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Impacted Lower Third Molar and Its Relation to the Inferior Alveolar Nerve: The Importance of CBCT for Surgical Planning and Treatment. Clinical Case Report

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Authors' contributions

This work was carried out in collaboration between all authors. Authors JRV and JLP performed the surgery. Author MG designed the study and wrote the manuscript. Authors AG and GMT helped with the final editing of the manuscript. All authors read and approved the final manuscript.

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Case Study

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ABSTRACT

Aims: This clinical case shows the importance of computed tomography as a complementary exam for the surgical planning and treatment of impacted third molar extraction surgery when it is in close contact with the inferior alveolar nerve.
Presentation of the Case: This study reports a clinical case where an impacted lower third molar indicated for extraction had its roots in intimate contact with the inferior alveolar nerve, requiring a cone beam computed tomography for the planning and execution of the surgery.
Discussion: Although the CBCT scan subjects the patient to a higher dose of radiation compared to panoramic radiography, it offers a 3D view of the local anatomy, preventing possible accidents and complications related to the surgical procedure.

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Conclusion: Computed tomography showed to be of great importance when the panoramic radiography does not allow a correct visualization of the relation of the inferior alveolar nerve with the tooth to be extracted.

Keywords: Third lower impacted molar; inferior alveolar nerve; cone beam computed tomography.

ABBREVIATIONS

CBCT : Cone Beam Computed Tomography
CT : Computed Tomography
3D : Three dimensional
2D : Two dimensional
FOV : Field of Vision

1. INTRODUCTION

The third molar is a tooth that is often included or affected due to factors such as overlying dense bone, overlying thick fibrous tissue, incorrect tooth angulation and insufficient space relative to adjacent teeth [1], being in most cases indicated for extraction. The extraction of an impacted or erupted third molar is regarded to be the most common dentoalveolar procedure performed in oral and maxillofacial surgery [2].

The surgical removal of impacted third molars has great potential for the development of accidents or complications during its execution. This statement becomes true when we observe the presence of important anatomical structures located near these dental elements. The most common postoperative complications are mild and reversible, although inferior alveolar nerve damage is one of the most serious consequences. Postoperative complications such as swelling, trismus and pain are not difficult to manage, but the functional loss of sensory innervations of the lower lip may cause traumatic injuries and fibromas, scar tissue, and mucocele formation on the mucosa [3].

Panoramic radiographs are the imaging modality most commonly used by oral and maxillofacial surgeons to view impacted third molars and to estimate the risk of inferior alveolar nerve injuries [4]. In this imaging modality, the professional can verify pathological alterations, classify the tooth to be extracted, evaluate the difficulty of the procedure, plan the surgery, obtain resolution of present problems and prevention of future problems [5,6]. Before planning extraction of an impacted mandibular third molar, the proximity between the mandibular canal and the impacted molar should be assessed to minimize the risk of inferior alveolar nerve damage [7]. It is known that the risk of inferior alveolar nerve paraesthesia dramatically increases when there is direct contact between the nerve and third molar root, therefore, panoramic radiographic findings can be predictors of inferior alveolar nerve exposure following third molar extraction [8]. However, this type of radiography only represents structures in two dimensions, causing the overlapping of anatomical structures, greatly hindering the visualization of what is really important. Thus, in many cases of impacted lower third molars, the panoramic radiograph does not show the correct relation between the inferior alveolar nerve and the dental roots, representing a risk to the surgical procedure. It has been observed that only 3D examinations, like cone-beam computed tomography, are effective in determining the true relationship of the tooth roots and the mandibular canal [9,10].

This article describes a case in which an impacted inferior third molar, with the roots in intimate contact with the mandibular nerve, was extracted using the cone beam computed tomography for the surgical planning and treatment.

2. CLINICAL CASE

The patient was g.h.g.s., a 17 year-old male, caucasian, who attended the maxillofacial surgery clinic, referred by an orthodontist for removal of impacted third molars, previously detected in orthodontic documentation from 2 years ago.

A new panoramic radiograph was performed and in its initial analysis was observed that all the third molars of this patient were impacted. The relation of each intraosseous teeth with the adjacent anatomical structures could be observed, with the exception of the left lower third molar, in wich the image of the periapical region was abnormal when compared to the opposite side (the images of the radiopaque lines that represent the mandibular canal were interrupted and a deviation from the channel path could be observed) (Fig. 1).

