



Coronectomy (intentional partial odontectomy of lower third molars)

Brian C. O'Riordan, BDS (NUI), FDSRCS (Eng), FFDRCSI, DDRRCR,^a Northwood and London, UK
MOUNT VERNON HOSPITAL AND GUY'S, KING'S & ST THOMAS' DENTAL INSTITUTE, KING'S COLLEGE,
UNIVERSITY OF LONDON

Objective. This study evaluates the rate of infection of retained lower third molar roots after coronectomy in teeth judged to be in intimate relation to the inferior alveolar nerve.

Study design. This was a retrospective study of 52 patients who were operated on over a 10-year period.

Results. Only 3 of 52 patients had to have roots removed because of pain or infection. Postoperative findings and aspects of the surgical technique are also discussed.

Conclusions. Coronectomy is a worthwhile option to extraction where a lower third molar is judged to be in close proximity to the inferior alveolar nerve. In lower third molar removal the potential damage is high when certain radiographic signs are present, whereas the infection rate of roots remaining after coronectomy is, by contrast, low. (Oral Surg Oral Med Oral Pathol Oral Radiol Endod 2004;98:274-80)

Coronectomy is the removal of the crown of a tooth, leaving the root "in situ." When applied to a third molar or any unerupted posterior tooth in the mandible, it is a measure adopted to avoid damage to the inferior alveolar nerve (IAN).

The incidence of damage to the IAN when removing third molars varies from 0.41% to 8.1% for temporary lack of sensation and 0.014% to 3.6% for prolonged signs and symptoms. However these figures relate to the incidence of damage where third molars of all degrees of difficulty are removed. When the radiologic markers of proximity of the IAN to the root of the third molars are present, the incidence of damage can be as high as 35%. Howe and Poyton in 1960,¹ by comparing the radiographic appearance of the tooth root and the IAN to whether or not the nerve was visible in the socket at operation, produced predictors for possible damage to the nerve. When these radiologic predictors were present, the incidence of labial nerve impairment was 35.64%.

Rood and Shehab in 1990,² by comparing the radiological signs to the actual incidence of damage to the IAN, found that 3 radiologic signs were statistically significant as predictors of trauma to the IAN. They found that when the most severe sign was present the nerve was affected in 30% of cases.

Pericoronitis is related to the persistence of the follicle or remnants of the follicle where the full clinical crown cannot erupt. The follicle acts like a deep periodontal pocket and is frequently the site of infection. Removal of the crown and related follicular tissue should relieve the problem (Fig 1).

The term "coronectomy" describes both the action on the tooth and the elimination of the prime cause of the infection and is preferred by this author to "intentional partial odontectomy."³ The question for the surgeon, however, is that if a coronectomy is performed, what is the likelihood of infection of the retained root and transected pulp? This paper, by looking at long-term results, shows that the incidence of infection is low (Fig 2).

^aConsultant Oral Surgeon, Department of Oral & Maxillofacial Surgery, Mount Vernon Hospital, and Consultant Dental Radiologist, Department of Oral Radiology, Guy's, King's & St Thomas' Dental Institute, King's College, University of London.

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PATIENTS AND METHOD

This study was a retrospective one of patients treated over a 10-year period. All the operations were carried out by the author and all but one were under general anesthesia. All had symptoms of pain or signs of

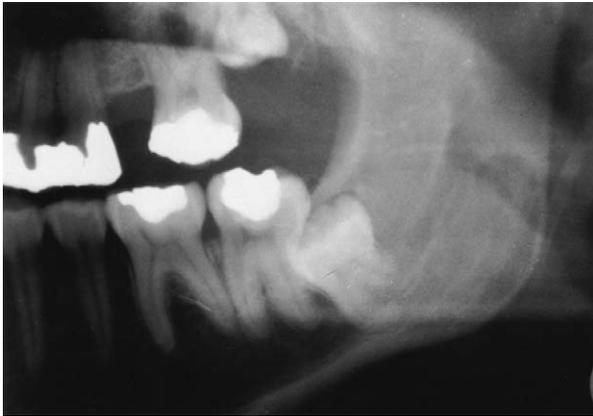


Fig 1. **A**, The problem—a 27-year-old patient with clinical signs and symptoms of purulent infection related to #17 despite a lack of radiographic signs of infection. Infection of #17 was confirmed at surgery. **B**, The solution—immediate postop view.

