

MANAGEMENT OF HIGH-RISK IMPACTED MANDIBULAR THIRD MOLARS USING SURGICAL METHOD OF CORONECTOMY: A CASE REPORT

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Abstract

Impacted mandibular third molars, due to their proximity with the mandibular canal, often are categorized as high-risk tooth for surgical intervention and may be accompanied by postoperative neurosensory deficit. The management of these situations, show better results by performing coronectomy, as a technique for surgical extraction of these teeth and prevention of potential neuropathy. This paper focuses on the importance of using coronectomy as an alternative surgical technique in cases with impacted mandibular third molars with high risk of nerve injury, in order to minimize possible postoperative complications. Case presentation: a 26 years old female patient presented with vertical impacted mandibular third molar, and a radiographic evaluation of a close proximity with the inferior alveolar nerve. CBCT confirmed the position. The procedure of coronectomy was performed, sectioning the crown and leaving the roots in situ. The follow-up time included radiographic evaluation of the root migration in 6 and 12 months after the coronectomy. The postoperative complications, including injury of inferior alveolar nerve, postoperative pain, swelling, trismus and wound infection, were followed the first week after the surgical procedure. There were no signs injury of IAN, infection or exposure of the roots. The root migration was visible in radiographic imaging after 6 and 12 months after the surgery. Postoperative morbidity consisted on moderate pain, trismus and swelling. Coronectomy is a safe method for surgical extraction of impacted mandibular molars for patients who demonstrate elevated risk for injury to the inferior alveolar nerve. This surgical method minimizes the incidence of damage to the inferior alveolar nerve and is safer than complete extraction in situations in which the root of the impacted mandibular third molar are in close proximity to the mandibular canal.

Keywords: coronectomy, mandibular third molar, impaction, inferior alveolar nerve, radiography, CBCT.

Introduction

Tooth impaction is a developmental anomaly, with a multicausal etiology, and is caused by various local and general factors. It can affect any morphological group of teeth, in both jaws, on deciduous and permanent teeth; it commonly the most involves the last teeth to erupt in the dental arch, such as mandibular third molars, maxillary third molars, maxillary canines. [1]

Impacted mandibular third molars have different positions considering the bone depth, occlusal plane, and angulation. Determining these elements is of clinical importance, since the position of the impacted tooth determines the risk of adjacent tooth caries, pain, pericoronitis, and mandibular angle fracture. Furthermore, it has been demonstrated that the position of the impacted mandibular third molar determines the level of difficulty of its surgical extraction and the occurrence of postoperative complications. [2-6]

Impacted third molars have a predisposition to cause various pathologies, such as: pericoronitis, periodontal diseases of the second molar, orofacial infections, caries, resorption of the root of the adjacent tooth, cystic changes, changes in the bone structure, problems with the temporomandibular joint [1]

The extraction of the impacted mandibular third molar is a challenge for oral surgeons, and the relationship of the intervention with intraoperative and postoperative complications is particularly important. These complications are due to the position of the impacted tooth, as well as the proximity of important anatomical-morphological structures, such as the

mandibular canal, i.e. its neuro-vascular content (n.alveolaris inferior, a.et v.alveolaris inferior) [7]

The most common and severe complications of third molar extraction surgery include dry socket, postoperative infection, alveolar bone fracture, damage of inferior alveolar nerve or lingual nerve and, in rare cases, mandibular fracture. Therefore, intentional coronectomy is a well-established technique where the root/roots of the wisdom tooth are left in situ and only the crown is sectioned and removed [8].

Before performing surgical extraction, an important initial step is to determine the exact position (localization, depth in the jawbone, inclination of the longitudinal axis and relationship to adjacent anatomical-morphological structures) of the impacted mandibular third molar. For this purpose, generally accepted and validated classification systems are used, according to George Winter, Pell & Gregory and Sisk.[9]

The Winter classification defines the deviation of the eruption of the impacted third molar from the normal position of the tooth in the dental arch, i.e. the angle formed between the average longitudinal axis of the second and third mandibular molar. Classification according to Pell and Gregory, determines the relationship of the tooth to the ramus mandibulae and the second molar, also the depth of the impacted molar in relation to the occlusal plane. [9]

In oral and maxillofacial surgery, panoramic radiography is primarily used to evaluate the position of impacted mandibular third molar and assess the risk of injury to the inferior alveolar nerve. However CBCT can provide more accurate information in this regard, allowing for better treatment planning and safer surgical extraction in cases with severe impaction.