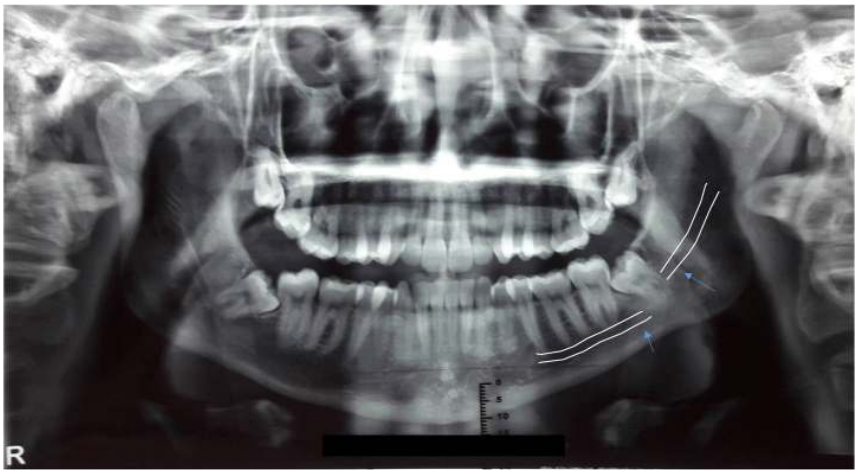

Fig. 1. Panoramic radiograph showing the deviation of the mandibular canal path (represented by the white lines) and the disappearance of its image near the apex of the left lower third molar (pointed by the arrows)

Due to an unsatisfactory anatomical representation of the region of the tooth 38 that required extractive surgery, we chose to refer the patient to perform a cone beam computed tomography, which was able to evidence the path of the inferior alveolar canal (Fig. 2).

Analyzing the coronal sections, we could see that the inferior alveolar nerve crossed between the roots of the tooth 38, requiring a detailed surgical planning for separation of the roots (Fig. 3).

2.1 Surgical Procedure

Under local anaesthesia using Mepiadre 100® (Nova DFL, Rio de Janeiro/RJ – Brazil) an incision and detachment of the mucoperiosteal flap was performed, exposing the bone tissue that was covering the tooth 38. Then, with the aid of a 702 high rotation drill (KG Sorensen, Cotia/SP – Brazil) (Fig. 4A), irrigated with saline solution, the osteotomy was performed exposing the crown of the tooth and enabling dental sectioning in its middle portion. In addition, a vestibular osteotomy was performed in order to increase access for root removal (Fig. 4B).

To avoid any nerve damage through the drill, a chisel was used to complete root separation and removal (Fig. 5). In this way, the surgical fracture occurs in a controlled manner, allowing the removal of the roots individually, reducing the risk of nerve traction during extraction.

Following this, the surgical cavity received abundant irrigation with saline solution to remove possible bone or dental fragments resulting from the procedure and we made sure that the cavity was completely filled with blood. Then, the soft tissue was closed through continuous scalloped-type sutures with silk thread 4-0 (Ethicom® - Johnson and Johnson, São Paulo/SP Brazil) and amoxicillin based antibiotics were prescribed for seven days, along with anti-inflammatories and analgesics to reduce pain and postoperative edema.

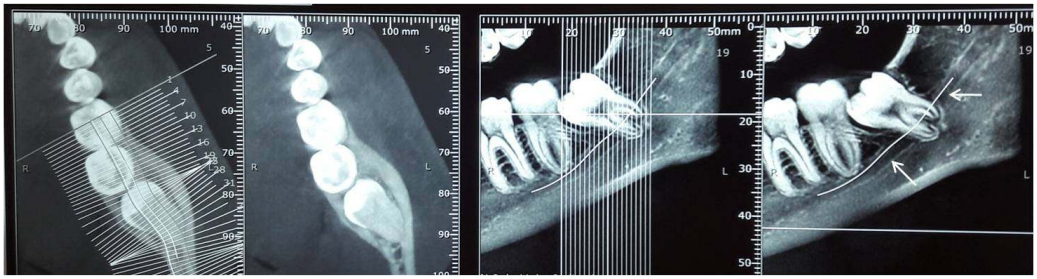

Fig. 2. Axial and panoramic cut showing the path of the inferior alveolar canal, pointed by the arrow

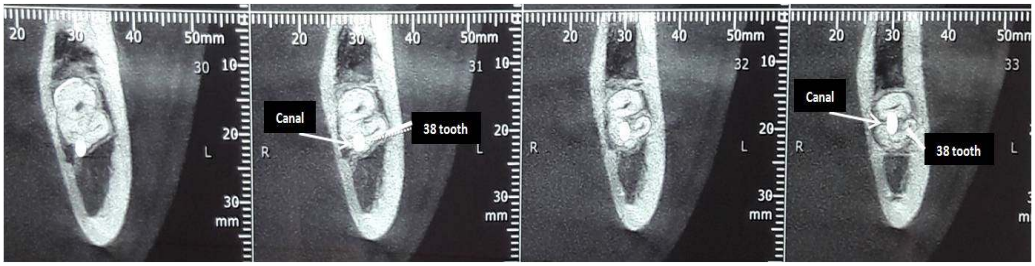

Fig. 3. Coronal cut showing the inferior alveolar nerve between the roots of the tooth 38, pointed by the arrow

