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International Journal of Current Research
Vol. 8, Issue, 12, pp.43837-43840, December, 2016

INTERNATIONAL JOURNAL OF CURRENT RESEARCH

ISSN: 0975-833X

RESEARCH ARTICLE

POTENTIALS OF CBCT FOR DETERMINATION OF THE OPERATIVE ACCESS IN TREATMENT OF ATYPICALLY RETAINED TEETH OF THE MANDIBLE

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ARTICLE INFO

Article History:
Received 23rd September, 2016
Received in revised form
19th October, 2016
Accepted 26th November, 2016
Published online 30th December, 2016

Key words:

Tooth Retention,
CBCT,
Lingual Access.

ABSTRACT

The current tridimensional interrelation of the retained teeth with the adjacent structures is impossible to be visualized with two-dimensional methods of imaging-diagnostics.
The objective: Of this work is to present the potentials of CBCT in diagnostics of clinical cases with complex relations between retained and other teeth of the mandible, and determining the operative access for their treatment.
Material and method: We present a clinical case of treatment of atypical tooth retention in complex position in relation to the surrounding structures. The diagnostics and the operative access are determined with the assistance of CBCT.
Results: The operative intervention was performed with lingual access. This allowed the preservation of the adjacent teeth.
Conclusion: The tridimensional interrelation of the retained teeth with the adjacent structures, is possible to be visualized with Cone-Beam Computed Tomography (CBCT). The use of this method helps the adequate planning of the surgery.

Citation: ***Daskalov, Hr., Kanazirska P. and Kanazirski, N.*** **2016**. "Potentials of cbct for determination of the operative access in treatment of atypically retained teeth of the mandible", *International Journal of Current Research*, 8, (12), 43837-43840.

INTRODUCTION

Tooth retention is one of the most common pathologies in the dental practice. An important condition for determining the operative access in planning the surgical treatment is to establish the location of the retained tooth in the mandible, its position in relation to the present adjacent teeth (vestibular or lingual, respectively palatal), and the surrounding anatomical structures (maxillary sinuses, nasal cavity, mandibular canal). The current tridimensional interrelation of the retained teeth with the adjacent structures is impossible to be visualized with two-dimensional methods of imaging-diagnostics. According to the contemporary authors, the Cone – Beam Computed Tomography (CBCT) is the method, used for accurate diagnostics of retained teeth and adequate planning of the surgical intervention. The use of this method, for determining the relation of the retained teeth of the mandible to the mandibular canal is undoubtedly necessary (Carter *et al*., 2008; Guang-zhou *et al*., 2013; Kamrun *et al*., 2013). The high resolution, the slices in different planes and the tridimensional reconstructions, make the method preferable in the planning of the treatment in the domain of oral surgery, implantology and orthodontics (Scarfe *et al*., 2008; Carter *et al*., 2008; Feldkamp *et al*., 1984; Yovchev, 2015).

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The method is quickly adopted in practice, as it provides diagnostic data with good quality, 3D images and relatively low dose of radiation exposure. The main difference between this method and the other radiological methods, is that the x-ray beam is in the shape of cone, and not divergent fan-shaped. Schematically, the CBCT image can be presented as combination of cubes, the so called voxels (volumetric pixels), which are isotropic (with equal sizes in the three planes). The smallest size of the voxel, which also provides the best resolution, varies between 0.09 to 0.42 mm in the different devices (Feldkamp *et al*., 1984; Carter *et al*., 2008; Yovchev, 2015). The principal planes, in which we visualize the images, are: axial, sagittal and coronal. With most software programs, there is generation of two-dimensional images from data arrays (OPG, laterography, etc.). Another principal plane, in which the images are visualized, is orthoradial mandibular slice (cross-section slice). It shows the anatomical structures in cross-section of the mandible.

The objective: Of this article is to present the potentials of CBCT in diagnostics of clinical cases with complex relations between retained and the other teeth of the mandible, and determining the operative access for their treatment.

