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Case Report

Coronectomy: A Report of an Exceptional Case and Literature Review

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Received: November 24, 2024; **Published:** January 06, 2025

Abstract

The surgical removal of mandibular third molars is a common procedure. The removal of a lower third molar can potentially cause permanent neurosensory disturbances of the inferior alveolar nerve (IAN) [1]. The incidence of IAN injury (IANI) reported in the literature ranges from 1.3% to 5.3%.

A coronectomy is a successful alternative procedure to reduce the risk of inferior alveolar nerve (IAN) damage, when lower third molar roots are in close proximity to the IAN [1,2]. It involves partial removal of the mandibular third molar; the crown is removed, but the root complex remains intact in the alveolar bone.

The objective of this work is to present a rare case of a patient with a very high risk of inferior alveolar nerve (IAN) damage and to investigate the application of coronectomy as an alternative surgical method for her right mandibular third molar (M3M). This approach is chosen over traditional surgical extraction in order to minimize the risk of IAN damage.

Coronectomy offers a viable alternative surgical approach to the extraction of mandibular third molars with a high risk of inferior alveolar nerve (IAN) damage. This is attributed to the substantial reduction in the risk of IAN damage and the low incidence of procedure failure.

Keywords: *Inferior Alveolar Nerve (IAN); IAN Injury (IANI); Mandibular Third Molar (M3M); Coronectomy*

Introduction

The surgical removal of mandibular third molars represents the most common procedure in oral surgical practice [1,2,6]. The extraction of a lower third molar can potentially cause one of the most feared complications by practitioners and the most disabling complications for patients: The inferior alveolar nerve injuries [1].

Serious adverse effects resulting from inferior alveolar nerve (IAN) injury include numbness, paraesthesia of the lower lip, and a diminished quality of life. The reported prevalence of IAN injury after mandibular third molar extraction varies from 0.4% to 8%; however, the rate of permanent IAN injury does not exceed 1%. This percentage can reach 35.64% in high-risk situations [1,5]. The injury may result from root compression during tooth extraction or from the use of surgical instruments, particularly rotary instruments [3].

Coronectomy is an effective alternative procedure aimed at minimizing the risk of inferior alveolar nerve (IAN) damage, particularly when the roots of the lower third molars are closely situated to the IAN [4]. It entails the partial removal of the mandibular third molar, where the crown is extracted while preserving the integrity of the root complex within the alveolar bone [2,5].

Objective of the Study

The objective of this work is to highlight this conservative technique through a clinical case followed within our department, to examine its clinical applications and limitations.

Case Report

A 28-year-old female patient, undergoing treatment for breast cancer with bone metastases, was referred by the oncology department for oral cavity preparation before commencing bisphosphonate therapy.

During her consultation appointment, she mentioned that she had been experiencing symptoms in the right molar region for around three months, with a gradual increase in discomfort, occasional pressure, and intermittent pain.

Upon a thorough clinical examination, we identified inflammation of the gingival mucosa, this prompted us to consider the possibility of pericoronitis (Figure 1).

Figure 1: *Intra oral picture showing an inflammation of the gingival mucosa of the partially impacted third molar.*

The panoramic radiograph displayed a reaction in the distal aspect of the crown, confirming the diagnosis of pericoronitis. It also evaluated the close relationship between the mandibular third molar and the inferior alveolar nerve (IAN) (Figure 2).

To further study the relationship between the right mandibular wisdom tooth and the inferior alveolar nerve, a cone-beam examination was prescribed, revealing the passage of the nerve between converging roots in the apical region, with no loss of cortication (Figure 3).

Figure 2: *A panoramic radiograph showing the darkening and superimposition of the apex of the roots of the mandibular third molar (48) with the inferior alveolar nerve suggests a high risk of injury to the inferior alveolar nerve.*

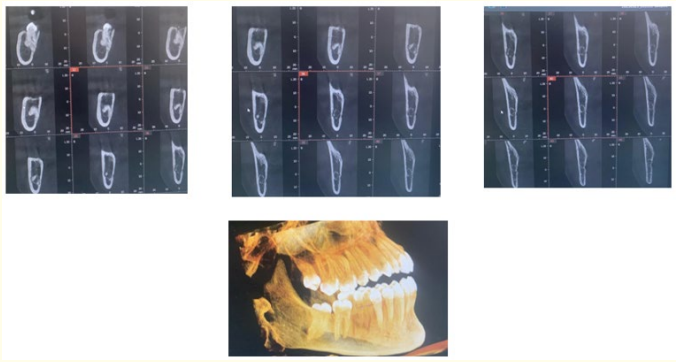

Figure 3: *In CBCT, the NAI appears to be inter-radicular with no loss of cortication and snaking through tooth roots.*

The patient was informed about the risks associated with complete extraction and was advised to undergo a coronectomy. She provided consent to proceed with the coronectomy.