infection or other pathology such as cysts. All third molars were assessed on a dental panoramic tomogram for proximity to the IAN using Howe and Poyton's¹ criteria: 1) a radiolucent band across the root (a definitive dark band on the root continuous with the white lines of the canal), 2) loss of one or both white lines of the inferior dental canal, and 3) narrowing of the canal. The majority fell into the first category—76%—with 11% and 2% in the second and third categories respectively. In addition, some had a complication which was judged to add to the difficulty and make nerve injury more likely, such as severe angulation of the root apices at the canal, hypercementosis of the root or root apex, or any factor which would be likely to involve manipulation with bur or instruments near the IAN (11%). One patient, with roots near the canal, was very concerned because his wife was left with a permanent anesthetic lip after third molar removal!



Fig 2. Coronectomy: **A**, preoperative radiograph. **B**, 7 years postop—symptom free.

Initially, only those teeth in the first category, with the radiolucent band in the root, were subjected to coronectomy; but as confidence in the outcome of the technique grew more teeth with less severe signs of grooving were included. In all cases the nerve was considered at risk.

All radiographs were examined on a light box using varying illumination and magnification.

The decision to perform a coronectomy was made preoperatively, as opposed to attempting a conventional third molar removal and then, if it was found difficult, removing the crown only. The preoperative decision was only altered if, on reflecting the flap, infection was found to be tracking apically, or if the angulation of the tooth made it difficult to transect. The crown was resected at or apical to the attachment of the follicle, using a rosehead bur (size 6) and angling the cut from the buccal to the lingual aspect at approximately 30 degrees. The cut stopped short of the lingual aspect. The crown was snapped off by twisting a Couplands chisel (elevator) No. 2 in the cut, putting equal pressure on the root and

Table I. Cases reviewed

Cases reviewed	68
Number of replies	52 (76.5% response)
Follow-up radiographs	20

Table II. Results of questionnaire and incidence of postoperative neuropraxia

Number of cases	52
Symptom free	49 (94.5%)
Number of roots removed	3 (5.5%)
Neuropraxia A (temporary)	3 (5.5%)
B (prolonged)	1 (1.8%)

crown, and avoiding any pressure on the buccal plate of bone.

In all, 95 cases were treated, but of these, 8 third molars did not split properly and were removed in toto. This problem with splitting was mainly early in the series and in multirooted teeth. It was found that if the cut was too close to the bifurcation there was a possibility of one root retaining an attachment to the crown on the lingual aspect. Seventeen cases were excluded because their follow-up period was less than the selected period of 2 years. However, none of those 17 have indicated that they have had any trouble in that period. The remaining 68 patients were sent questionnaires. The questionnaire asked about symptoms or signs of swelling or infection, and asked if the patients' own dentist had taken radiographs since the operation that might have included the wisdom tooth area. Fifty-two patients replied, which was a response rate of 76.5% (Table I). A number of patients were difficult to trace. There was a preponderance of patients in a younger age group, many of whom were attending a university or in the early part of their career. By the time of the survey many had graduated or moved to other jobs and, therefore, changed addresses and were not possible to trace. 20 patients were close enough to the author's surgery in London to return for a clinical review and a radiograph. The age ranges of respondents were 23 patients under 30 years, 19 in the 30-40 age group, and 12 over 40 years of age. The length of follow-up ranged from 10 years for 4 patients, 5-9 years for 15 patients, and 2-4 years for the remaining 33 patients.

RESULTS

Three patients of the 52 had to have roots subsequently removed (Table II). One had postoperative purulent infection in the first week and had 3