Clinical case: The patient is G.M, a 32-year-old female from Plovdiv.

Fig. 1. OPG of the patient G.M. with retained tooth 45

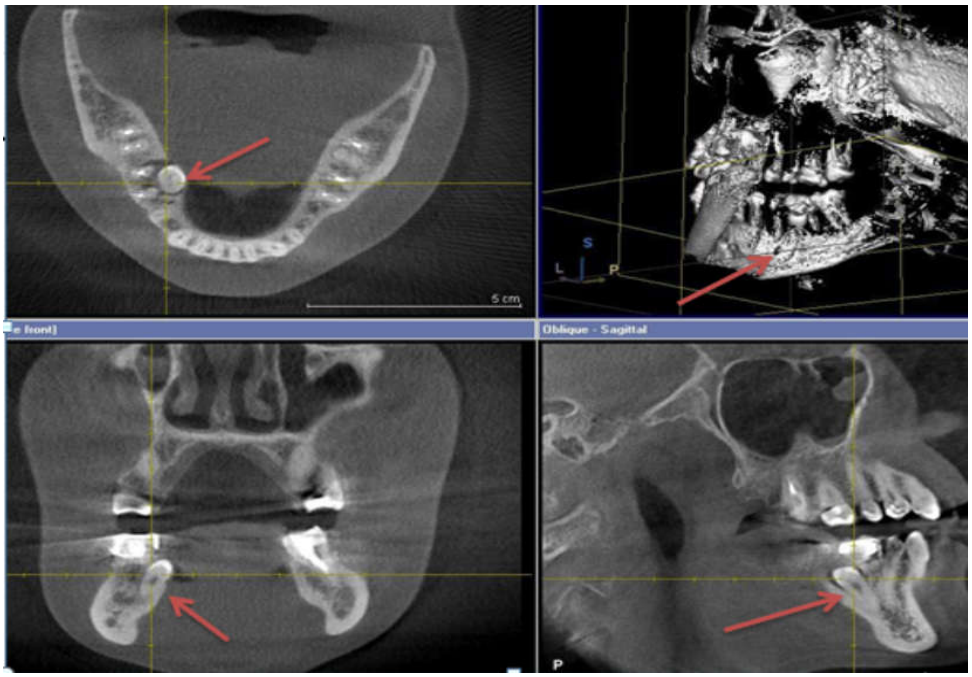

Fig.2. Visualization of the retained tooth 45 in the three planes – axial, coronal and sagittal

