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Coronectomy of the Mandibular Third Molar: A Narrative Review of Indications, Surgical Technique, Clinical Outcomes, and Ongoing Controversies

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Abstract

Coronectomy, also termed intentional partial odontectomy, is a surgical technique in which the crown of an impacted mandibular third molar is deliberately removed while a portion of the root complex is left in situ, with the aim of avoiding direct surgical trauma to the inferior alveolar nerve (IAN). This narrative review synthesises the current evidence on the indications, surgical technique, outcomes, and controversies surrounding coronectomy of the mandibular third molar.

A literature search of PubMed, Scopus, and the Cochrane Library was performed to identify original studies, systematic reviews, meta-analyses, and case series addressing coronectomy published from the introduction of the technique to the present. Relevant data on indications, radiographic risk assessment, operative technique, complication rates, root migration, and re-operation were extracted and synthesised narratively.

Across the available literature, coronectomy is associated with a substantially lower incidence of IAN injury than complete surgical removal when the third molar root is judged radiographically to be in intimate contact with the mandibular canal, while rates of infection, dry socket, and postoperative pain are broadly comparable between the two approaches. Retained root fragments migrate away from the canal in the majority of cases, most markedly within the first six to twenty-four months, and re-operation is required in a minority of patients, most commonly for root mobility, exposure, or infection. Lingual nerve injury, pulpal disease, and failure of the technique intra-operatively (necessitating conversion to complete extraction) are recognised but infrequent.

Coronectomy is a safe and clinically effective alternative to complete extraction for mandibular third molars judged to carry a high radiographic risk of IAN injury, provided that appropriate case selection, informed consent, and structured radiographic and clinical follow-up are observed. Long-term, adequately powered randomised evidence remains comparatively limited, and further prospective research is warranted to refine patient selection criteria and to clarify the very long-term fate of retained roots.

Keywords

Coronectomy; Mandibular Third Molar; Inferior Alveolar Nerve; Partial Odontectomy; Tooth Extraction; Nerve Injury

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1. Introduction

The surgical removal of impacted mandibular third molars is among the most frequently performed procedures in oral and maxillofacial surgery. Although generally safe, complete extraction carries a recognised risk of injury to the inferior alveolar nerve (IAN) when the roots of the tooth lie in close anatomical proximity to, or overlap, the mandibular canal. Reported incidence figures for temporary IAN injury following conventional extraction range from approximately 0.5% to 8%, with permanent injury occurring in roughly 1% of cases[1,2,3]; such injury can result in persistent paraesthesia, dysaesthesia, or neuropathic pain that meaningfully affects a patient's quality of life[4].

Because the consequences of IAN injury can be permanent and disabling, considerable effort has been directed toward identifying patients at elevated risk before surgery. Rood and Shehab described a set of panoramic radiographic signs — including darkening of the root where it crosses the canal, interruption of the white lines of the canal, and diversion or narrowing of the canal — that are predictive of intimate root–canal contact and, by extension, of increased surgical risk[5]. Where two or more such signs are present, or where cone-beam computed tomography confirms a close or perforating relationship, clinicians must weigh the benefits of complete tooth removal against the risk of permanent nerve injury.

Coronectomy — also referred to as intentional partial odontectomy or deliberate root retention — was proposed as a means of reconciling this dilemma. The technique involves sectioning and removing the crown of the tooth to a level below the alveolar crest while deliberately leaving the root(s), and by extension the tissue in most intimate contact with the nerve, undisturbed in situ. An early description of partial removal of the mandibular third molar was reported by Knutsson and colleagues[6], and the rationale and outcomes of the approach were subsequently articulated in more detail by O'Riordan[7] and, in the paper most widely credited with popularising the modern technique, by Pogrel, Lee and Muff[8]. Since these initial reports, coronectomy has increasingly been incorporated into the surgical armamentarium for high-risk mandibular third molars, although it remains a technique that not all surgeons routinely offer, and its long-term outcomes and precise indications continue to be debated[9].

The objective of this review is to summarise the current evidence base for coronectomy of the mandibular third molar, with particular attention to patient selection and radiographic risk assessment, the surgical technique, the reported rates of nerve injury and other complications relative to complete extraction, the natural history of retained root fragments, and the principal areas of ongoing clinical controversy.

