine bone on the median line that corresponds to the median palatine junction, called "*torus palatinus*."This can be observed in the panoramic radiograph as a transversal high-intensity opacity bone surplus.The exaggerated protuberance, along with a concave **menton**, can result in an image similar to that of a mandibular cyst.

Figure no. 7. Torus palatinus

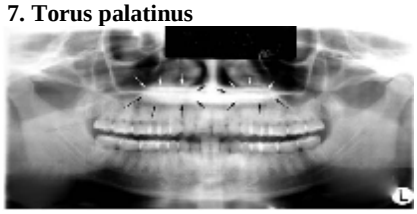
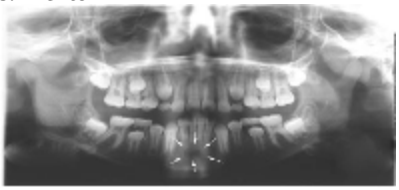
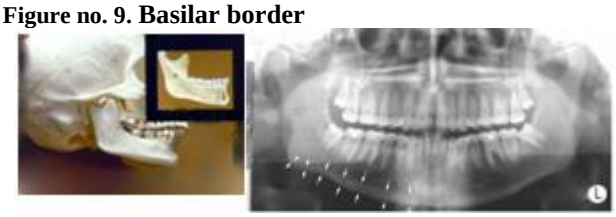


Figure no. 8. Menton



- **The inferior (basilar) border of mandible**

Figure no. 9. Basilar border



- **The mandibular canal** is a structure which can be observed radiographically, containing the inferior alveolar nerve and the inferior alveolar artery. This canal starts in the ascending branch of the mandible, corresponding to the mandibular spine or the ligula. The external duct of the mandibular canal, called the mandibular duct.

Figure no. 10. Mandibular canal

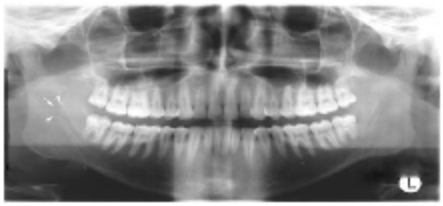
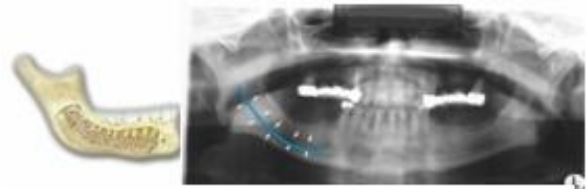
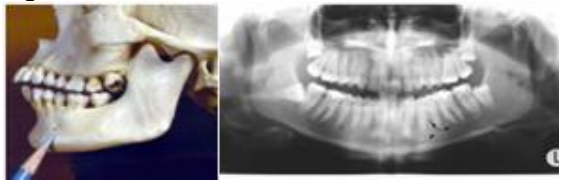


Figure no. 11. The path of the mandibular duct



- The mandibular canal extends through the body of the mandible under the roots of the molars and opens ventrally on the anterior (vestibular) surface of the mandible body through the **mental foramen**.

Figure no. 12. Mental foramen



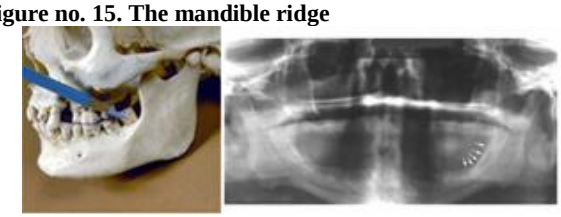
- The identification of the **mental foramen** may result in erroneous diagnostics of periradicular pathologies of the first or the second premolar.
- **The submandibular fossa** is a round-shaped depression in the lingual wall of the mandible body.

Figure no.13. The submandibular fossa

- **The mylohyoid line** traverses obliquely the lingual surface of the mandible body, anatomically separating the sublingual gland fossa located above the mouth ceiling (less evident) from the submandibular gland fossa located under the mouth ceiling.
- **The oblique line (ridge)** of the mandible located on the external side of the mandible body.

Figure no. 14. The mylohyoid line

Figure no. 15. The mandible ridge



The goal is to discern the anatomical forms of the two maxillary bones in order to designate the area suitable for dental implants.

CASE PRESENTATION

Several cases are used in illustrating the above aspects:

Pacient, 28 year-old, subjected to an aggression, loses the tooth 2.1, along with bone tissue. Bio-bone augmentation is being performed.

Figure no. 16. Initial Rx

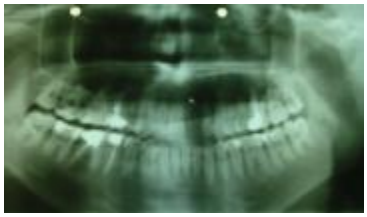


Figure no. 17. Rx. Four months after implant

Figure no. 18. Rx six month later. Fixed collated prosthetic work, temporary placed on 2.1

Figure no. 19. Retroalveolar image with the prosthetic

Pacient, 26-year old, loses thooth 3.6, as result of a caries-related process.

Figure no. 20. Initial situation

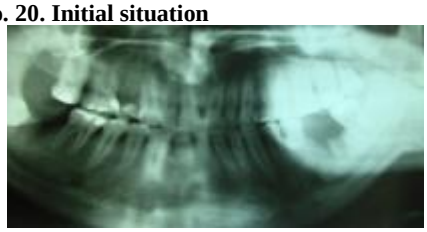


Figure no. 21. Dental implant is applied three months after the removal of the tooth.

Figure no. 22. Three months after the insertion of the implant the fixed prosthetic work is installed.

Periodontitis-suffering pacient, with pluridental fixed bilateral prosthetic works on the maxillary arch, with support teeth that have started to move **è** loss of the prosthetic works.

Figure no. 23. Initial Rx

Figure no. 24. Implants applied on the right hemiarch

Figure no. 25. Rehabilitation of the right hemiarch by means of multiple-implant fixed prosthetic works.

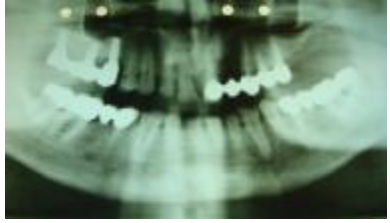


Figure no. 26. Bilateral rehabilitation by osseo-integrated multiple-implant fixed prosthetic works. Rx at 2 years (right) and 1 year (left)

CONCLUSIONS

The identification of the radiographed anatomical formations and the discrimination between them is instrumental to the accurate designation of the zones to which implants are applied, preventing them from intersecting the mandibular canal, the mental foramen, the sinuses or the maxillary fosses. This type of investigation has its own limitations, which call for more performing investigations.

BIBLIOGRAPHY

1. Anclair M., Bert, M., Klein, L., Touboul, J. P. – Les implantes entaires aujourd'hui prothese dentaire, 41, 7/14, 1990
2. Rândaşu, I, Stanciu, L – Tratamente protetice dentare fixe – Ed. Meteorpres, 2006
3. Clemente C : Anatomy – A Regional Atlas of the Human Body Baltimore, urban&Scharzenberg, 1981
4. Clemente C : Anatomy of the Human Body by Henry Gray, Philadelphia, Lea&Rebiger, 1984
5. Buruian M – Tratat de tomografie computerizată vol. I, Editura University Press, Tg. Mureş - 2006