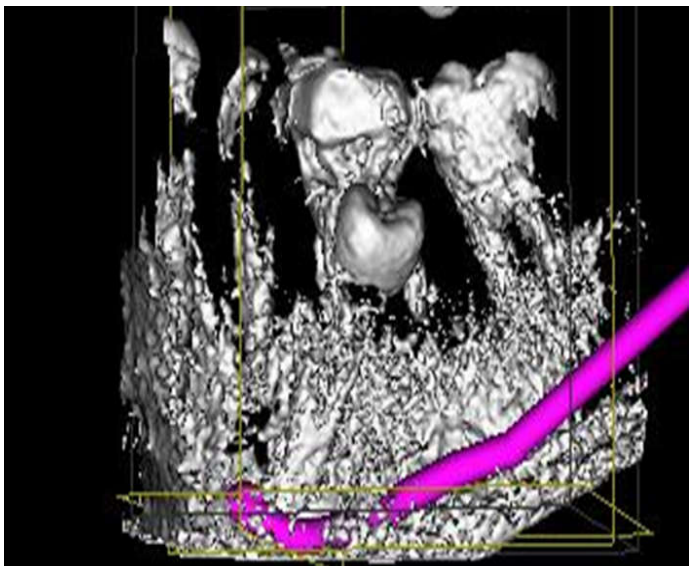

Fig.3. 3D volumetric image of the retained tooth with image subtraction

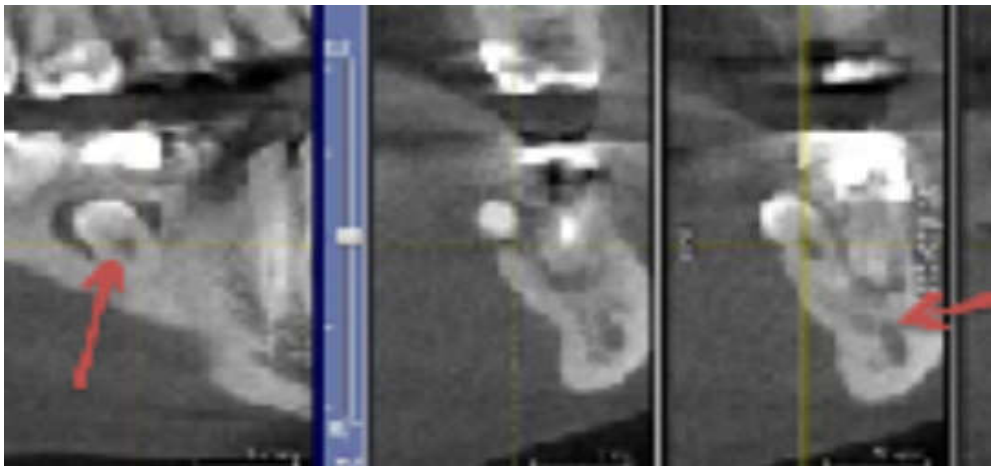

Fig.4. Cross-section slice

Fig.5. Radiography after 6 months

Clinical history: The patient reports periodic pain and swelling of the gum in the region of the root apex of tooth 46. Established retention of tooth 45 and periapical changes of tooth 46. The consultations with other dental practices suggest extraction of tooth 45 and 46.

Status: The examination showed mild swelling of the mandibular body at the left, with soft consistency, slightly painful upon palpation, without change in the color and the tone of the skin. Intraorally there is reddened and swollen mucosa around tooth 46, which is painful upon vertical percussion. The vestibular palpation of the mucosa evokes pain. The lingual palpation shows swelling in the area of tooth 46, with hard consistency, mildly painful.

Radiological examination: Orthopantomography (OPG) (2D) and CBCT (3D) were performed using Sirona GALILEO Scompact/comfort.The 2D image showed compromised endodontic treatment of tooth 46, and retention of tooth 45, immediately behind the roots of tooth 46. Its exact location in relation to the surrounding structures cannot be established (Fig. 1). In the 3D image, the location of tooth 45 is determined in the multiplanar reconstruction of the scanning data. This gives us an idea about the position of the tooth in the bone, and its relation to the adjacent structures (Fig.2, Fig. 3). We establish lingual location of the tooth, immediately behind the roots of tooth 46. There is no resorption of its roots. The retained tooth lyses the lingual compact of the mandible. We established lingual location of the root of the retained tooth, in relation to the mandibular canal. There is no contact between the two structures (Fig.4).

Treatment: Following analysis of the radiological data, it was decided the surgery for the extraction of the retained tooth 45, to be performed with lingual approach. The defect was filled with bone replacement material, and covered with barrier membrane. The recovery period was without complications. The follow-up radiography after 6 months, showed almost completely recovered cancellous and compact bone structure (Fig.5).

DISCUSSION

The atypical retention of the teeth makes difficult the preparation of operative plan for their extraction. The use only of panoramic radiography, does not provide details on the position of the tooth in relation to the other important adjacent anatomic structures and hides a risk from their damage during the surgery. The combination of two radiological methods, as in this case – OPG and cone-beam tomography, significantly facilitates the preoperative planning.

Conclusion

The Cone-Beam Computed Tomography (CBCT) makes possible the visualization of the current tridimensional interrelation of the retained teeth with the adjacent structures. The use of this method, for determining the relation of the retained teeth of the mandible to the mandibular canal is undoubtedly necessary. This method helps the adequate planning of the surgical intervention.

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