**Journal of Advanced Medical and Dental Sciences Research**

@Society of Scientific Research and Studies ***NLM ID:***

Journal home page: www.jamdsr.com doi: 10.21276/jamdsr Index Copernicus value = 82.06

(e) ISSN Online: 2321-9599; (p) ISSN Print: 2348-6805

# Review Article

## Root Resorption- A Review Article

Indu Bhardwaj[1], Sudhir Munjal[2], Satnam Singh[3], Harmeet Singh[4]

[1]Post Graduate Student (Final Year), [2]Professor & Head, [3,4]Associate Professor,

Department of Orthodontics & Dentofacial Orthopaedics, Dasmesh Institute of Research & Dental Sciences, Faridkot (Punjab)

***ABSTRACT:***

Root resorption is one of the most serious problems associated with dentistry, since it has not spared any discipline of dentistry and orthodontics is no exception. It is believed that too strong forces during orthodontic tooth movement will cause increased damage to the engaged tissues. Loss of apical root material is unpredictable and when extending to dentine is irreversible. Histological studies report a high incidence, whereas clinical studies reveal a more varied incidence.

**Key words**: Root resorption, Orthodontic treatment, Orthodontic forces, Apical root resorption.

Received: 12 April, 2020 Accepted: 26 April, 2020

**Corresponding author:** Dr. Indu Bhardwaj, Post Graduate Student (Final Year), Department of Orthodontics & Dentofacial Orthopaedics, Dasmesh Institute of Research & Dental Sciences, Faridkot (Punjab), India

**This article may be cited as:** Bhardwaj I, Munjal S, Singh S, Singh H. Root Resorption- A Review Article. J Adv Med Dent Scie Res 2020;8(5):52-55.

**INTRODUCTION:**

The basic tenet of Hippocratic oath 'first do no harm' is not always possible even with best of care and caution. Root resorption is one of the most serious problems associated with dentistry, since it has not spared any discipline of dentistry and orthodontics is no exception. A common goal that permeates the practice of orthodontics has been the determination of the "optimal" force magnitude, which results in the highest rate of tooth movement with minimal iatrogenic side effects.[1] Therefore, the magnitude of the applied force has been recommended to be related to the root area.[2] Keeping these factors in mind, this artical is aimed at providing the reader with comprehensive knowledge of root resorption occurring due to orthodontic treatment, so that at the end of this reading one becomes aware of various factors that lead to resorption and have a better knowledge on how to minimize it.

**Historical Perspective**:

In 1856, 'Bates' was the first person to describe root resorption of the permanent teeth. In 1887, 'Schwarzkopf' demonstrated the root resorption with extracted permanent teeth. In 1914, 'Ottolengui' related the root resorption directly to orthodontic treatment. In 1932, 'Ketcham' demonstrated the effect of orthodontic treatment on root length and shape by comparing the radiographs taken before and after the orthodontic treatment. However, Linge and Linge[11] (1983) concluded that fixed appliances are more detrimental to root resorption. Vardimon et al[15] (1992) have reported external root resorption with palatal expansion. Linge and Linge[12] found that there was an increase in root resorption with the use of class II elastics and suggested that jiggling forces, the result of function combined with elastics are responsible for incisor root resorption.

**NORMAL TOOTH SURROUNDING STRUCTURE**: Each tooth has a crown and root portion. The four tissues of teeth are enamel, cementum, dentin and pulp. The first three are hard tissues and the pulp is a soft tissue. The root portion of the tooth is firmly positioned in the alveolar process of the jaw. The bone of the tooth socket is called the alveolus. Three major connective tissues of periodontium i.e. cementum, periodontal ligament and alveolar bone are involved in the process of tooth movement and hold great importance during orthodontic treatment[8].

**CLASSIFICATION OF ROOT RESORPTION**

(I). ACCORDING TO SHAFER, HINE AND LEVY[14]

1) External root resorption.
2) Internal root resorption.