2. Materials and Methods

This article was structured as a narrative literature review rather than a formal systematic review or meta-analysis. A literature search of PubMed/MEDLINE, Scopus, and the Cochrane Library was undertaken to identify English-language original research articles, randomised controlled trials, systematic reviews, meta-analyses, and case series concerned with coronectomy (partial odontectomy) of the mandibular third molar, published from the earliest description of the technique to the present. Search terms included combinations of "coronectomy", "partial odontectomy", "root retention", "mandibular third molar", and "inferior alveolar nerve injury".

Articles were considered for inclusion if they reported clinical outcomes of coronectomy (including nerve injury, infection, dry socket, pain, root migration, or re-operation), described the surgical technique or patient selection criteria, or provided a systematic synthesis of the coronectomy literature. Reference lists of retrieved articles were hand-searched for additional relevant sources. Given the narrative design of this review, no formal risk-of-bias assessment, meta-analytic pooling, or PRISMA-based screening protocol was applied; findings from the identified literature are instead synthesised descriptively by theme.

As this review relied exclusively on previously published, publicly available data and did not involve the recruitment of human participants, animal subjects, or the use of identifiable patient information, formal ethical approval and informed consent were not required.

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3. Results and Discussion

3.1 Rationale and Definition

Coronectomy is defined as the deliberate removal of the crown of a tooth, sectioned at or below the level of the alveolar bone, with retention of the associated root(s) in situ[8]. The underlying rationale is that the majority of iatrogenic IAN injuries during third molar removal occur as a result of direct mechanical trauma, compression, or traction on the nerve during elevation or delivery of the root complex, rather than from manipulation of the crown itself. By avoiding luxation and delivery of the apical root fragment that is in closest proximity to the canal, coronectomy is intended to substantially reduce the mechanical insult to the nerve while still addressing the pathology, symptoms, or space requirements that prompted removal of the tooth.

3.2 Indications and Preoperative Risk Assessment

Coronectomy is generally indicated for a vital, non-carious, non-mobile mandibular third molar in a patient who is otherwise a candidate for extraction, where preoperative imaging suggests a high risk of IAN injury should complete removal be undertaken. Panoramic radiography remains the standard initial imaging modality, with the radiographic signs described by Rood and Shehab — darkening of the root, interruption of the tramlines of the canal, diversion or narrowing of the canal, and deflection of the root — used to flag teeth warranting further risk assessment[5]. Where two or more such signs are present, cross-sectional imaging with cone-beam computed tomography can be used to clarify the three-dimensional relationship between the root apex and the canal, and case-control data using dental computed tomography have supported its value in refining the decision between coronectomy and complete removal[12].

In broad terms, coronectomy is best suited to teeth that are vertically or mesio-angularly impacted, with roots that are not markedly horizontal or dilacerated in a way that would place the retained fragment at ongoing risk of late exposure. Non-carious status and the absence of periapical or periodontal pathology are generally required, since coronectomy is not intended as a means of managing an already-infected tooth.

3.3 Contraindications

Recognised contraindications to coronectomy include an actively infected or grossly carious tooth, an existing periapical radiolucency, active periodontal disease affecting the third molar, longitudinal root fracture, and a horizontally impacted tooth in which the retained root would remain superficially placed and prone to re-exposure. Coronectomy is also generally avoided in medically compromised patients, including those who are immunosuppressed or undergoing radiotherapy or chemotherapy to the head and neck, and in cases where the tooth can be removed completely with a low anticipated surgical risk, since the procedure offers no advantage over conventional extraction in low-risk cases.

A further relative contraindication arises intra-operatively: should the root complex become mobilised during crown sectioning, the rationale for coronectomy is lost, and the surgeon should proceed to complete removal of the mobilised root rather than leave a loose fragment in situ, since a mobile retained root carries an increased risk of infection and delayed exposure.

3.4 Surgical Technique

The surgical technique described by Pogrel and colleagues, and subsequently refined by others, follows a broadly consistent sequence[8,9]. A standard buccal mucoperiosteal flap is raised and bone removed as required to expose the crown, as for conventional third molar removal. The crown is then sectioned obliquely from the enamel at, or just below, the amelocemental junction down to a level 3–4 mm below the alveolar crest, so that the remaining root fragment lies well beneath the level of anticipated bone remodelling. Crucially, the root is not elevated or luxated; rather, the pulp is left undisturbed, and any sharp bony or enamel edges are smoothed. Where the root is inadvertently mobilised during sectioning, it should be removed in its entirety rather than left loose within the socket. The socket is then irrigated and the flap closed in the standard manner, either primarily or with a period of secondary intention healing over the retained fragment.

