

# Coronectomy: Technique and Review

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## Abstract

Coronectomy involves removal of the crown from roots of a healthy tooth in healthy patients it is indicated to prevent inferior alveolar nerve injury in a high-risk case. There has been a lot of interest in this procedure and it has become routine in specialty practice. Causing damage to the inferior alveolar nerve (IAN) when extracting lower third molars is due to the intimate relationship between the nerve and the roots of the teeth. When the proximity between the IAN and the root of the third molars is present radiologically, the technique of coronectomy can be proposed as an alternative for extraction to minimize the risk of nerve injury, with minimal complications.

## Keywords

Coronectomy; Intentional Partial Odontectomy; Damage to IAN

## Introduction

Mandibular third molars are the most frequently impacted teeth and are associated with various pathologies ranging from infection, inflammatory to cystic lesions necessitating their surgical removal. Neurosensory disturbances related to the inferior alveolar nerve [1, 2, 3] due to the close anatomic relationship between the roots of mandibular third molars and the inferior alveolar canal [4]. The safe removal of third molars involved with the inferior alveolar canal (IAC) has been an area of concern since long. Many times we hesitate for the removal of third molars, fearing injury to the inferior alveolar nerve [5, 6]. Inferior alveolar nerve (IAN) injury (IANI) is a postoperative complication occurring after mandibular third molar extraction. The incidence of neurapraxia is about 1% to 5%, and the rate of persistent IAN involvement has been reported at up to 0.9%. More than 30% of the IANIs have been reported in confirmed cases of high-risk IAN involvement [7, 8]. The technique of coronectomy, or deliberate vital root retention, has been proposed as a means of removing the crown of a tooth but leaving the roots, which may be intimately related with the inferior alveolar nerve, untouched so that the possibility of nerve

damage is reduced [9].

History

Coronectomy is the oldest and the best researched of the IANI-risk-reducing procedures. First described in 1984, it has been now listed as a standard treatment option for surgical management of third molars by AAOMS ParCare 2012 in the USA. Despite those facts, coronectomy has not yet been accepted by the majority of the oral surgery community. The term coronectomy describes both the action on tooth and also the elimination of prime cause of the infection and is also known as ‘intentional partial odontectomy’ [10].

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## Indications for Coronectomy

The only major indication for selecting this technique is when the roots of the impacted third molar are in a very close proximity to the inferior alveolar nerve [1, 2, 10]

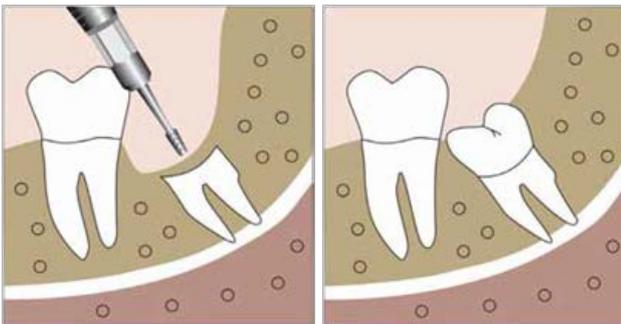
## Radiological Assessment

It is done mostly on a panoramic radiograph, the proximity of IAN is done by Howe and Poyton's [11] criteria.

1. A radiolucent band across the root (a definitive dark band on the root continues with the white line of the canal).
2. Loss of one or both white lines of the inferior alveolar canal
3. Narrowing of the canal [10].

## Specific Technique

The intention of coronectomy or deliberate root retention is that the part of the root intimately related to the inferior alveolar nerve is undisturbed. However, enough of the root must be removed below the crest of the lingual and buccal plates of bone to enable bone to form over the retained roots as part of the normal healing process. The technique used is as follows: [5, 9, 12, 13]

