



Investigation of Biological Markers for Orthodontically Induced Root Resorption, Review Of Literature



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Abstract:

Orthodontic root resorption might be inevitable consequence of tooth movement during orthodontic treatment. During orthodontic tooth movement, mechanical forces of compression and tension are applied to the periodontal ligament (PDL). The PDL undergoes compression between the tooth surface and the alveolar bone on the side to which the tooth is moved. If great force is applied over long durations the PDL is injured forming hyalinized tissue and also root resorption may occur. Teeth at risk of severe resorption are needed to be identified as early as possible while the patient is undergoing orthodontic treatment.

The clinical diagnosis of root resorption relies basically on radiographs including; periapical, panorama, and 3D images. Nonetheless, root resorption is not detectable by radiographs until 60–70% of the mineralized tissue is lost. Also, radiographs do not indicate whether the root resorption is active or not. Above all, radiographs bear the risk of radiation.

Monitoring disease progression through biological fluid diagnostic techniques has been advocated among healthcare professional and researchers. Among the biological markers with potential diagnostic capabilities for root resorption are Dentine sialoprotein (DSP) and Interleukin 1 receptor antagonist (IL-1RA) expressed in gingival crevicular fluid.

Review of literature

Orthodontic root resorption may be inevitable consequence of tooth movement during orthodontic treatment,⁽¹⁾ Brezniak et al in 2002 referred to the inflammatory process that is essential to orthodontic tooth movement as the main cause behind root resorption, from which they reached the term orthodontically induced inflammatory root resorption (OIIRR). It is the irreversible loss of the root apex that may be viewed on a diagnostic radiographic examination.⁽²⁾

The incisor resorption increases with the increase of the overjet due to the greater amount of required force and retraction also,⁽³⁾ root resorption of the distal root of the maxillary first molar was found with deep overbite, due to the greater incisor intrusion that is required.⁽⁴⁾ Extraction treatment plan can influence the degree of external apical root resorption (EARR) because of the longer distance of tooth movement required to close extraction spaces, as compared with non-extraction treatment plans.^(5, 6)

With orthodontic tooth movement, mechanical forces of compression and tension are applied to the periodontal ligament (PDL). The PDL under goes compression between the tooth surface and the alveolar bone on the side which the tooth is moved. In cases of great forces over long durations the PDL is injured which causes forming of hyalinized tissue.⁽⁷⁾

Mainly, the clinical diagnosis relies on regular radiographic imaging, by panoramic and periapical radiography. Although, there must be significant loss in the length of the root in order to be detected in two-dimensional radiograph.

Also, in a comparison between panoramic radiograph, periapical radiographs and micro-computed tomography scanner, panoramic radiograph overvalues the degree of tooth loss by 20% or more than periapical radiography, and digitized periapical radiographs undervalue apical root resorption than micro-computed tomography scanner. OIRR has not yet had a gold standard to be accurately detected.⁽⁸⁾

Teeth at risk of severe resorption must be identified as early as possible while the patient is undergoing orthodontic treatment. Thus, radiographic techniques are commonly used. Nonetheless, root resorption is not detectable by radiographs until 60–70% loss of the mineralized tissue. Also, using radiographs to indicate whether the root resorption is active or not or the progress of root resorption needs to be recorded by exposing the patient to additional radiation. The early stages of the root resorption can be viewed histologically due to small size of the lacunae present on the apical third are difficult to view in periapical radiographs.⁽⁹⁾

Cone beam computerized tomography (CBCT) has demonstrated more accurate viewing and diagnosis of root resorption. Nevertheless, taken the need for multiple routine images it would be inapplicable to use CBCT due to its high cost and increased radiation dose. After demonstrating the drawbacks of the radiographic methods, there was a need to find more safe and reliable substitute diagnostic technique for root resorption.⁽¹⁰⁾

Monitoring disease progression through biological fluid diagnostic technique has been a needed goal between

healthcare professionals.⁽¹¹⁾ It could have high value to diagnose early root resorption because its site specific nature.⁽¹²⁾

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