



Guidelines for Surgical Coronectomies

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INTRODUCTION

Third molar impactions are the most commonly impacted teeth in clinical practice, with prevalence ranging from 35.9% to 58.7%.¹ One theory accounting for the frequent impaction of third molars holds the human diet transitioning from coarse to refined grains accountable for the decreased mesial migration of teeth.¹ Third molar impactions are associated with several pathological changes such as cysts, tumors, caries, and pericoronitis.^{1,2} Practitioners advise patients on the removal of impacted third molars via extraction or coronectomy in the absence of pathology on the basis of prevention; if pathology is present, coronectomy may not be an available treatment option.³

Coronectomy is a surgical procedure, first proposed in 1984 by Ecuyer and Debien, designed to avoid the risk of iatrogenic neurological injury to the inferior alveolar nerve (IAN) by removal of the anatomical crown only, leaving root fragments.⁴ IAN injury is a rare, but serious risk associated with removal of third molars, especially impacted third molars. Injury is thought to be due to compression or direct contact by surgical instruments or tooth roots.^{1,3} The resulting sensory deficit may or may not be permanent and has a generally accepted incidence rate of three percent.^{3,5} This Clinical Update will discuss the assessment factors integral to determining treatment modality, coronectomy technique, and the possible complications.

Clinical Examination

Patient selection is an important aspect for any surgeon to consider regarding any procedure. Post-operative complications related to extraction of impacted third molars occur more frequently in patients 40 years and older.⁴ Coronectomy success relies on the vitality of the retained fragments and health of the surrounding bone.⁶ Coronectomies are contraindicated when the tooth in question presents with caries and there is a risk of pulpal involvement or when periodontal disease is present compromising the surrounding bone and/or mobility of roots.⁶ Immunocompromised patients and those having odontectomies prior to radiotherapy are not candidates for coronectomy treatment. Dentigerous cysts are normally associated with teeth that have failed to erupt, therefore commonly associated with impacted third molars.² If complete removal of the tooth and associated cyst compromises the IAN, coronectomy can be considered as an alternative treatment to extraction of the associated tooth as long as all cystic tissue can successfully be removed.⁶

Radiographic Examination

Third molar impactions are classified using multiple methods; the method referenced in this Clinical Update is Winter's classification, which is based on the inclination of the impacted third molar to the long axis of the second molar. The four impaction classifications are vertical, horizontal, mesio-angular, and disto-angular (see Fig. 1). Each impaction angulation is approached somewhat differently in terms of surgical technique whether an extraction or coronectomy is performed.⁶ All case studies referenced in this Clinical Update utilized dental panoramic radiographs initially on all patients prior to surgery. If a high risk of IAN damage was suspected, all studies referenced in this Clinical Update utilized cone beam computed tomography (CBCT) to determine the exact

three dimensional relationship between the third molar roots and the IAN canal. Risk factors that can be observed on panoramic radiographs are diversion of the IAN canal, darkening of the root, narrowing or deflection of the root, and interruption of the white lines of the canal (see Fig. 2).⁶

A CBCT should be considered if the panorex has radiographic evidence that is associated with IAN proximity. A CBCT can show the three-dimensional morphology of the canal and cortication status of the canal. Absence of cortication and a dumbbell shaped canal are reliable predictors of proximity of the third molar to the IAN and present a high risk for injury.⁷ These predictors can be used to treatment plan the patient for coronectomy.

Contraindications

1. Teeth with an active infection or pathology
2. Teeth in which the roots are mobile
3. Horizontally impacted teeth that are along the IAN canal in such a position where sectioning could result in injury⁸

Coronectomy Technique

Procedure

A six stage coronectomy technique documented by Gleeson et al. follows.

Incision

Triangular full thickness mucoperiosteal flap is reflected and retracted with a Minnesota retractor to prevent injury to the mucosa. Care is taken to preserve the papilla, which aids in achieving primary closure when procedure is complete.