Following the administration of local-regional anesthesia, an intra-sulcular incision was made from the mesial papilla of the right first molar to the 48, followed by a vertical incision.

Once the incision is made, a mucoperiosteal flap is detached.

By employing a Zekrya bur mounted on turbines, with continuous irrigation, the bone is cleared, and the tooth is exposed up to the amelo-cemental junction. This allowed us to have direct access to the entire crown and prepare for crown section. The crown section is performed at the amelo-cemental junction while keeping the bur perpendicular to the tooth's longitudinal axis. This section needs to be deep enough to facilitate the extraction of the coronal portion without mobilizing the roots and intentionally incomplete to prevent injury to the lingual nerve.

The coronal portion was then completely dislodged by introducing a narrow elevator deeply into the created trench, allowing for the fracture of the remaining coronal part. Following that, we conducted a reduction of the root surface, bringing it to a level 2-3 mm below the surrounding bone (Figure 4).

Figure 3: *In CBCT, the NAI appears to be inter-radicular with no loss of cortication and snaking through tooth roots.*

The socket was irrigated with saline solution, and the site was subsequently closed primarily using absorbable sutures. Postoperatively, antibiotics, corticosteroids, analgesics, and mouthwash were prescribed.

During the follow-up appointment eight days later, the surgical sites were observed to be healing well with no apparent complications (Figure 5).

Figure 5: *Clinical photograph at 4 weeks post op.*

The patient was instructed to come back for reassessment and radiographic control every six months for the initial two years and then again after the third year (Figure 6).

Figure 6: *Postoperative panoramic X-ray taken three months after the surgical procedure shows no evidence of root migration.*

Discussion

In 1989, Knutsson., *et al*. proposed coronectomy as an alternative approach to the total removal of an impacted mandibular third molar, With the aim of minimizing the occurrence of iatrogenic injury to the inferior dental nerve [3,5]. However, contemporary literature indicates that coronectomy of the mandibular third molar remains an unconventional treatment, and its indications are not entirely clear for clinicians [7,8].

The suggested indications for coronectomy include [7]:

a. The lower wisdom tooth is radiographically close to the inferior alveolar canal;
b. Presence of signs of narrowing or diversion (loop) of the inferior alveolar canal;
c. Roots are darkened in the apical third, with interruption of the inferior alveolar canal;
d. Interruption of the lingual cortical bone;
e. A vital tooth without caries, periodontal, or periapical pathology.

Coronectomy should be avoided in the following cases: infected teeth or cases associated with cystic tissue and any other apical disease, particularly when the root portion is involved. It is not recommended for mobile teeth, as they may become a source of infection or migration. Coronectomy should not be pursued in cases where the patient is medically compromised (immunocompromised or has a tumor) because root remnants of those teeth may act as foreign bodies [3,12].

Oncological treatment is currently considered a contraindication for coronectomy due to the theoretical risk of infection from non-vital roots left behind in patients who may have secondary or acquired immunodeficiency due to their cancer treatment.

Between 2011 and 2017, a series of seven patients, who were about to begin head and neck radiotherapy or chemotherapy, underwent coronectomy on mandibular third molars (M3Ms) to mitigate the risks associated with full extraction, particularly the risk of osteonecrosis of the jaw. Clinical and radiographic follow-up, averaging 15 months (ranging from 3 to 48 months), showed successful healing with no cases of persistent pain or infection. Radiographic evidence indicated that 56% of the retained roots migrated slightly, although none

required retrieval. Notably, no instances of osteonecrosis or permanent inferior alveolar nerve injury (IANI) were reported. This case series suggests that coronectomy could be a feasible and safer alternative to full extraction for patients about to undergo oncological treatments, particularly in immunocompromised individuals or those at risk for osteonecrosis [18].

Our patient presented with breast cancer and bone metastases and is scheduled to receive bisphosphonate therapy. Despite literature guidelines suggesting that her general health status contraindicates coronectomy, we opted for this approach due to the unavoidable risk of permanent nerve damage associated with a conventional extraction. Specifically, the inferior alveolar nerve passes between the roots of her wisdom tooth, which converge apically, making full extraction extremely risky in terms of preserving the nerve. Coronectomy in this case allows us to limit bone trauma and minimize the risk of severe neurological complications.

Several studies have attempted to establish a correlation between radiographic markers and the relationship between the inferior alveolar nerve (IAN) and the root of the tooth [3,4,9].