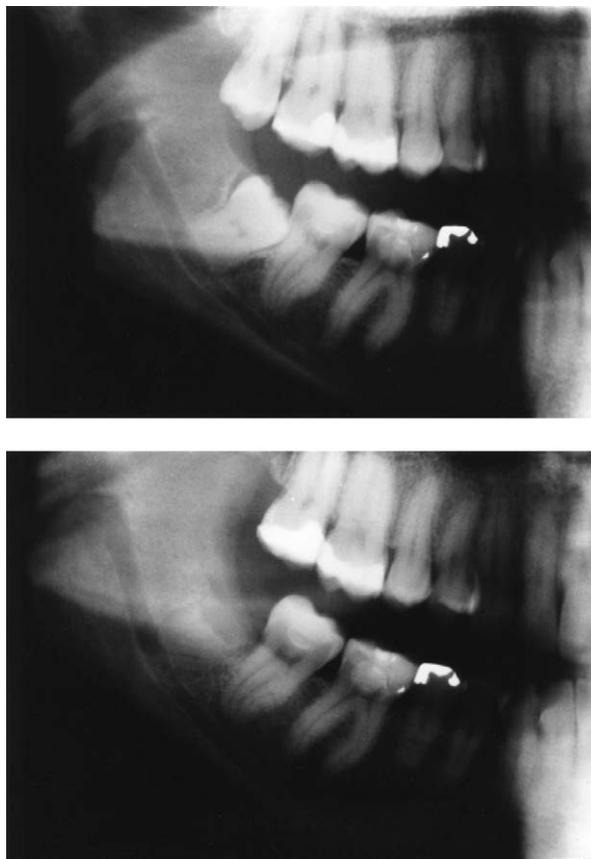


Fig 3. **A**, Preoperative, and **B**, postoperative views after coronectomy shows migration of root. An apparent apical radiolucency occupies the area from which the root has migrated.

recurrences of infection, by which time it was decided to remove the roots. She then moved away and the roots were subsequently removed elsewhere. The second case was complicated by chronic advanced periodontal disease from the outset. The root gave rise frequently to symptoms and was removed 7 years later, by which time it had come away from the IAN. The third failure was in a patient of 25 who was symptom free for 18 months and then reported pain and swelling, although on repeated clinical examination no sign of inflammation or sinus formation could be detected. When the root was removed the operator noted that there were no signs of inflammatory tissue and most of the root face was covered by bone, but the sharp buccal aspect projected above the bone. It may have been pressure between the overlying gingiva and this sharp projection that led to the pain.

A number of patients had postoperative pain and those that were owing to "dry sockets" were dressed with Alvogyl (Septodont), a sedative antiseptic dressing that uses short fibers as filler and is extruded slowly as the