Exposure

Expose tooth to the level of the cemental enamel junction (CEJ) using a fissure bur in a high speed hand piece. Bone removal is limited since only the crown of the tooth requires disimpaction and piecemeal retrieval. CBCT can be an excellent reference for safely removing bone when the IAN canal is positioned buccally.

Decoronation

Sectioning of the tooth roughly three-quarters through the tooth in the buccal lingual dimension, 1-2mm below the CEJ is completed with a fissure bur in a high speed hand piece. Incomplete sectioning aims to protect the lingual nerve. Additional cuts may be necessary to ensure crown removal without mobilizing the roots. Gleeson suggests that elevating the crown with a Coupland chisel minimizes root mobility. If the decoronating cut is deep enough, minimal force is required to retrieve the crown. If the crown fails to section, depth of cut should be evaluated and deepened. Forceful elevation leads to mobilization of the entire tooth, including the roots. Once roots are mobilized, a coronectomy is no longer a treatment option as mobile roots are a nidus for infection.⁹

Finishing of the Root Surface

A round bur is used to reduce the surface of the root to 2-3mm below the level of the surrounding alveolar bone, and remove any retained enamel. Reducing the tooth structure to 3mm below the bone crest has been shown to be sufficient to encourage deposition of bone. The presence of enamel remnants inhibits healing. All remnants of the coronal pulp chamber should be removed, leaving only the pulpal canals in the residual roots, which is thought to reduce postoperative discomfort.⁹

Debridement of the socket

Any exposed surface of the mandibular second molar should be curetted and the entire surgical site should be copiously irrigated with saline to remove debris. Ensure that all enamel has been removed and that residual roots are 2-3mm deep to the bony margin.

Closure

Primary, tension free closure with an adequate number of simple interrupted sutures should be obtained.

Perioperative Complications

The conservative nature of a coronectomy tends to reduce the incidence and severity of intraoperative complications, but they still warrant consideration and patients should be adequately informed.

Hemorrhage

The risk of hemorrhage is rare with dentoalveolar surgeries in the absence of a hematological disorder, but if encountered is managed via the application of hemostatic agents applied locally. These agents are not contraindicated in the presence of a retained root and have not been associated with an adverse outcome.⁹

Mobilized Root Fragments

Mobilization of the retained root fragment is the most common complication with a coronectomy with an incidence of 3%-9%.^{10,11} This complication is seen more frequently with vertical impactions with conical roots that narrow within the nerve canal. This root phenotype is more common in females.^{6,9} Root mobilization is likely due to inadequate decoronating cuts, thus it is imperative to evaluate and deepen the cut if the crown is not elevated or fractured away with minimal force. When roots are mobilized, it is considered a failed coronectomy. Mobile roots must be removed to prevent infection.^{4,6,9}

Damage to Adjacent Structures

Iatrogenic damage to the second molar has been reported, which likely occurs when removing all enamel from mesio-angular impactions. To avoid damage to the second molar, the clinician can make additional coronal cuts to "implode" the crown and retrieve it in several pieces. The crown is closely positioned with the IAN with horizontally impacted third molars, so the clinician needs to plan the decoronating cut carefully after assessment of radiographs.^{6,10}

Lack of Root Visibility

Not being able to visualize the root surface is a common problem with disto-angular impactions and makes root finishing difficult. The solution is to make the decoronating cut below the CEJ, reducing the likelihood that there is enamel remaining, thereby eliminating the need for finishing.⁶

Postoperative Complications

Alveolar Osteitis

Alveolar osteitis (also known as a dry socket), which is severe, throbbing pain several days after extraction is thought to be attributed to partial or complete loss of the blood clot.¹⁰ Hatano found that alveolar osteitis was reported less after coronectomy than extraction of third molars.¹² The decreased amount of bone removal may explain the reduced incidence. When alveolar osteitis does occur, the region should be thoroughly irrigated with saline or chlorhexidine gluconate and dressed with eugenol.

