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ORTHODONTIC-ENDODONTIC: AN INTERDISCIPLINARY APPROACH

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ABSTRACT

During orthodontic treatment various precautions that have to be kept in mind while planning a treatment approach for endodontically treated teeth during orthodontic tooth movement. There are various questions to be answered such as what happens to dental pulp, is there any apical root resorption of endodontically treated. Hence this article will review about the comprised treatment approach for proper diagnosis and treatment of endodontically treated teeth during orthodontic tooth movement.

INTRODUCTION

There is a less information on the relationship between endodontics and orthodontics during diagnosis and treatment. This relationship ranges from effects on the teeth especially the pulp from orthodontic biomechanics and the potential for resorption during tooth movement, to the clinical management of teeth requiring integrated endodontic and orthodontic treatment. The expanding role of orthodontics into more phases of dental treatment is illustrated by the awareness of relationships with endodontics. There are two major areas where endodontics and orthodontics share common ground. 1. Etiologic- orthodontic treatment affects the pulp tissue 2. Combined therapy- orthodontic treatment is necessary to gain a desirable endodontic result.

Does orthodontic tooth movement have any effect on dental pulp?

The dental pulp is a specialized connective tissue derived from ectomesenchyme. It is enclosed by the rigid mineralised dentin. It remains throughout the life and provides nourishment to the odontoblasts which lines its surface. Many studies have shown that showed some signs of severe pulpal

degeneration in all human cases using a labiolingual expansion appliance. The movement afforded by this technique resulted in a tipping motion in the apical third of the root. The findings focused on the lack of collateral circulation to the pulp during tooth movement as being the major etiological factor for pulpal degeneration. As a result, he recommended the use of light intermittent forces to reduce damage to the dental tissues and provide time for possible repair.¹

Clinically the teeth may have altered sensations to stimuli. Effects of this nature may have a direct impact on the metabolism of the pulp tissue, in particular the odontoblasts in fully formed teeth, and Hertwigs epithelial root sheath in incompletely formed teeth. The pulpal changes and their consequences appear to be proportionally more severe with greater orthodontic forces. He also concluded that forces had some effect on the pulpal nerves and therefore pulps testing with electrical devices are of no value.² Hamersky *et al.* conducted a study using radio respirometric methods, demonstrated a significant 27.4% mean depression in the pulpal respiratory rate when the tooth is undergoing orthodontic movement. These results would seem to indicate a relationship between the biologic effect of an orthodontic force and the maturity of the tooth, particularly the dentinogenic activity of the pulp. This would imply that a greater dentinogenic activity coupled with a larger apical foramen would result in a reduction of detrimental effects

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from orthodontic forces.³ Bunner & Johnson conducted a study and explored intrapulpal axon response to orthodontic movement. Symptoms of reversible or irreversible pulpitis may still be present and may be masked by the discomfort felt from changes in force that are made during appliance modifications.⁴ According to literature it has been suggested that teeth with complete apical formation and teeth with pulps that have had previous compromises such as trauma, caries, and restorations or periodontal disease may be more susceptible to irreversible pulpal changes or necrosis under this type of orthodontic movement.⁵ Many questions arise whether apical root resorption, that may occur during orthodontic treatment, the same on teeth with vital pulps as on teeth with previous root canal treatment? According to the Glossary-Contemporary Terminology For Endodontics (1998), resorption is defined as 'a condition associated with either a physiologic or a pathologic process resulting in a loss of dentine, cementum, and/or bone. Steadman, root canal treatment was criticized in that it was claimed that the devitalized root acts as a foreign body causing chronic irritation and root resorption. Histological sections of such resorptions showed cellular pictures typical of a foreign-body reaction. He considered that the resorption could not be controlled and therefore the prognosis for these teeth was unfavorable. Steadman even went to the point of suggesting, based on the literature, that because of the resorptions, the roots of these teeth would become ankylosed, thereby eliminating the possibility of orthodontic movement.⁶

