

Histological evaluation of mandibular third molar roots retrieved after coronectomy

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Abstract

There is a resurgence of interest in coronectomy for the management of mandibular third molars because it has a low risk of injury to the inferior dental nerve. However, there is concern that the root that is left in place will eventually become a source of infection. We describe the histological evaluation of 26 consecutive symptomatic coronectomy roots in 21 patients. All roots had vital tissue in the pulp chamber and there was no evidence of periradicular inflammation. Persistent postoperative symptoms related predominantly to inflammation of the soft tissue, which was caused by partially erupted roots or failure of the socket to heal.

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Introduction

Coronectomy or partial odontectomy involves the deliberate retention of a portion of a mandibular third molar root. The technique was reported in 1984 by Ecuver and Debien¹ but did not gain universal acceptance because there was a perceived risk of late complications associated with the retained root. There is no scientific evidence to confirm or refute this risk so the technique has now been acknowledged with reservations. Renewed interest in coronectomy has developed because it seems to almost remove the risk of injury to the inferior dental nerve (IDN).² However, this advantage is countered by the perceived threat of possible

late infection caused by loss of pulpal vitality in the retained root.

To find out the pulpal and periradicular status of the retained root of mandibular third molars, we histologically evaluated coronectomy roots that were removed because of persistent symptoms, which we presumed had been caused by an infected root. This study provides insight into the possible causes of symptoms and late complications following coronectomy.

Method

Approximately 840 coronectomies were carried out in the Oral Surgery department at Guy's Dental Hospital from September 2011 to May 2013 (21 consecutive months). A total of 21 consecutive patients (26 teeth) had persistent symptoms after the procedure and had the residual root retrieved. All except one had had their original operation at

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Guy's Hospital. Information was recorded on the persistent symptoms, and the clinical signs and radiographic appearance of the retained roots including their migratory status. All patients had the roots removed surgically (16 unilateral, 5 bilateral). Function of the IDN was assessed before and at 2 weeks after retrieval.

The roots were extracted under local anaesthesia with or without sedation, or under general anaesthesia using a traditional buccal approach and rotary instruments. A 3-sided buccal mucoperiosteal flap was raised, buccal bone was removed to expose the roots, and they were sectioned if required or simply elevated. The site was curetted superficially, irrigated with saline, and closed primarily with resorbable sutures. All patients were reviewed at 2 weeks to check healing. Nerve function was also assessed, primarily by verbal enquiry and if necessary by clinical examination.

The retrieved roots were fixed in 10% (v/v) buffered formal saline for 48 h then longitudinally hemisected using a diamond band saw, and decalcified in 10% (v/v) buffered formic acid. Blocks of decalcified tissue were processed and embedded in paraffin wax. Sections of 5 μm were cut and mounted on slides coated with poly-L-lysine. They were deparaffinised in xylene, dehydrated in 100% (v/v) industrial methylated spirit, and rinsed in running tap water. All sections were routinely stained with haematoxylin and eosin and submitted for routine microscopy.

Results

In the study group, the mean age of patients was 31.6 years (range 22–70) with a female dominance of 17:4. The ratio of left:right molars was 1.4:1.

The causes of the persistent symptoms are shown in Fig. 1. A total of 21 patients had persistent symptoms involving 26 sockets. Each socket contained 2 roots, which provided 52 individual root canals for analysis.

Of the 26 symptomatic teeth, radiographic assessment showed that coronectomy had been adequate in 20, but a shard of enamel had been retained on the root fragment in 6.

The mean time to the second operation was 15 months (range 2–54) in the 20 patients who had had an adequate coronectomy. Of these, healing was uncomplicated in 15 apart from root migration, which eventually resulted in the fragments erupting through the mucosa where they developed localised soft tissue inflammation. In this group the time to second operation was 19 months (range 6–54) compared with 3.3 months (range 3–6) in those who had an enamel shard attached to the root.

At the time of retrieval, 11 of 26 cases were radiographically clear of the inferior dental nerve canal on two-dimensional imaging. All roots were retrieved with no complications apart from one patient who had transient dysfunction of the nerve. In this case, the panoramic radiograph before retrieval suggested that there was risk of injury to the

nerve so cone beam computed tomography (CBCT) was used to aid the operation.

All 52 roots contained vital pulp (Fig. 2). In 3 there was partial necrosis but it was limited to the coronal portion of the root canal; the apical portion contained vital pulp that was not inflamed (Fig. 3). In all cases, including those presenting with acute symptoms, the periradicular soft tissues showed no evidence of an acute or chronic inflammatory cell infiltrate (Fig. 4). There was variable hypercementosis in all cases.

Discussion

The most appropriate technique that will allow extraction of an impacted mandibular third molar with minimal risk of injury to the IDN is debatable. The resurgence of interest in coronectomy has occurred because it is reported almost to eliminate the risk of injury to the nerve. However, the retained root is a possible source of late symptoms, and the aetiopathogenesis of persistent symptoms is poorly understood.

The principles underpinning coronectomy are not new. Dentists worldwide have inadvertently left vital root apices in situ with minimal complications,^{3–5} and elective root retention has been used by restorative dentists for many years as a basis for overdenture abutments. More recently, where no active caries is present in the retained roots, the abutments are left untreated and do not even require root canal treatment because of pulpal sclerosis. The roots tend to remain asymptomatic despite being exposed to the oral cavity. In theory, a root that is vital after coronectomy is in an environment more conducive to healing as it is sealed within the mandible and isolated from the oral cavity.

To reduce the risk of a root becoming infected, teeth selected for coronectomy should be sound and have no clinico-radiological evidence of caries, or pulpal, periodontal, or apical disease. To preserve the vitality of the root the crown must be separated from the root without mobilising the root within its socket. Coronectomy seems to decompress the pulp chamber and provides adequate space to accommodate the pulpal oedema.² Interestingly, therapeutic interventions such as root canal treatment of the retained root have previously been shown to result in a high rate of infection and the subsequent need for removal.⁶

Fig. 1 shows the indication for the retrieval of roots in this study. Patients were subdivided into successful and unsuccessful (retained enamel) coronectomy groups. In general, symptoms were modest in their extent. In the successful group, the symptoms were related to breach of the mucosa by a root, which is similar to that of pericoronitis. There were 4 non-healing sockets in the successful group and each had had alveolar osteitis (dry socket). Retained shards of enamel attached to the root caused the symptoms after unsuccessful coronectomy; enamel is inert and soft tissues cannot attach to its surface so the socket does not heal.

The symptoms in 15 of our 26 patients were caused by continued eruption of the root fragment. Other symptoms

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