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Deliberate retention of vital, undisturbed pulp tissue within the root fragment has generally been favoured over prophylactic endodontic treatment of the remaining root prior to closure; comparative data have not shown endodontic treatment of the retained root to confer additional benefit, and most authors now recommend against routine root canal treatment as part of the coronectomy procedure[14].

3.5 Inferior Alveolar Nerve Injury

The principal outcome of interest across the coronectomy literature is the incidence of IAN injury, and the evidence consistently favours coronectomy over complete extraction in teeth judged to be at high radiographic risk. In the original prospective series reported by Pogrel and colleagues, no cases of permanent IAN injury occurred among patients undergoing coronectomy[8]. In the only randomised controlled trial directly comparing coronectomy with complete removal in high-risk cases, Renton and colleagues reported a significantly lower incidence of IAN disturbance in the coronectomy group[10], a finding subsequently corroborated by Leung and Cheung in a further randomised trial, which also reported fewer cases of dry socket after coronectomy, with a broadly similar infection rate between the two techniques[11].

Systematic reviews and meta-analyses have generally reinforced these findings. Long and colleagues, pooling data from four controlled studies, reported a pooled risk ratio for IAN injury of 0.11 in favour of coronectomy, with no significant difference in the risk of postoperative infection, dry socket, or pain at one week[16]. Martin and colleagues, reviewing ten studies, reported IAN injury rates after coronectomy ranging from 0% to 9.5%, alongside a low incidence of lingual nerve injury (0–2%), postoperative pain, dry socket, and infection[17]. A subsequent meta-analysis by Cervera-Espert and colleagues similarly concluded that coronectomy results in significantly less loss of IAN sensitivity and a lower incidence of dry socket than complete removal, without a statistically significant difference in the rates of pain or infection between the two techniques[18].

3.6 Root Migration and the Fate of the Retained Fragment

A distinctive feature of coronectomy is that retained root fragments frequently migrate coronally and away from the mandibular canal over the months following surgery, a phenomenon thought to result from continued eruptive forces, bone remodelling, and healing of the surrounding periodontal ligament remnant. Reported rates of visible root migration vary considerably between series, from as low as 2% to as high as 85%, reflecting differences in follow-up duration, imaging modality, and the radiographic definition of migration used across studies[17]. Migration distances are generally modest, most commonly in the order of a few millimetres, and Dolanmaz and colleagues reported a mean total root movement of 3.4 mm at six months, increasing only slightly to 4.0 mm by twenty-four months[13]. Most authors report that migration is most pronounced within the first six to twenty-four months after surgery and slows substantially thereafter, with the retained fragment typically coming to lie further from, rather than closer to, the mandibular canal[19].

Histological analysis of root fragments retrieved after coronectomy — most commonly because eruption or migration has necessitated secondary removal — has shown that retained roots typically undergo a process of continued vitality, cemental deposition, and, in some cases, partial or complete pulpal obliteration, rather than the periapical inflammatory change that might otherwise be expected of a retained dental fragment[15].

3.7 Re-operation and Long-Term Outcomes

A minority of patients who undergo coronectomy will require a second surgical procedure to remove the retained root, most commonly because of coronal migration and mucosal exposure of the fragment, mobility, or localised infection. Reported re-operation rates in the literature are generally low, though they vary with the duration of follow-up; longer-term series have generally reported re-intervention in a small proportion of cases, most often within the first one to two years after the original procedure[17]. In their long-term follow-up study, Leung and Cheung reported that the great majority of patients who underwent coronectomy did not require further surgery, and that where nerve-related symptoms did occur, they were typically transient[20]. More recent retrospective series with extended follow-up of two to nine years, and prospective comparative studies incorporating oral

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health-related quality-of-life measures, have continued to support coronectomy as a durable long-term alternative to complete extraction in appropriately selected patients[23,24].