Infection

Incidence of infection is similar to that of extraction of third molars. If the infection involves the root fragment, it must be removed. If sufficient time has not passed and there has been no migration of the retained roots has occurred, CBCT is an invaluable resource for localization of the root in surgical planning of removal.⁹

Delayed or Non-Healing Sockets

Several etiologies may be the culprit for delayed or non-healing sockets after coronectomy. Retention of enamel is a common

cause, usually enamel spurs are left in two areas. One area is distal to the lower second molar where direct visual access is difficult and there is risk of damaging the second molar, the other area is on the buccal aspect of the root on the third molar especially if the tooth is lingually positioned. Checking bony undercuts and other areas not visible directly should be inspected using a dental mirror.¹⁰

Nerve Injury

The decision to treat with a coronectomy procedure is generally to avoid injury to the IAN. Clinical studies report very low incidence of 0% to 1% of nerve injury from a coronectomy as compared to up to 6% with extraction of third molars. In all cases of reported IAN injury, none resulted in permanent damage. Lingual nerve injury is not likely as long as the technique of partial sectioning is used. One study, by Pogrel, advises raising a lingual flap and one patient suffered lingual nerve injury. Though the lingual nerve cannot be visualized on CBCT, the scan is an essential tool for treatment planning to avoid both the inferior alveolar nerves and unnecessary risk to the lingual nerve.¹⁰

Migration or Eruption of Roots

The most common long-term consequence of coronectomy is migration of the retained root. This is not necessarily a complication. The majority of migration will occur within the first six months with a typical distance of 2-3mm away from the IAN canal. Root migration halts as the bone regenerates and remodels. Rarely, the retained roots will continue to migrate and eventually erupt. This can take up to ten years. Removal of the erupted roots is reported as being an uncomplicated procedure.¹⁰

Conclusion

In patients with risk factors and radiographic signs associated with proximity to inferior alveolar nerve, coronectomy should be considered. The procedure significantly decreases risk of injury and can be easily performed by clinicians trained to manage impacted teeth.

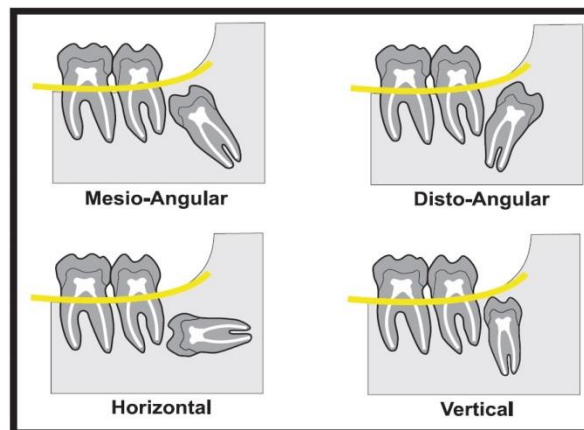


Figure 1

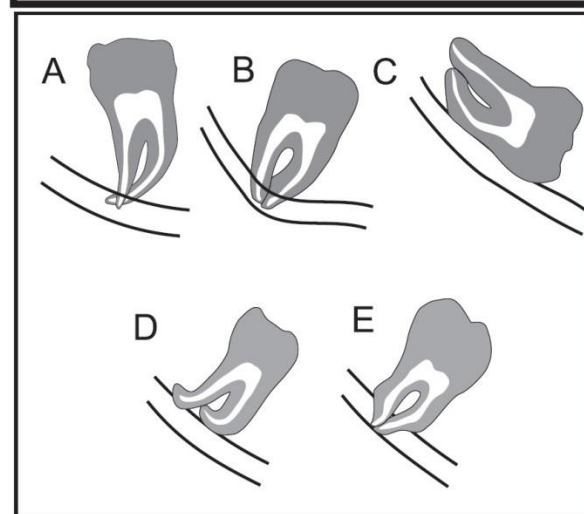


Figure 2

All figures courtesy of NMC Portsmouth Graphics Department.

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