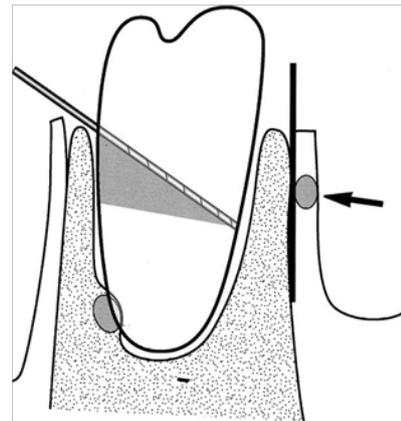


Chkoura Ahmed et al, Coronectomy of Third Molar, Dentup Date 2011

1. All patients were placed on appropriate preoperative prophylactic antibiotics.
2. A conventional buccal flap with releasing incision was raised, elevated, and retained with a retractor.
3. A lingual flap was raised and the lingual tissues were retracted and an appropriate lingual retractor, such as a lingual retractor, were placed to protect the lingual nerve.
4. Using a 701-type fissure bur, the crown of the tooth was transected at an angle of 45°. The crown was totally

transected so that it could be removed with tissue forceps alone. This minimizes the possibility of mobilizing the roots. However, the lingual retractor is essential during this technique because the lingual plate of bone can be inadvertently perforated, otherwise, the lingual nerve would be at risk.

Pogrel, Lee, and Muff. Coronectomy. J Oral Maxillofac Surg 2004



Following removal of the crown of the tooth, the fissure bur is used to reduce the remaining root fragments so that the remaining roots are at least 3 mm below the crest of the lingual and buccal plates in all places.

An alternative technique is to use a round bur from a superior aspect and remove the crown and superior part of the roots by drilling it away. In this case, only minimal lingual retraction may be required.

5. There is no need for root canal treatment or any other therapy to the exposed vital pulp of the tooth.
6. Following a periosteal release, a watertight primary closure of the socket is performed with 1 or more vertical mattress sutures.

Radiographs were taken preoperatively, immediately after the surgery for assessment.



Pre-operative

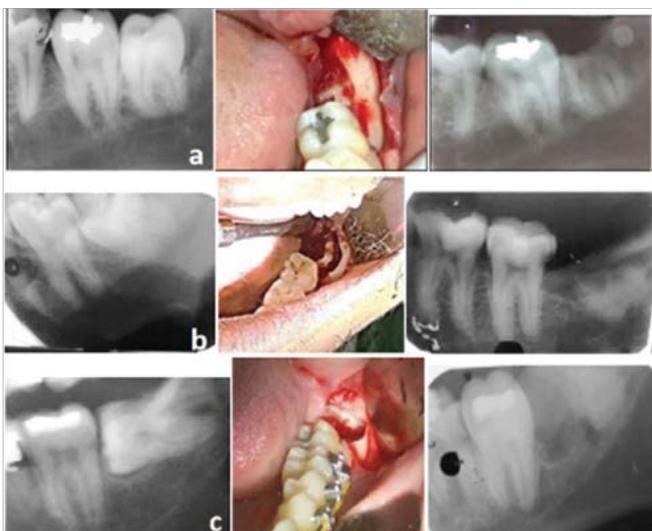
Postoperative

## The Outcomes of the Root

One logical question is the outcome of roots left in place after the coronectomy. Poe et al. [14] showed in dogs that, in vital retention of roots, all pulps survived and had calcific spurs attempting to bridge the pulp canal. Johnson et al. [15] showed the same results in humans.

### Coronectomy Photographs

- a. Vertical impaction
- b. Mesioangular impaction
- c. Horizontal impaction



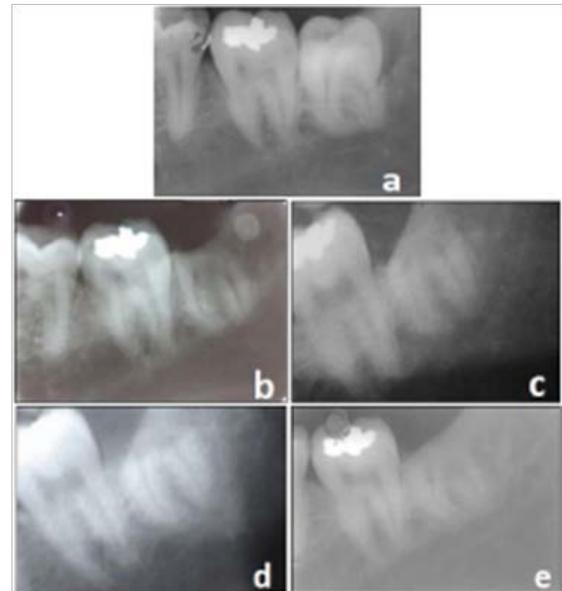
After the procedure, the patients were evaluated at six months interval for a period of two years for IAN deficit, lingual nerve deficit, pain, dry socket, infection or other complications if anything was noted. If the roots required extraction due to infection or exposure at a later date, it was recorded as complications of coronectomy [10, 12]