3.8 Patient-Reported Outcomes

Beyond objective clinical endpoints, patient-reported outcome measures have increasingly been incorporated into the coronectomy literature. A recent single-blinded prospective study using the Postoperative Symptom Severity scale found that, while coronectomy successfully avoided IAN injury, patients undergoing coronectomy reported somewhat longer recovery times, more prolonged analgesic use, and higher pain and swelling scores than those undergoing complete extraction, particularly among older and female patients, without an adverse effect on eating, speech, or overall quality of life[25]. Such findings underscore that, although coronectomy reduces the risk of a rare but serious permanent complication, it does not necessarily confer an advantage in terms of short-term postoperative morbidity, and this trade-off should be discussed explicitly with patients during the consent process.

3.9 Controversies and Limitations of the Current Evidence

Despite generally favourable findings, several areas of controversy and evidentiary limitation persist. First, the number of adequately powered randomised controlled trials directly comparing coronectomy with complete extraction remains small, with much of the supporting evidence drawn from retrospective case series and single-arm cohort studies of variable methodological quality and follow-up duration[22]. Second, there is no universal consensus on the precise radiographic threshold at which coronectomy should be recommended over complete extraction, and practice varies between centres and individual surgeons. Third, the long-term fate of retained roots beyond five to ten years is not yet fully characterised, and questions remain regarding the very late risk of infection, root exposure, or interference with future implant or denture planning in the third molar region. Finally, because coronectomy leaves a portion of the tooth in situ, patients must be counselled that a second procedure may, in a minority of cases, ultimately be required, and that the technique is not a guarantee against all forms of postoperative morbidity.

Taken together, the weight of current evidence supports coronectomy as a valid and evidence-based technique for reducing the risk of IAN injury in carefully selected mandibular third molars, while highlighting the continued need for long-term prospective data, standardised outcome reporting, and clearer consensus guidance on patient selection.

4. Conclusion

Coronectomy is a well-documented and evidence-supported alternative to complete surgical removal of the mandibular third molar in patients judged, on the basis of panoramic radiography and, where indicated, cone-beam computed tomography, to be at high risk of inferior alveolar nerve injury. Compared with complete extraction, coronectomy is associated with a markedly lower incidence of IAN injury and dry socket, a broadly comparable rate of infection and postoperative pain, and a low but non-negligible rate of re-operation, most often necessitated by root migration, exposure, or mobility. Appropriate patient selection, meticulous surgical technique that avoids intra-operative mobilisation of the root, and structured long-term radiographic and clinical follow-up are essential to achieving favourable outcomes. Further prospective, adequately powered studies with extended follow-up are needed to refine selection criteria and to better characterise the very long-term behaviour of retained root fragments.

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7. Conflict of Interest

The author declares no financial, professional, institutional, or personal conflict of interest in relation to this manuscript.