To minimize the risk of nerve injury during surgical extraction of impacted mandibular third molars Knutson K. in 1989 proposed the technique of coronectomy [10]. In recent years, this technique has been indicated in cases characterized by a close contact relationship between the mandibular third molar and the inferior alveolar nerve, where complete removal could cause injury to the nerve [11]

In recent years, less invasive therapeutic alternatives have been implemented.

Laser therapy has shown promising results. Less invasive approaches offer several practical advantages, including reduced intraoperative bleeding, shorter procedural time, lower postoperative discomfort, and faster healing of the wound.[12]

Material and methods

This report presents a case of coronectomy with clinical and radiographic follow-up. The selection of patients in the research sample was limited by certain criteria for patient selection. Criteria for inclusion in the study:

Patients with an impacted mandibular third molar with a vertical, mesioangular and distoangular position

Patients with an impacted mandibular third molar in close relation to the mandibular canal.

Patients with subjective and objective complaints related to an impacted mandibular third molar

ASA I (normal, healthy patient)

Exclusion criteria from the study

Horizontally positioned impacted mandibular third molar (along the direction of the mandibular canal), where there is a high risk of injury to the inferior alveolar nerve during tooth separation

Acute infection present in the oral cavity or in the immediate vicinity of the tooth that is subject to coronectomy

The planned therapeutic procedure was carried out by implementing the basic surgical principles in relation to conventional operative extraction and the method of coronectomy, i.e.

surgical principles for working in soft and bone tissue. Local block anesthesia was applied for n.alveolaris inferior, n.lingualis and n.buccalis, with 2% lidocaine hydrochloride with 1:100 000 adrenaline.

The procedure includes: elevation of a mucoperiosteal flap with adequate flap design, osteotomy, separation of the tooth crown immediately below the enamel-cementum boundary at an angle of 45°, removal of the tooth crown, reduction of the root fragment 2-3mm below the crestal bone ridge, buccally/lingually, dressing of the surgical wound and closure of the surgical area (per primam) by placing individual sutures with non-absorbable Silk 3-0 thread. A postoperative panoramic radiograph is performed to visualize the root fragments after the coronectomy. The chosen medical treatment includes ibuprofen 600 mg (one tablet every 12 hours for 3 days) as anti-inflammatory and analgesic therapy. A soft and cold diet is recommended for 24 hours, with local application of cold compresses placed on the cheek in the surgical region for during the first hour after surgery. Oral hygiene measures are also recommended (rinsing with 1% Betadine (Povidonum iodinum) three times a day until the sutures are removed one week after surgery).

Case presentation

A twenty-six year-old female patient complained about pain in the right posterior region of mandible. With clinical examination and radiographic imaging we could witness the presence of impacted mandibular third molar in close proximity with mandibular canal. CBCT was performed to confirm the direct contact of the roots of the impacted mandibular third molar with the mandibular canal.