### Possible outcomes [12, 10, 15, 16]

1. The vital roots remain vital with some minimal Degenerative changes.
2. The bony formation has been observed over the remaining root piece.
  - a. Pre-operative, b. Immediate post-operative, c. Six months postoperative d. One year post-operative, e. Two

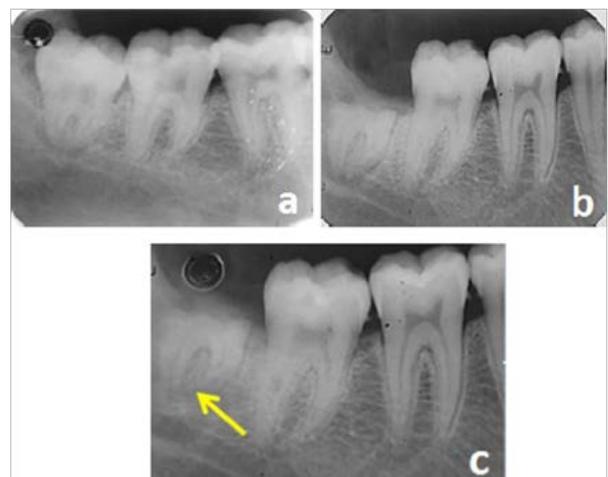
years post-operative.

A. Pre-Operative, B. Immediate Post-Operative, C. Six Months Postoperative D. One Year Post-Operative, E. Two Years Post-Operative



3. Apical changes may be seen but with no clinical symptoms. Though the radiolucency is observed there will always be a migrated root piece with a lamina dura [12].

A. Pre-Operative B. Immediately After Coronectomy C. Six Months After Coronectomy



### Rates of Infection

- Freedman published a retrospective series of 33 cases. Only one root had to be removed because of infection [17].
- In the study of Hatano et al. [7], four remaining

roots had signs of post-operative infection, and the patients underwent extraction of the root. No nerve damage resulted in these patients after repeat extraction.

- In the study of Renton et al. [14], the incidence of dry socket and infection was similar in the extraction group and in the coronectomy group.

- In the study of Leung and Cheung [18], pain and dry socket incidence were significantly lower in the coronectomy group. But there was no statistical difference in infection rate between the two groups.

### **Contra-Indications**

There are relatively few contraindications to carrying out coronectomy under the appropriate circumstances, but these do include the following:

1. Teeth with active infection around them particularly infection involving the root.

2. Teeth that are mobile because the roots may act as a mobile foreign body and become a site for infection or migration.

3. Teeth that are horizontally impacted along the course of the inferior alveolar nerve because sectioning of the tooth could itself endanger the nerve [12].

The technique is, therefore, better utilized for vertical, mesioangular, or distoangular impactions where the sectioning itself does not endanger the nerve. Currently, there are no standards regarding the timing and frequency of follow-up of patients having coronectomy. Most authors take radiographs immediately post-operatively and 6 months later, and the nerve function should be evaluated by pre and post-surgical nerve assessment tests [19].

### **Discussion**

Majority of nerve injuries in the oral surgery involve branches of the trigeminal nerve. The nerve injuries can be produced by pathological conditions, traumatic injury, surgical access, orthognathic surgery, dental implantology surgery or occasionally following local anesthetic administration. In all the etiology of nerve injuries, the extraction of the third molar was the cause of nerve damage in 52.1% of oral surgical cases [11, 20]. Fieldman has reported the incidence nerve injury following third molar impaction surgery as “silent epidemic of iatrogenic trigeminal nerve injury” [16, 21].

