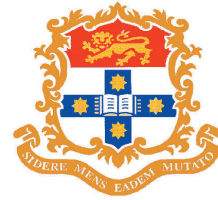


Australian Society  
of Orthodontists



University of Sydney



# Orthodontic - Endodontic Considerations

PART 2

*Creating **Brighter** Futures*

# Orthodontic - Endodontic Considerations

## PART 1

Part I concluded that some degree of reversible pulpal inflammation occurs following orthodontic movement. Teeth in young patients with open apices are at minimal risk while teeth with a history of trauma or ongoing insult such as caries may lose vitality.

Endodontically treated teeth can be moved orthodontically just as readily as vital teeth, with no greater risk of root resorption. The exception seems to be those teeth that have suffered intrusive trauma, where the risk of moderate to severe root resorption is greater.

### Timing of orthodontic treatment following endodontics

Although there is not a great deal of literature examining the ideal timing for orthodontic treatment following endodontic treatment, most recommend waiting 3-6 months for inflammation to subside (Proffit and Fields, 2000). In cases with periapical pathosis the judgment is more subjective.

Cases with recent trauma should initially be treated with calcium hydroxide filling and then monitored during the course of orthodontic movement with definitive root filling postponed until orthodontic treatment has concluded (Andreasen and Andreasen, 1994).

### Can we move teeth that have undergone periradicular surgery?

Although clinical reports have shown that it is possible to orthodontically move teeth that have been subjected to endodontic periradicular surgery with root resection, there is insufficient evidence-based research. The first paper to investigate this question (Baranowskyj, 1969) was a study conducted on 2 dogs. In the control animal, root canal treatment and apicectomy were performed 6 weeks apart. In the experimental animal the same procedures were performed and then after 2 weeks the teeth were banded and an intrusive orthodontic force applied. At six weeks the animals were sacrificed and histologically examined. The authors found that the healing process was completely delayed for the loaded teeth with no evidence of bone regeneration, while the control teeth showed complete periodontal and bone regeneration.

Baranowskyj concluded that it might be sensible to allow for a longer period of healing following apicectomy prior to orthodontic movement.

A few case studies have presented successful orthodontic movement of root-end resected teeth. Geron and Ziskind, in 2002 demonstrated successful orthodontic extrusion to allow for a crown lengthening procedure of an incisor tooth with a retrograde filling. In 2004 Uematsu, et al demonstrated successful orthodontic alignment of an impacted central incisor with root dilaceration. The tooth was initially aligned and then underwent apicectomy and root-end filling. Orthodontic treatment was discontinued for 4 months to allow for healing then orthodontic treatment was resumed.

In a literature review Hamilton and Gutmann (1999) concluded that many questions remain unanswered. How long is needed before orthodontic loading can be started? What are the factors that affect the success? Are these teeth more liable to root resorption due to the exposure of dentine? What effect does the type of root end filling material have?

### Will ongoing orthodontic treatment affect the provision and outcome of endodontic treatment?

Ongoing orthodontic treatment can affect the provision of endodontic treatment in several ways. Diagnosis, tooth isolation, coronal access, working length determination and canal obturation may be affected.

Diagnostically, osseous changes due to orthodontic treatment may be misinterpreted radiographically as being of pulpal origin. Metal bands may interfere with pulp testing procedures as well as obscuring decay both radiographically and clinically. Furthermore it is sometimes difficult to determine whether the patients' symptoms are the result of pulpal hyperaemia due to orthodontic movement or a degenerating pulp. The situation is further confused if there is a history of trauma.

The presence of orthodontic appliances can make tooth isolation quite challenging. Rubber dam clamps may need to be modified by grinding and/or bending to secure adequate isolation. With the exception of lingual brackets, orthodontic appliances do not directly interfere with access to the pulp chamber.



## Periodontal Disease and Cardiovascular Disease

Cardiovascular disease, including acute events such as myocardial infarction and stroke, cause an incredible burden on the health of Australians. The link between cardiovascular disease and periodontitis was noted anecdotally throughout the 1980's leading to some large cohort studies of the relationship in the 1990's.

The biological plausibility of the correlation is such that bacteria from inflamed periodontal pockets can enter the bloodstream causing inflammatory cells to stick to and activate the endothelial cells lining the arteries. This leads to the development of the atherosclerotic plaques that thicken the walls of the arteries thereby potentially causing or amplifying a systemic inflammatory event. Various studies have confirmed this hypothesis with the severity of the periodontal infection increasing the risk and severity of an acute cardiovascular incident by up to 25% (DeStefano F et al, 1993, Beck JD et al, 1996, Morrison et al, 1999 and Mendez et al, 1998). The independence of the correlation requires further research with some studies questioning the causative nature of the link versus the analogous risk factors such as smoking and poor diet. (Mattila K et al, 1995 and Joshipura K et al, 1996, 2003).

As oral health professionals we can no longer consider the treatment and management of periodontal disease as an isolated clinical event. Complete periodontal management requires a thorough review of all risk factors, both real and potential, and inter-disciplinary management of our patients.



Fig 1 Primary trauma to the maxillary anterior teeth. Transverse fracture to 21 requiring combined endodontic and orthodontic treatment.

Working length determination may be compromised in teeth undergoing orthodontic movement due to the difficulty in locating a discrete apical constriction where apical root resorption or root blunting has occurred. Creating an apical stop in such cases will rely greatly on the clinician's judgment. Electronic apex locators are also unreliable in those cases. According to Gutmann and Leonard (1995), the clinician should identify the coronal most point in the root apex that exhibits sound radiodensity and identify that as the new radiographic apex and so establish the working length at 1-2 mm from that point.