Panoramic radiographs may reveal signs suggestive of potential risk to the inferior alveolar nerve (IAN), including: Diversion or deviation of the canal; narrowing or darkening of the root; Interruption of the canal lamina dura, curving of the root, narrowing of the canal; peri-apical radiolucent area. The primary emphasis is on the first three enumerated signs. These indications exhibit a relatively low specificity, and nerve damage can occur in their absence. However, according to most authors, any roots that vertically overlap the outline of the canal or remain in prolonged contact with it are deemed at risk [4,9,10]. In our patient, the panoramic radiograph exhibited two precursory signs indicating a high risk of inferior alveolar nerve injury: the darkening of the roots and the interruption of the lamina dura of the nerve canal.

Therefore, there is growing evidence that three-dimensional (3-D) radiographic modalities, such as computed tomography (CT) and cone-beam computed tomography (CBCT), provide more accurate predictions of the likelihood of nerve injury for high-risk teeth. These modalities offer cross-sectional, axial, sagittal, coronal, and panoramic views, allowing for a comprehensive assessment. This approach provides precise information about the anatomical relationship between the inferior alveolar nerve (IAN) and the tooth roots, enabling a detailed analysis of how the IAN canal position influences impaction class, impaction position, angulation, and bone contact, especially in the presence of high-risk findings on panoramic radiographs.

However, 3-D imaging has revealed that some IANs are distant from the roots (approximately 30 - 50%), even if they were initially deemed high risk on plain films. This discrepancy is attributed to the superimposition issue in panoramic radiography, which can be misleading.

The advantage of 3-D imaging is highlighted in cases where tooth removal, rather than planned coronectomy, is considered. It's important to note that computed tomography comes with a relatively high radiation dose and cost [3,11].

In the presented case, the combination of panoramic radiographic signs indicating proximity and subsequent CBCT assessment confirmed a greater risk to the nerve. The CBCT specifically assessed the perforation of the mandibular third molar by the IAN. This case reinforces the appropriateness of the indication and choice of coronectomy based on the combined use of these two radiological techniques.

We believe that all the indicators cited in the literature are aimed at minimizing the risk of inferior alveolar nerve injury; however, in our case, where the inferior alveolar nerve passes between the roots, which converge apically, the risk of nerve injury is nearly 100%. This risk can only be avoided through the performance of a coronectomy. Given the unique anatomical relationship in our case, the coronectomy appears to be the only viable option to minimize nerve injury and preserve the integrity of the inferior alveolar nerve.

In the literature, it is generally recommended not to perform root canal treatment (RCT) during a coronectomy, as studies have shown a higher risk of postoperative infection when RCT is combined with this procedure. For instance, Sencimen., *et al*. found that seven out of eight patients who underwent coronectomy with RCT developed infections, compared to only one out of eight in the control group who had coronectomy without RCT. This higher infection rate may be due to root mobilization during RCT and the longer procedure time required [14]. A study conducted in 2020 aimed to provide a comprehensive review of controlled studies comparing the outcomes of mandibular third molar (M3) coronectomies with and without concurrent root canal treatment revealed a significant difference in postoperative infection rates: 87.5% of cases with concurrent root canal treatment developed an infection, compared to only 12.5% of cases without root canal treatment [15].

Patel., *et al*. (2014), through histological studies of roots extracted after coronectomy, observed that pulp healing can occur without endodontic treatment, with the formation of a tertiary dentin bridge isolating the pulp from surrounding tissues and thus preventing complications [16]. However, Kim., *et al*. (2014), suggest that exposed pulp following crown removal is at risk of inflammation and necrosis, which may justify performing RCT after crown extraction. In such cases, mineral trioxide aggregate (MTA) has been successfully used in vital pulp therapy to promote healing and protect exposed pulp tissue, offering an alternative that may help prevent infection and promote recovery [17].

The decision to perform root canal treatment during or after coronectomy remains debated in the literature. Studies highlight the potential for natural healing without endodontic intervention, but there is also a risk of inflammation or necrosis that may warrant RCT in certain cases. The use of materials like MTA may help in managing exposed pulp while reducing infection risks. For our patient, we did not perform root canal treatment or use vital therapy, and the results were excellent, with no complications after a 9-month follow-up.

Despite the inherent risks associated with surgical extractions, coronectomy has been reported to decrease the risk of inferior alveolar nerve (IAN) injury by 84%. However, the procedure itself carries a 1.3% incidence of IAN injury. Additionally, the risk of failure in the coronectomy procedure is reported to be around 7%, mainly due to root mobility or migration. The literature continues to debate the long-term outcomes of retained roots, considering the need for a second-stage surgery for removal and associated complications. Reports indicate that up to 91% of roots migrate within six months, with a 2.2% incidence of second-stage surgery [13].

Conclusion

In conclusion, coronectomy is a technique with specific indications and requires a high level of technical expertise to minimize complications. Although it offers a viable alternative to conventional extraction in cases with a high risk of nerve damage, further research is needed to better understand the long-term outcomes of retained roots.

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Volume 24 Issue 1 January 2025