The first dictum of Medicine and Surgery is – ‘Primum Non-Curaram’ means – First Do No Harm. Neurosensory damage is the commonest cause of litigation following impacted third molar surgery [21]. Lydiatt claims that the patients often forget the information given

to them prior to the procedure and only 30% to 50% of the information given to them was recalled after seven days of the surgery and stresses the significance of informed consent [22]. Pogrel MA has reported that only 20% of cases had good improvement, 30% had moderate improvement and the remaining 50% had no improvement in sensation following micro neurosurgery [23]. Therefore, prevention is better than a cure to prevent patient dissatisfaction following the procedure. Conservative and minimally invasive procedure that is required for the management of disease is always the preferred treatment [24].

Pathological conditions arising from the third molar are related to the crown and peri-follicular structures. The follicle acts as a deep periodontal pocket which is the frequent site of infection. It gives rise to pericoronitis, periodontal problems, decayed tooth and follicle related odontogenic cysts and tumors. Thus, the crown along with the follicular tissue should be removed to relieve from any further infections [21]. Coronectomy or Prejudiced Odontectomy (American Dental Association-D7251) is a technique by means of which the crown is sectioned and the roots that are closer to the IAN canal on diagnostic radiographic imaging are left in situ. Retention of root for coronectomy is based on the idea that broken fragments of vital teeth generally heal without complications [24, 25, 26]. This procedure attracted special attention in the last decade, because of the reported benefits and success rate of this technique, in contrast to the contemporary belief that the roots left behind will be the source of the problem [27, 28].

Landi L et al., recommends coronectomy to be done, 2mm-3mm from the occlusal surface without involving the pulp after considering the pulpal anatomy of the impacted third molar tooth and the distance between the third molar crown and the second molar. In case of accidental pulpal exposure pulpal dressing or pulpotomy was advised. In our study, we sectioned the crown at the cemento-enamel junction level and the remaining enamel if anything is ground off to the level 2-3 mm below the alveolar crest. It was described that enamel is inert and soft tissue cannot attach to its surface so the socket does not heal [29]. The enamel acts as a foreign body, so chances of infection of the unhealed socket are more. Root fragment at least 3 mm inferior to the crest of bone seems appropriate and appears to encourage bone formation over the retained root fragment [30-31]. Our objective was to leave the root behind and aim for Osseo-cementum formation over the retained root in contrast to migration and staged removal protocol of Landi L et al.,. We didn't attempt to treat

the exposed pulp as advocated by O’Riordan et al., as coronectomy decompresses the pulp chamber, it will not be a significant contributing factor for post-operative pain. Histological evaluation of the retrieved lower third molar roots stated that symptoms after coronectomy do not result from the loss of pulp vitality or subsequent periradicular inflammation. It was refined that these pulpal tissues blend with an overlying connective tissue when the mucosa heals successfully and the opening of the canal heals with osteo-cementum [29]. Interestingly, it was described that pulpal treatment of the retained root has resulted in high rate of infection and the subsequent need for removal [32, 33].

Many authors are not advocating coronectomy procedure for the horizontally impacted third molar because of the difficulty in conceptualizing the third molar three-dimensionally during sectioning and for the potential risk to IAN injury during sectioning the crown [34]. In contrary to this concept, the crown was sectioned bit by bit as advocated by Clare et al., [35]. Philips et al., claims that 26% to 35% of unerupted third molars retain eruption potential and change their position over time, depending on the angle of impaction and migrate towards occlusal plane [36]. Migration of root has been noted in every article published on this subject and appears to occur in between 14% to 81%, depending on the length of the follow-up [37]. A literature revealed that more than half of the roots migrated at a higher rate for 3 months postoperatively and then gradually stopped between 12 and 24 months [38]. a root migration of about 1mm-3mm during a period of two years [16].

Many coronectomy studies reported the incidence of 10%-12% of alveolar osteitis [39]. There was report where they mentioned that the occurrence of dry socket was considerably low in coronectomy in comparison to removal of third molars because there is reduction in the amount of bone exposed and stabilizing effect with primary closure for all coronectomy cases, eventually resulted in no loss of clots [40].

## Conclusion

Nerve injury after the extraction of the mandibular third molar is a serious complication. The technique of coronectomy can be proposed to minimize the risk. but depends on the skill set of the operator and has a learning curve in assessing the case for coronectomy and understanding the positive outcomes of it.

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