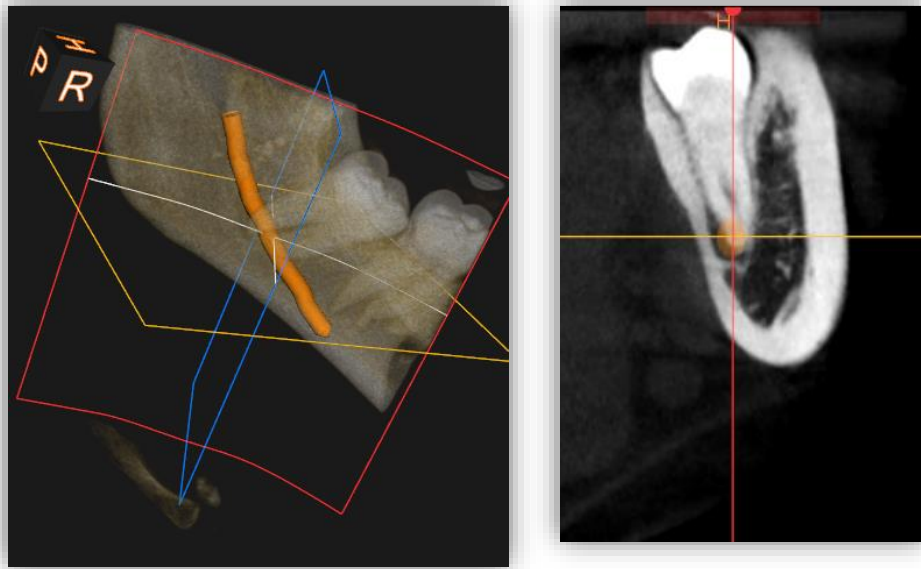
Ortopantomography imaging of the current patient shows a vertical positioned impacted mandibular third molar where the roots of the tooth are in close relationship with the mandibular canal.



Picture1. Ortopantomography shows the position of the right impacted mandibular third molar

Cone beam computed tomography (CBCT) has significantly expanded the possibilities for clinical assessment of the three-dimensional relationship between the mandibular third molars and the mandibular canal and for more accurate assessment of the risk of injury to the inferior alveolar nerve. Although CBCT does not completely eliminate surgical risk; it primarily contributes to better anatomical understanding and more adequate case selection. Studies comparing panoramic findings with CBCT consistently indicate superior detection and better characterization of the root-canal relationship when CBCT is applied in appropriately selected cases. [13]

In the presented case CBCT confirms the close relationship between the roots of the right impacted mandibular molar and the mandibular canal, showing the canal which passes between the two roots of the tooth. (Picture 2 and 3.)



Picture 2. CBCT – custom slicing Picture3.CBCT – oblique slicing

Methods of work

The method of coronectomy is presented in the literature as a surgical technique that reduces the risk of injury to the inferior alveolar nerve. The basis of this method is the removal of the crown of the impacted lower third molar, leaving the roots in situ, that way avoiding direct or indirect injury to the inferior alveolar nerve.[14]

When performing the method of coronectomy we applied the following principles [15]

Applying and elevation of a triangular mucoperiosteal flap

Buccal, occlusal and distal osteotomy

Separation of the crown from the root of the tooth, immediately below the enamel - cement border

Complete cutting of the crown at an angle of 45°

Removal of the crown with a suitable instrument

Reduction of the root fragment 2-3mm below the crestal bone ridge, buccal and lingual

Suturing the wound primary with vertical mattress sutures



Picture 4. Elevation of mucoperiosteal flap



Picture5.Crown sectioning, remaining roots



Picture6. Suture of the wound



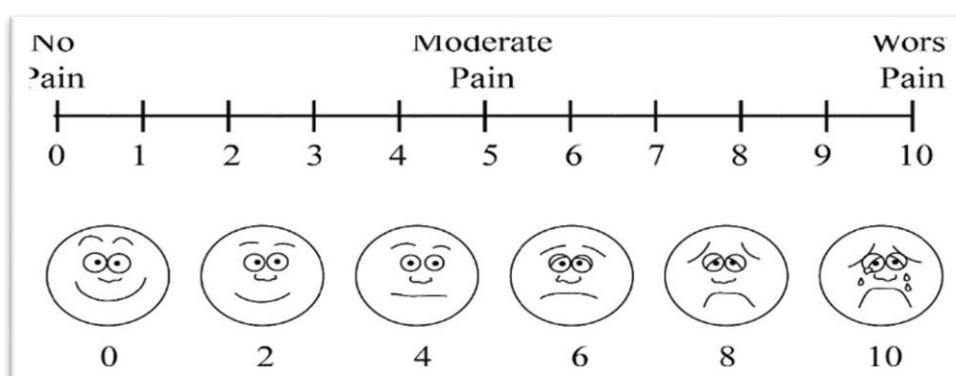
Picture 7. The separated crown

The first week after surgical treatment the patient was observed for early postoperative morbidity, including pain, swelling and trismus.

