

## **Coronectomy of Third Molar Impaction- a Review on Treatment outcome And Clinical Considerations**

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### **Abstract:**

Impaction of the mandibular third molars is relatively common than any other teeth that can cause severe pain, food lodgment and pathological lesions. Removal of the impacted mandibular third molars is a challenging task owing to its potential risk of damaging Inferior alveolar Nerve (IAN) either temporarily or permanently. Numerous surgical approaches were introduced to minimize the risk associated with nerve injury. Coronectomy evolved as an alternative surgical procedure that involves removal of the crown portion in an impacted tooth without disturbing the root within the socket to avoid direct or indirect injury to the IAN. The present review was performed to briefly evaluate the treatment outcomes, technical and clinical consideration associated with Coronectomy of mandibular impacted third molars. This review clearly shows despite potential difficulties of this technique, discrepancies in radiographic investigations and interpretation methods Coronectomy can be considered as a safe and effective alternative procedure, however the successful clinical outcome largely depends on appropriate case selection, patient cooperation and precise technique. Further evidence-based clinical studies with long-term follow up are required to quantify the success rate and establish the clinical effectiveness as well as reliability.

**Keywords: Coronectomy, Impaction, Inferior alveolar Nerve Injury, Periodontal pocket, Root migration.**

#### **Introduction:**

Impaction of the third molars is relatively common than other teeth due to several factors such as insufficiency of the space in the retro-molar region, reduced alveolar arch space between distal end of second molar and anterior border of the ascending mandibular ramus, shorter mandible/maxilla size, insufficient growth potential and forward movement of the dentition, dense bone covering, abnormal eruption pathway, unusual position of the tooth bud or any pathological lesions [1, 2]. Failure of the tooth to erupt or develop in its anatomical and functional position can cause food lodgment, inflammation of the Peri-coronal tissue, severe pain, dental caries, pathological lesions and occlusal disturbances [3]. Among impacted teeth, mandibular third molars are more frequently involved than their maxillary counterpart due to imbalance between the bone deposition and resorption process at the ramus, resulting in either a decreased mandibular angle or an increased mandibular plane angle leading to an insufficient alveolar space. Thus increased incidence of unerupted mandibular third molars and its associated complications necessitates appropriate patient management with acceptable decision-making either by retaining the tooth or extraction of the same [4].

Extraction of the impacted mandibular third molars is a challenging task owing to its potential risk of damaging Inferior alveolar Nerve (IAN) temporarily or permanently. Previous studies have reported

the incidence of chronic IAN injuries following impacted mandibular third molars extraction ranges from 0.5% - 5.3% depending on the third molar position, angulation and level in association with Inferior alveolar canal [5, 6, 7]. However the incidence increases as high as 19% if the root lies in close vicinity with the nerve canal [8]. In severe cases while extraction of the impacted third molar was the only treatment option available to prevent further tooth related complication, radiographic investigations are carried out to evaluate the location of the root in association with the nerve and to minimize the risk of neurological impediment during surgical tooth removal. Injury to the nerve often occurs as a result of indirect compression force to the nerve by the root during elevation or directly by the force of the elevators and rotary instruments during the removal of the tooth [9]. Numerous alternative surgical approaches were introduced to minimize the risk associated with nerve injury during impaction removal that includes orthodontic assisted extraction, Peri-coronectomy, coronectomy and Modified Grafted Coronectomy. Over the years, coronectomy evolved as an alternative surgical procedure that involves removal of the crown portion in an impacted mandibular third molar tooth without disturbing the root within the socket to avoid direct or indirect injury to the IAN [10]. Nonetheless application of this technique has also created a dilemma in the minds of surgeon in making a decision about the case selection and the risk associated with this alternative method. Hence the present review was performed to briefly evaluate the treatment outcomes, technical and clinical consideration associated with coronectomy of mandibular impacted third molars.

**Methodology:**

A structured literature search for articles written in the English language in PubMed/MEDLINE, EBSCOhost, Google Scholar, Scopus, and Web of Science databases was retrieved by using MESH terms “Coronectomy” OR “Partial odontectomy” AND “Dental”, “Impaction” AND “Mandibular Molar impaction” " Coronectomy, Dental" OR “Alternative surgical approach” OR “Mandibular impaction” OR "All Metadata", “Inferior alveolar nerve injury”, “Impaction, Systemic Review”.