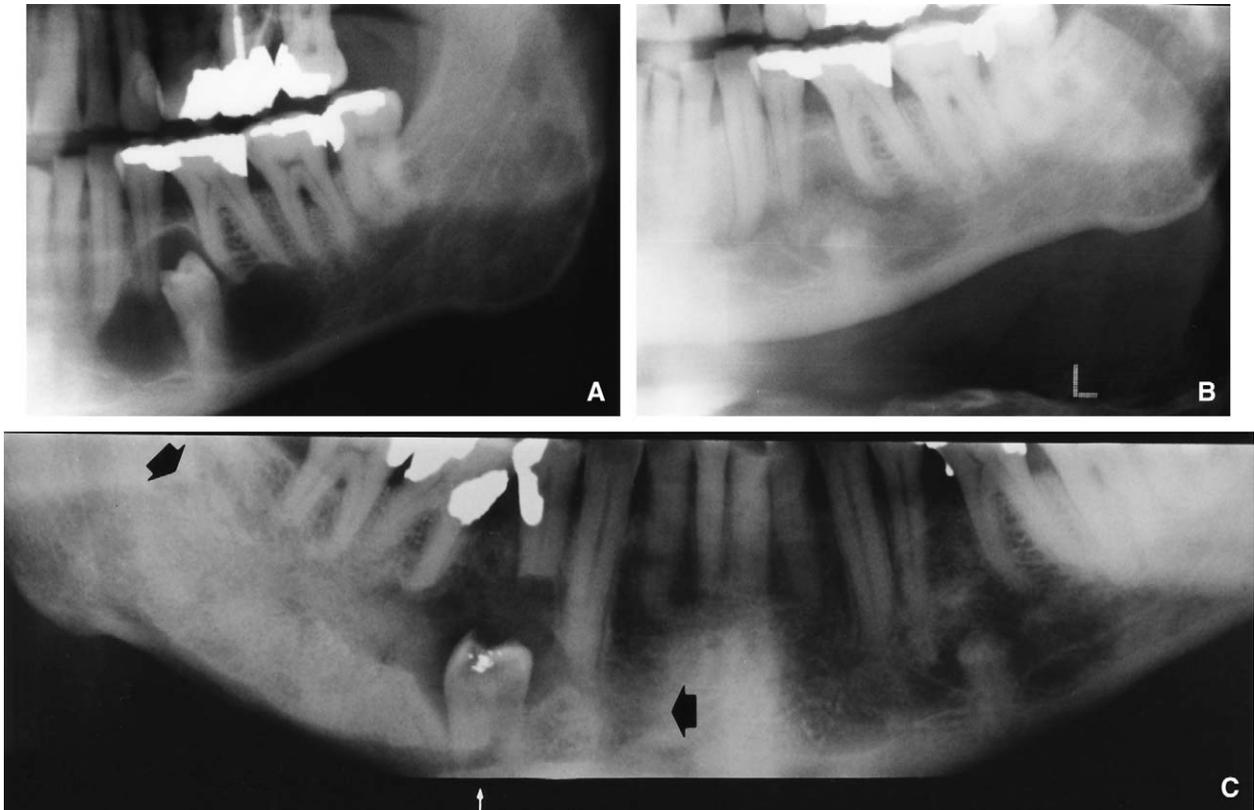


Fig 4. **A**, A 64-year-old patient with Gorlin's Syndrome with a keratocyst of #20. He had a keratocyst of #29 11 years previously. At that time an attempt was made to remove the unerupted right premolar but due to its firmness and the possibility that it was ankylosed, the likelihood of fracture of the mandible and/or serious damage to the IAN, a marsupialization was performed. **B**, 1 year after coronectomy of #20. **C**, 3 years after coronectomy of #20. Black arrows show the original extent of cyst #29. White arrows show mental foramen. Resorption of #28 predated all operations.

socket heals. One patient had a nonresorbable bone wax inserted to control brisk bone bleeding. All healed without further complications.

The neural complication (Table II) comprised 3 cases of temporary sensory disturbance of sensation in the lip, mainly tingling, which was wearing off 1 week postoperatively. However, there was 1 case of prolonged anesthesia of the lip owing to damage from the bur. An underestimate was made of the depth of the bur in the tooth when trying out a new design of handpiece and it perforated the canal on the distolingual aspect of the root. The anesthesia was wearing off 1 year later and was mainly a subjective feeling that could not be found on objective testing. This was not a complication of the technique as such, but was operator based. The other cases of paresthesia probably resulted from intratooth pressure transmitted to the nerve when splitting the crown from the root, as suggested by Knutsson et al,⁵ or a slight elevation of the root when splitting and were clearly related to the technique.

There were no cases of prolonged lingual anesthesia reported.

Fate of the pulp

In this series no attempt was made to treat the pulp of the tooth in any way, apart from using adequate coolant on the bur tip while cutting. The fate of the pulp, therefore, has to be considered. No histological sections of asymptomatic roots where coronectomy was performed have been obtained, but evidence is available of the fate of the pulp when vital transection or coronectomy has been performed on teeth in periodontal or prosthetic procedures. In these techniques the aim was to remove the crown and advance a flap over the cut root face and by this method use the retained root to preserve alveolar bulk. Poe et al in 1971⁷ 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 in 1974⁸ showed the same results in humans. Subsequent papers in 1974,⁹ 1976,¹⁰ and 1977,¹¹ some



Fig 5. A female professional clarinet player in whom loss of lip sensation would create difficulties in playing. The roots of the third molar were not only near the IA canal but were hypercementosed. **A**, Preop. **B**, 2 years postop—symptom free.

of which examined roots and adjacent bone “en bloc,” found that the pulp remained vital.

When the crown is removed the pulp is no longer enclosed in a rigid compartment with a tiny apical outlet, so any hyperemia or inflammatory edema after the surgical “insult” can expand without restriction. However, the cut pulp should be irrigated well and any manipulation avoided.

In cases where the crown of the tooth is grossly carious it is prudent to check that the cut pulp is bleeding and therefore presumably vital. If there is any doubt about its vitality it is safer to extract the root or adopt the view that because many roots are shown to move coronally and away from the canal subsequent to this procedure, the root can then be removed later if necessary.

In this series, closure of the operative site was achieved by mobilizing the flap and using vertical mattress sutures to aid healing by primary intention. Other

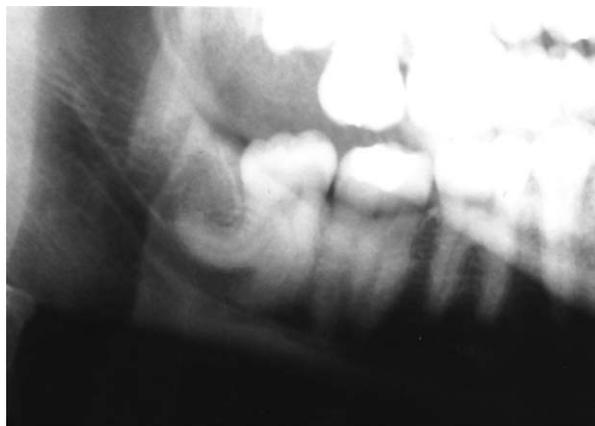


Fig 6. A 23-year-old female doctor with a third molar with dilacerated roots, one of which is intimately associated with the IAN. **A**, Preop. **B**, 8 years postop—symptom free.

authors have simply closed with interrupted sutures.^{5,12} In all cases a lingual flap was reflected and an instrument used to protect the lingual nerve. All patients had antibiotic coverage postoperatively.