Andreasen and Andreasen (1994), on the other hand, recommend that teeth requiring endodontic treatment during orthodontic treatment should be cleaned and shaped and filled temporarily with calcium hydroxide until the completion of orthodontic treatment when the definitive obturation and root filling is appropriate.

## Orthodontics to aid endodontic treatment

Orthodontic movement can enhance the prognosis of endodontic treatment by improving access to teeth requiring endodontic treatment, usually by extrusion (Hamilton and Gutmann, 1999). Common indications are infrabony fractures, deep subgingival decay, lateral root perforations due to resorption or post preparation as well as situations where access preparation may be difficult. Periodontal surgery for crown lengthening is often necessary since the alveolar bone and gingiva usually follow the tooth occlusally.

The primary objective of orthodontic extrusion in these situations is to provide a sound margin for a restoration as well as adequate biologic width. Most of the literature on this subject consists of cases reports.

Extrusion is usually performed with light forces, with a considerable array of appliances available. At 4 weeks it is normal to note a periapical radiolucency appearing with the PDL normalizing by 7-8 weeks. Ingber, (1974, 1976) and Simon et al. (1978) indicated that orthodontically extruded teeth need to be stabilized for 8-12 weeks prior to provision of the final restoration.

Orthodontic movement can also be used to optimize embrasure spaces. For example, moving the roots of a molar apart following hemisection or distalising a second molar that has drifted mesially into a decayed first molar will benefit placement of the final restoration (Gutmann and Harrison, 1994).

## Endodontic considerations in orthodontic treatment planning

From an endodontic point of view, there are three significant considerations prior to commencement of orthodontic treatment.

### 1. Trauma History

In a prospective study where all dental injuries from birth to age 14 were recorded, 30% of children had injuries to the primary teeth and 22% to the permanent teeth (Andreasen and Ravn, 1972). Other studies have reported the incidence to be up to 40% in primary teeth and 30% in the permanent dentition (Andreasen & Andreasen, 1994). Dental trauma is often sub-clinical in nature and can lead to unexpected additional treatment for patients if an underlying endodontic problem is not detected prior to orthodontic treatment. For example, where there is a positive history of trauma in one arch (Fig 1), examination should include the opposing teeth (Fig 2) and include periapical radiographs as well as pulp testing procedures.



Fig 2 Pulp canal narrowing (31) and apical periodontitis (42) secondary to trauma to the maxillary anterior teeth.

### 2. Periapical Radiographs

Because panoramic radiographs often result in poor visualization of the anterior teeth, accurate periapical radiographs of anterior teeth involved in orthodontic treatment may be needed. This will assist in identifying asymptomatic apical periodontitis (Fig 3), developmental anomalies (Fig 4) that may be difficult to treat (Fig 5) and resorptive defects (Fig 6) to be taken into account during orthodontic treatment planning. The clinician should also examine the teeth for discolouration or other anomalies.



Fig 3 An example of clinically undetected apical periodontitis.



Fig 4 Dens in dente with associated apical periodontitis. Successful endodontic treatment can be very difficult.

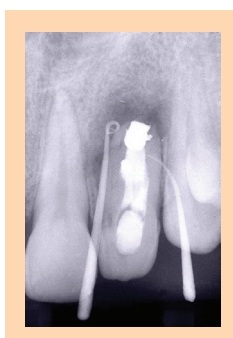


Fig 5 Failed treatment of the dens in dente in Fig 4



Fig 6 A resorptive defect: was it present before the orthodontic treatment commenced?

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### 3. Pulp Testing

Pulp testing will identify pulpal pathology not associated with radiographic changes and establish a baseline should endodontic symptoms develop. In particular, the carbon dioxide pulp tester (Fig 7) is recommended because it is reliable in the presence of orthodontic bands and brackets. A negative response to CO<sub>2</sub> testing indicates pulpal pathology or either the tooth has undergone pulp canal calcification secondary to trauma or has been root filled (Fig 8). Management of pulp canal calcification should be considered before beginning orthodontic treatment and an opinion from an endodontist may be indicated.



Fig 7 The CO<sub>2</sub> pulp tester is quick and easy to use.



Fig 8 Pulp canal calcification and root filled teeth post trauma.

### Conclusion

Orthodontic movement of teeth will induce some degree of usually reversible pulpal inflammation. Poorly controlled forces on teeth with closed apices or those with a history of trauma or ongoing insult due to caries may result in loss of pulp vitality. On the other hand, teeth in young patients with open apices are less at risk.

Combined endodontic/orthodontic treatment planning can benefit tooth prognosis by facilitating endodontic treatment and ensuring optimal conditions for the final restoration. Teeth can be extruded to allow adequate isolation, uprighted or even separated when they have drifted together due to caries.

Endodontically treated teeth can be moved orthodontically just as readily as vital teeth although specific guidelines as to treatment timing have yet to be confirmed. Apical resorption of root filled teeth will have variable effects on the longevity of the tooth depending on the quality of root filling and subsequent coronal restoration. Endodontically treated teeth that have been well cleaned and shaped, with optimal three-dimensional obturation, will suffer minimal resorptive remodeling and have a long-term prognosis comparable to that of vital teeth.

Orthodontic movement can be both a hindrance and a help to successful endodontic treatment depending on the diagnostic and treatment status of the particular tooth. Comprehensive liaison between the general dentist, orthodontist and endodontist is essential to ensure a successful outcome when endodontically compromised teeth are involved in orthodontic treatment – no matter what the circumstances.

References available on request

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