**Clinical considerations:**

Coronectomy, also known as partial odontectomy was first introduced in 1984 to minimize the neurological complication by removing the crown portion of the impacted tooth without disturbing the root [11]. Different radiographic imaging techniques ranging from conventional radiography to digital computerized tomography (CT) were recommended to evaluate the root apices and inferior alveolar nerve canal relationship before the procedure to assess the nerve injury risk. However several technique variations and procedures has created a dilemma in the minds of surgeon in making a decision about the case selection and the risk associated with this alternative method [12]. Lenfant et al [7] in a systemic review described the standard conventional technique recommended by Pogrel et al [13], Renton et al [8], Hatano et al [14] and its clinical considerations. According to this, the

conventional technique in mandibular third molar region involves full-thickness gingival flap retraction followed by alveolectomy to expose the level of cement-enamel junction (CEJ). Once CEJ is exposed the crown is separated by using Lindhemann or fissure bur from the root perpendicular to the long axis of the tooth. Round or fissure burs are commonly used to reduce the root portion without exposing the pulp 3mm approximately below the lingual and buccal crest plates followed by debridement, copious irrigation to enhance new bone growth over the retained fragment of root [7, 9]. Sencimen et al [15] preferred coronectomy followed by endodontic treatment with mineral trioxide aggregate (MTA) of the roots to reduce the complication. Lenfant et al [7] conversely stated endodontic treatment of residual root complex is not required as long term studies reported no significant apical pulp tissue changes.

### **Clinical Complications:**

Injury to the inferior alveolar nerve and migration of the retained radicular complex were the most common post-operative primary complication associated with coronectomy. Renton et al [8], Hatano et al [14], Leung and Cheung [16], Geisier [17], Cilasun et al [18] showed that inferior alveolar nerve injury was found to be 0.5-5% following coronectomy while Patel et al [19] reported 9.5% transient inferior alveolar nerve injury and 4.8% permanent inferior alveolar nerve injury though comparatively lower than IAN injury caused by conventional complete removal of tooth. Long et al [10], Cervera-Espert et al [20] in a similar study also showed lower risk of inferior alveolar nerve damage compared to standard extraction. Gerardo et al [21] reported 0.1% to 22% risk of damage to the lingual nerve. On the other hand, Monaco et al [22] reported root migration of about 1.6mm from the actual site after 3 months while Dolanmaz et al [12] witnessed 4mm movement after 24 months follow-up. Philips et al [23] showed 26% to 35% of retained roots alter their position and migrate towards the occlusal plane over a period of time. Kohara et al [24] illustrated that 68% roots had migrated towards the coronal surface, with a faster rate by 3 months and stabilization at 3.5 mm after 36 months. Hatano et al [14], Kouwenberg et al [25] also found similar migration rates in their respective studies. The secondary complication includes Post-operative pain in 1.1% [18] to 41.9% [16], deep periodontal pockets on the distal of the second molars [26, 27], swelling in 4.6% [21], dry socket or suppurative alveolitis in 2% [14, 28] to 12% [8, 16], bleeding and pulpal diseases in less than 1% [29].

### **Treatment outcome based studies:**

Monaco et al [22], Goto et al [29] in their respective studies reported 100% success rate following this technique. In contrast, Renton et al [8] in his randomized control clinical trial observed 38.3% failure rate with severe complications. Vignudelli et al [30], Kohara et al [24] observed no periodontal complications on the adjacent tooth with adequate bone healing after coronectomy. Geisier [17] highlighted that coronectomy as an ideal technique for patients with high risk of IAN damage nonetheless technique sensitive with mild to moderate complications. Cilasun et al [18] and Renton et

al [8] also indicated that no re-treatment was required in majority of these cases performed without nerve damage due to the position of the tooth root. Lenfant et al [7] however recommended that mesio-crestal movement of the residual roots often requires re-intervention to prevent damaging the adjacent structures. Studies have also shown re-intervention if needed can be performed with a relative low risk of paresthesia and nerve injury for the remnant roots [7, 9]. Leizerovitz [26] reported a case of a Modified and Grafted Coronectomy (MGC) to reduce the incidence of potential periodontal pockets, root migration, intra-operative root displacement distal to the second molar, and prevent periodontal health of the adjacent tooth.

#### **Indications and Limitations:**

Indications of coronectomy includes deeply placed, angulated tooth within the bone associated with inferior alveolar nerve canal, thin bucco-lingual cortical bone and tooth with potential nerve injury risk. Pogrel et al [13] proposed that coronectomy should not be performed in third molars with acute or chronic infection, periodontally compromised tooth, and also in horizontally impacted teeth that lies along the course of nerve. In accordance with this, Cilasun et al [18], Leung and Cheung [16] suggested that failure of this technique often arises as a result of mobilization of roots during the de-crowning procedure leading to compromised periodontal tissue while Hatano et al [14] observed acute infection as a predominant factor for failure.

#### **Conclusion:**

Coronectomy can be considered as a safe and effective alternative procedure in certain circumstances as discussed to significantly reduce the risk of inferior alveolar nerve injury and incidence of severe postoperative complications following mandibular third molar impaction. However, because of potential difficulties of this technique, discrepancies in radiographic investigations and interpretation methods, the successful clinical outcome largely depends on appropriate case selection, patient cooperation and precise operator technique. Further evidence-based clinical studies with long-term follow up are required to quantify the success rate and establish the clinical effectiveness as well as reliability.

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