Huettnner & Young challenged Steadman's theory through a study where they evaluated the root structure of monkey teeth with both vital and non vital pulps (root canal treatment) following orthodontic movement with edgewise fixed appliance technique was carried from 6 to 8 weeks prior to animal sacrifice. Histological examination showed no foreign-body reactions and the root resorption that was observed was similar in both the vital and devitalized teeth.⁷ Wickwire *et al.* (1974) a study reviewed 45 orthodontic patient case histories that contained 53 endodontically treated teeth that included the following orthodontic techniques; edgewise, Begg, and partial banding mechanotherapy. Historical data, lateral cephalograms, and appropriate radiographs were used to evaluate the teeth. Data revealed those teeth with root canal treatment moved as readily as teeth with vital pulps, but there appeared to be greater radiographic evidence of root resorption in the endodontically treated teeth when compared to the controls [vital teeth].⁸

Unterseher *et al.* (1987) assessed the pulpal respiration response after a 7 -day rest period. The mean respiratory rates remained depressed approximately 32.2% after the rest period. However, two subgroups were identified in the experimental pulps, one that had returned to normal respiratory rates and one that did not. Age and apical opening size correlated with the return to normal respiratory rates in 1 week. Age was negatively correlated with the respiration rate, while apical opening size was positively correlated with the respiration rate. Clinically, the occurrence of apical root resorption appears to be greater when orthodontic treatment is started after 11 years of age, with fixed appliances causing more resorption than removable appliances.⁹ Studies evaluated the effectiveness of orthodontic forces in moving root-filled teeth and the degree of EARR that may occur in the ferret animal

model. Root-filled teeth and those with vital pulps moved similar distances when subjected to the same forces. Root-filled teeth showed greater loss of cementum after tooth movement than teeth with pulps, but without significant differences in radiographic root length. The root-filled teeth also showed more resorption lacunae than teeth with vital pulps. This suggests that the incidence of resorption lacunae may be related to nonvitality and probably the presence of periradicular lesions rather than orthodontic forces.¹⁰

If root filled teeth are subject to the resorptive phenomenon, what will happen to the root canal filling material?

Many possibilities exist

- 1) The tooth may resorb, exfoliate, and the filling material may be removed with the tooth.
- 2) The tooth may resorb, exfoliate, and the filling material may be left in the bone. In these cases if the material is gutta-percha, a fibrous capsule will probably surround it. It is also possible that a sinus tract may form and the material will require removal.
- 3) In cases of both gutta-percha and silver cones, the extended material may undergo resorption itself after the tooth has undergone resorption and exfoliation.
- 4) In some cases the root may begin resorption, exposing the filling material, and subsequently the resorption ceases with the filling material protruding beyond the new apical foramen. In this situation the root is often seen to develop a new periodontal ligament space and lamina dura around the root apex in close approximation to the filling material.
- 5) In other cases, once the apical resorption begins, a radiolucency develops around the root and the filling material. A sinus tract may develop or there may be incidences of localized swelling. Likewise the tooth may remain symptom free and function normally.

Can endodontically treated teeth be moved orthodontically as readily as non endodontically treated teeth?

Based on the literature, endodontically treated teeth can be moved as readily and for the same distances as teeth with vital pulps.¹¹ This presumes that there would be no other factors that may prevent tooth movement, such as the presence of replacement resorption (ankylosis) that may occur following certain traumatic incidences or be the result of injury to the apical periodontal ligament by the root canal filling material.¹² Because there is a risk of EARR during the movement of any teeth, however, it is recommended that teeth requiring root canal treatment during orthodontic movement be initially cleaned and shaped followed by the interim placement of calcium hydroxide. This should be maintained during the active phases of tooth movement, with the final canal obturation occurring upon completion of orthodontic treatment. This approach is not recommended when an already successful gutta-percha filling is in place prior to tooth movement. Another situation arises whether a teeth that have been managed with surgical endodontic procedures be moved orthodontically? In this context the major causes for failure following surgical endodontic procedures have been identified as failure to debride and obturate thoroughly the root canal system, and the superimposition of periodontal disease in the surgical site.¹³ Other considerations would include the

propensity for a greater amount of apical resorption due to the exposed dentine on the resected root face, irritation and persistent inflammation that may be caused by the root-end filling material, the adequacy of the seal achieved with the root-end filling material.

Conclusion

This article enlightens that an endodontically treated teeth can be moved orthodontically as readily as teeth with vital pulps. but certain precautions should be taken if teeth require root canal treatment during orthodontic movement such as placing an interim dressing of calcium hydroxide and final canal obturation is accomplished upon the completion of orthodontic tooth movement. Hence all necessary steps to be taken during treatment planning with an interdisciplinary approach between an endodontist and orthodontist during each phase of tooth movement.

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