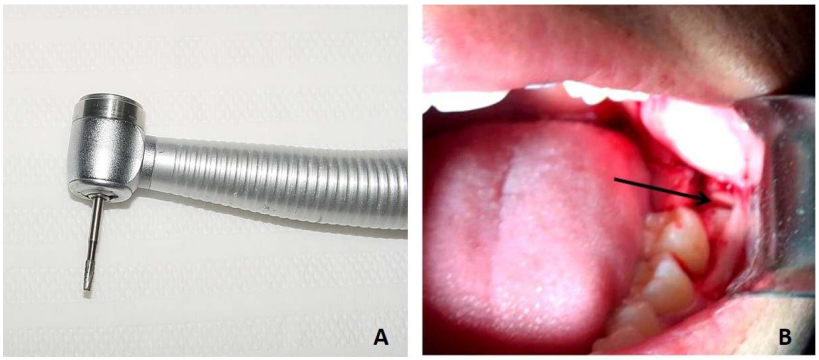

Fig. 4. High rotation drill 702 (A) and osteotomy of the crown pointed by arrow (B)

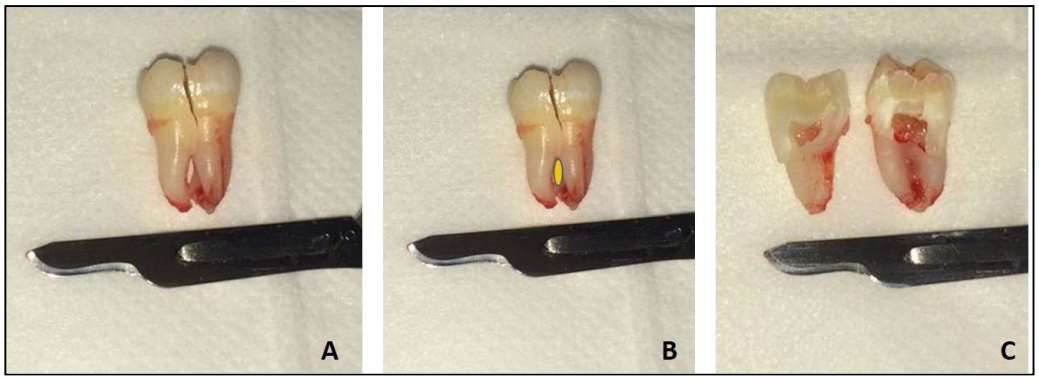

Fig. 5. Tooth 38 extracted with the surgical fracture line (A), the path of the nerve between the roots represented in yellow (B) and fragments resulting from the separation of the crown and roots (C)

3. DISCUSSION

The limitation of radiography due to its two-dimensional representation of three-dimensional structures has been a problem for correct diagnosis and treatment of the different pathologies that affect the dental arches [11]. For extraction of impacted third molars, one of the most common surgical procedures in dentistry, the radiographic image contributes to the treatment plan, herein the decision for removal of the tooth. The radiographic examination of mandibular third molars should provide information about the tooth itself, the surrounding bone, the neighbouring tooth and related anatomical structures. Parameters that should be assessed are state of impaction, root development, angulation of the tooth, number of roots, root morphology, related pathology and, most importantly, the relation between the tooth/roots and the mandibular canal [12]. The majority of oral and maxillofacial surgeons rely

upon the panoramic radiograph for the diagnosis of the proximity of lower third molars to the mandibular canal, even though many did not consider this image to be the ideal diagnostic tool [10]. There are many studies reporting panoramic radiographic findings to predict direct contact between mandibular canal and impacted third molars [13,14]. They showed that darkening of roots and interruption of radiopaque line observed on panoramic radiographs, both as isolated findings and in association, were effective in determining the risk relationship between the tooth roots and the mandibular canal, requiring three-dimensional evaluation of the cases, like cone beam computed tomography.

Although cone beam computed tomography subjects the patient to the highest dose of radiation when compared to panoramic radiography, it shows be able to provide the exact location of the tooth, requiring no additional image exams, and especially, promoting prompt treatment to the patient [15]. Currently, with the modernization of CT scanners, we observed that the radiation dose used in a conventional examination of a dental arch for example, has decreased substantively. It's important to consider that a 5-hour flight at altitudes of 12 km can result in an equivalent cosmic radiation dose around 25 μSv and a cone beam computed tomography of a small area (small FOV) expose the patient to a radiation dose of approximately 30 μSv, representing the patient greater benefits than risks [16,17,18].

This is unlike panoramic radiographs, which have reduced cost, reduced radiation dose and are more accessible, but display images in only two dimensions, causing an overlap of various bones and soft tissue structures [19].

In addition to complete surgical planning, some authors say that the accurate preoperative prediction of direct contact between inferior alveolar nerve and impacted third molar is very useful for warning patients of the potential risk of postoperative dysesthesia and obtaining informed consent [20].

4. CONCLUSION

Computed tomography showed to be of great importance when the panoramic radiography does not allow a correct visualization of the relation of the inferior alveolar nerve with the tooth to be extracted, directly influencing surgical planning and postoperative patient orientation.

CONSENT

As per international standard or university standard written patient consent has been collected and preserved by the authors.

ETHICAL APPROVAL

It is not applicable.

COMPETING INTERESTS

Authors have declared that no competing interests exist.

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