References

1. Carmichael FA, McGowan DA. Incidence of nerve damage following third molar removal: a West of Scotland Oral Surgery Research Group study. Br J Oral Maxillofac Surg. 1992;30(2):78-82.
2. Valmaseda-Castellón E, Berini-Aytés L, Gay-Escoda C. Inferior alveolar nerve damage after lower third molar surgical extraction: a prospective study of 1117 surgical extractions. Oral Surg Oral Med Oral Pathol Oral Radiol Endod. 2001;92(4):377-383.
3. Queral-Godoy E, Valmaseda-Castellón E, Berini-Aytés L, Gay-Escoda C. Incidence and evolution of inferior alveolar nerve lesions following lower third molar extraction. Oral Surg Oral Med Oral Pathol Oral Radiol Endod. 2005;99(3):259-264.
4. Renton T, Yilmaz Z. Managing iatrogenic trigeminal nerve injury: a case series and review of the literature. Int J Oral Maxillofac Surg. 2012;41(5):629-637.
5. Rood JP, Shehab BA. The radiological prediction of inferior alveolar nerve injury during third molar surgery. Br J Oral Maxillofac Surg. 1990;28(1):20-25.
6. Knutsson K, Lysell L, Rohlin M. Postoperative status after partial removal of the mandibular third molar. Swed Dent J. 1989;13(1):15-22.
7. O'Riordan BC. Coronectomy (intentional partial odontectomy of lower third molars). Oral Surg Oral Med Oral Pathol Oral Radiol Endod. 2004;98(3):274-280.
8. Pogrel MA, Lee JS, Muff DF. Coronectomy: a technique to protect the inferior alveolar nerve. J Oral Maxillofac Surg. 2004;62(12):1447-1452.
9. Pogrel MA. Coronectomy: partial odontectomy or intentional root retention. Oral Maxillofac Surg Clin North Am. 2015;27(3):373-382.
10. Renton T, Hankins M, Sproate C, McGurk M. A randomised controlled clinical trial to compare the incidence of injury to the inferior alveolar nerve as a result of coronectomy and removal of mandibular third molars. Br J Oral Maxillofac Surg. 2005;43(1):7-12.
11. Leung YY, Cheung LK. Safety of coronectomy versus excision of wisdom teeth: a randomized controlled trial. Oral Surg Oral Med Oral Pathol Oral Radiol Endod. 2009;108(6):821-827.
12. Hatano Y, Kurita K, Kuroiwa Y, Yuasa H, Ariji E. Clinical evaluations of coronectomy (intentional partial odontectomy) for mandibular third molars using dental computed tomography: a case-control study. J Oral Maxillofac Surg. 2009;67(9):1806-1814.
13. Dolanmaz D, Yildirim G, Isik K, Kucuk K, Ozturk A. A preferable technique for protecting the inferior alveolar nerve: coronectomy. J Oral Maxillofac Surg. 2009;67(6):1234-1238.
14. Sencimen M, Ortakoglu K, Aydin C, Aydintug YS, Ozyigit A, Ozen T, et al. Is endodontic treatment necessary during coronectomy procedure? J Oral Maxillofac Surg. 2010;68(10):2385-2390.
15. Patel V, Sproat C, Kwok J, Beneng K, Thavaraj S, McGurk M. Histological evaluation of mandibular third molar roots retrieved after coronectomy. Br J Oral Maxillofac Surg. 2014;52(5):415-419.
16. Long H, Zhou Y, Liao L, Pyakurel U, Wang Y, Lai W. Coronectomy vs. total removal for third molar extraction: a systematic review. J Dent Res. 2012;91(7):659-665.
17. Martin A, Perinetti G, Costantinides F, Maglione M. Coronectomy as a surgical approach to impacted mandibular third molars: a systematic review. Head Face Med. 2015;11:9.
18. Cervera-Espert J, Pérez-Martínez S, Cervera-Ballester J, Peñarrocha-Oltra D, Peñarrocha-Diago M. Coronectomy of impacted mandibular third molars: a meta-analysis and systematic review of the literature. Med Oral Patol Oral Cir Bucal. 2016;21(4):e505-e513.
19. Kohara K, Kurita K, Kuroiwa Y, Goto S, Umemura E. Usefulness of mandibular third molar coronectomy assessed through clinical evaluation over three years of follow-up. Int J Oral Maxillofac Surg. 2015;44(2):259-266.

ISSN:2584-2706 DOI: https://doi.org/10.67317/IJMSRT26SEP077

20. Leung YY, Cheung LK. Long-term morbidities of coronectomy on lower third molar. Oral Surg Oral Med Oral Pathol Oral Radiol. 2016;121(1):5-11.
21. Jowett A, Mansoor J, Coulthard P. The coronectomy technique for lower third molars: past and present. Oral Surg. 2016;9(3):150-154.
22. Coulthard P, Bailey E, Esposito M, Furness S, Renton TF, Worthington HV. Surgical techniques for the removal of mandibular wisdom teeth. Cochrane Database Syst Rev. 2014;(7):CD004345.
23.Bernabeu-Mira JC, Peñarrocha-Oltra D, Peñarrocha-Diago M. Coronectomy of impacted mandibular third molars: a clinical and radiological retrospective case series study with 2-9 years of follow-up. Med Oral Patol Oral Cir Bucal. 2023 Aug 25. doi:10.4317/medoral.26159.
24. Simons RN, Lindeboom JA, Tuk JG, de Lange J. Postoperative outcome after coronectomy versus surgical removal of impacted mandibular third molars - clinical and oral health-related quality of life follow-up. J Oral Maxillofac Surg. 2024;82(9):1109-1120.
25. Al-Ali K, Saqan R, Alkhazraji S, Gaballah K. Standardized coronectomy versus total extraction for impacted mandibular third molars: a single-blinded prospective analysis of patient-reported outcomes. Front Oral Health. 2025;6:1647852.