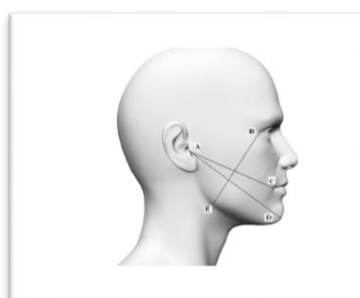
Trismus is most often evaluated by measuring the reduction in maximum interincisal opening of the mouth, and is evaluated: absence of trismus - 0, mouth opening $>76\%$ - 1, mouth opening $< 75\%$ - 2, mouth opening $< 50\%$ and $> 26\%$ - 3, mouth opening $< 25\%$ - 4. [16]

The pain evaluation was realized through a horizontal VAS scale to determine the intensity of pain from 1 to 10 by the patient on the first, third and seventh day postoperatively Kaczmarzyk T. et al. [17] (Picture 8).

Picture 8. VAS scale – pain intensity



The swelling evaluation was realized by measuring the distance of certain points in the face, tragus (point A), labial commissure (point C), pogonion (point D), lateral angle of mandible. [18] (Picture 9.)



Picture 9. Swelling measurement by certain points in the face

The swelling the first day after coronectomy is presented at the patient of that participated in this surgical procedure, where it can be seen a moderate swelling on the right cheek. (Picture 10).

The results showed that swelling after applying the method of coronectomy is comparable to the outcomes of cases where is performed conventional extraction of impacted mandibular third molar.



Picture 10. Swelling on the right cheek, first postoperative day

Except the first week, we also followed the long term postoperative morbidity after coronectomy, including the presented case, like root migration, new bone generated above the remained tooth, root eruption. Radiograph imaging is performed 6 month and 12 months after coronectomy (Picture 9, 10 and 11)



Picture 10. 6 months after coronectomy



Picture 11. 12 months after coronectomy

Results

The patient was followed up for a 12-month period, where a clinical and radiographic evaluation was conducted. The patient showed a small discomfort after surgery, including moderate pain and swelling, and a light trismus (mouth opening $>76\%$ - 1), there was not registered any deficit in sensitive nerve function for the anticipated follow-up period. The migration of the remaining roots was evident after 6 months of surgery, while the difference between 6 and 12 months was insignificant. The distance of root migration from the mandibular canal from the initial position and after 12 months follow up was measured 1.6 mm.

Discussion and conclusion

The combination of radiographic imaging and CBCT findings has significant clinical value and directly contributes to better decision-making, aiming to reduce the risk of neurosensory complications and optimize surgical outcomes.

According to two systematic reviews coronectomy appears to be safer than total extraction in terms of lower risk of injury to the inferior alveolar nerve during surgical treatment of impacted mandibular third molars. [19,20] The study by Bernabeu-Mira JC et al. [21] showed only one case (2.56%) of temporary paresthesia. The inferior alveolar nerve was not affected. Several factors have been identified that influence the incidence of nerve injury: the anatomical position of the tooth to be extracted, the age of the patient, the exposure of the nerve, the applied extraction access technique and the experience of the surgeon.[22]

One of the most characteristic features of coronectomy is the postoperative migration of the roots left in situ. The majority of long-term radiographic studies have shown that the greatest root migration occurs in the first 6–12 months, with minimal additional migration beyond 24 months [94]. [23]

The success rate of coronectomy depends on the survival of the retained root fragments, i.e., the successful formation of bone tissue over the roots, and the absence of symptoms.

The analysis of the available literature and the discussed results from a clinical and radiographic aspect, we can conclude that the method of coronectomy is a scientifically based and clinically justified surgical method for the treatment of impacted mandibular third molars with a high risk of injury to the inferior alveolar nerve.

Coronectomy shows a clear advantage in terms of preserving the neurosensory function of the inferior alveolar nerve, significantly reducing the risk of temporary and permanent consequences of injury to it compared to conventional extraction in high-risk cases.

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