Postoperative findings

At the time of the review many of the roots in this series had migrated compared to their position on the preoperative radiograph (Fig 3). Only one, however, caused symptoms leading to removal. Knutsson et al recorded similar migration.⁵ All authors, however, point out that this migration, even if the root gets infected, means that the root fragment comes away from the IAN and, therefore, facilitates uncomplicated removal.

Apical radiolucency

Apical radiolucency without symptoms was noticed in 3 cases (Fig 3). Two of these were subsequently examined radiographically 2 years later, and although the radiolucency was still evident, a lamina dura could be seen around the apex. Knutsson et al also noted this in 3

cases.⁵ This appearance may be due to the migration; the area from which the root moved being filled with immature, more radiolucent bone, or may have been there preoperatively owing to large cancellous spaces around the apex. This latter appearance was apparent on reviewing the preoperative radiographs in 2 of the cases in this series.

DISCUSSION

The first published description of this technique was by Ecuyer and Debien in 1984.⁴ Their technique was further elaborated in a letter in 1995 which included 6 other colleagues from the *College de Medecin des Hospiteaux de Paris*.¹² The technique was described as "wearing down resection of the wisdom teeth". After resection of the crown the roots were ground down sufficiently beyond the pulp cavity floor and below the bifurcation to within about 2 mm of the canal. This has not been found necessary in this series, the resection only being performed and no grinding being carried out.

Knutsson et al carried out a prospective trial on 33 patients.⁵ The surgeon resected the crown at an "adequate" level without further grinding and the flap was closed with interrupted sutures. After 1 year all but 6 root fragments had migrated, most between 1 and 4 mm. However, 7 showed "unsatisfactory healing" (27%). Nine was the number given in the report, but 2 of these were "dysesthesia" only, with no additional complications. The dysesthesia resolved. Despite their high complication rate of "unsatisfactory healing," they state, "finding of satisfactory healing around most of the root fragments indicates that partial removal might be considered as an alternative method in certain cases of complicated root anatomy."

Freedman (1997)⁶ published a retrospective series of 33 cases, one of which has previously been reported in 1992.³ Only 1 root had to be removed because of infection. One case had been operated on 8 years previously and the rest over a period of 7 years up to the report. No detailed analysis of the technique or of the complications was included in the paper. Freedman, as far as could be gleaned from the published radiographs, resected the crowns horizontally at the neck of the tooth and commented in the text that "proper sectioning of the tooth may require more dexterity and perceptual acuity than removal in toto." However, in the series being reported here, oblique sectioning seemed to prove much easier and simpler.

This technique can be utilized for any tooth when the IAN is thought to be at risk, so as well as third molars any unerupted molar or premolar tooth which has to be removed because of infection or cyst formation can be treated in this way (Fig 4). The nerve may also be at risk

when the root configuration may be such that the surgical tools may have to be used near the nerve, such as in cases of hypercementosis (Fig 5) or divergent roots where the bifurcation is near the nerve (Fig 6).

CONCLUSION

This series developed over time and as confidence in the technique grew more cases were embarked upon. Because of this exploratory progression, no controls were used. Therefore, no conclusion can be inferred from the flap design, closure of the flap, or antibiotic regime. However, one can conclude from the results that the technique of coronectomy in third molars does not lead to excessive complications and has a far lower incidence of complications than would be predicted in cases where the radiographic signs indicate a high risk of nerve damage. When this paper is taken with those of Ecuyer and Debien,⁴ Knutsson et al,⁵ and Freedman,⁶ there is now enough evidence to suggest that this technique should be taken seriously and subjected to the rigor of prospective trials and, in the meantime, can be confidently used in cases where the inferior alveolar nerve is judged at high risk of damage.

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Brian C. O'Riordan
8 Cassiobury Park Avenue
Watford
WD18 7LB, UK
brian.oriordan@bigfoot.com

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