1) EXTERNAL ROOT RESORPTION: -

A. Periapical inflammation
B. Reimplantation of teeth
C. Tumors or cysts
D. Excessive mechanical or occlusal forces
E. Impaction of teeth
F. Idiopathic.

2) INTERNAL ROOT RESORPTION

A. Idiopathic

(II). NAPHTALI BREZNIAK et al. have published three types of external root resorption originally given by Andreasen[7]:-

1. Surface resorption
2. Inflammatory resorption
   A. Transient inflammatory resorption
   B. Progressive inflammatory resorption
3. Replacement resorption

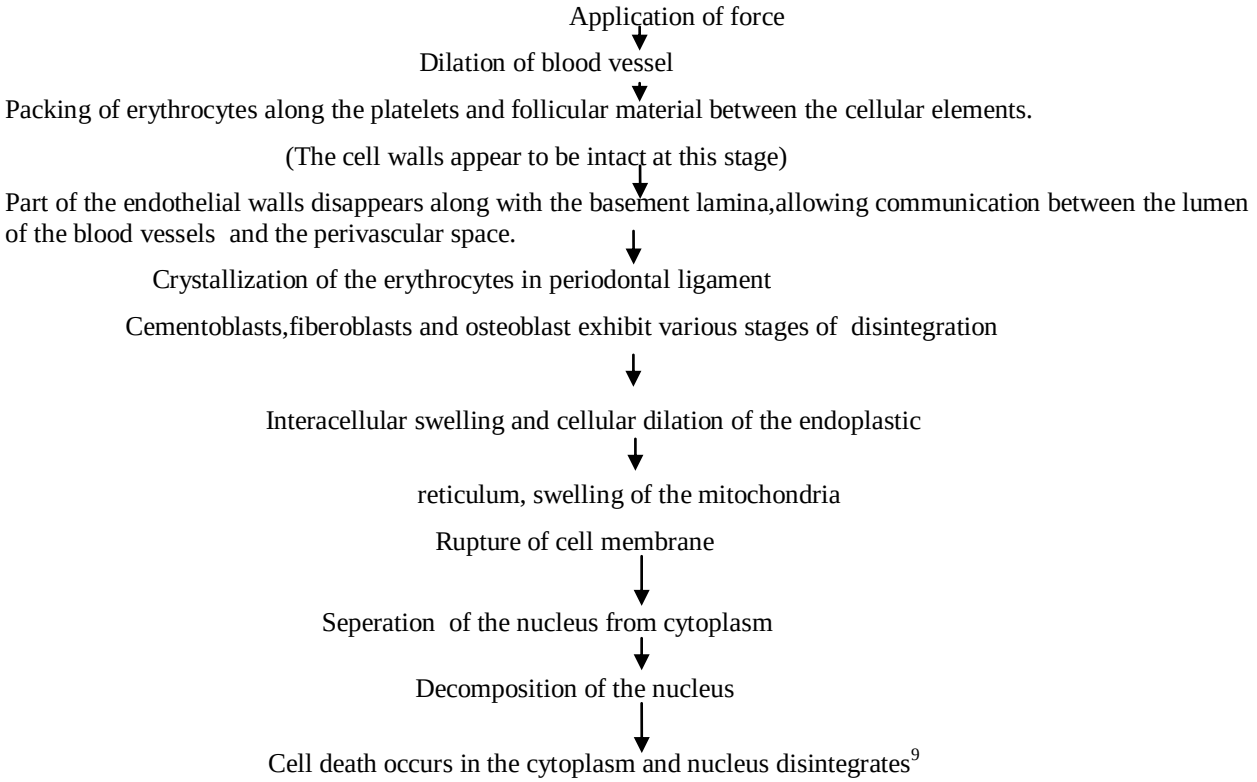
(III). ACCORDING TO PROFFIT, shortening of roots after orthodontic treatment occurs in three distinct forms that must be distinguished when the etiology of resorption is considered [13].

1. Moderate generalized root resorption
2. Severe generalized root resorption
3. Severe localized root resorption

(IV). ACCORDING TO FUSS Z, TSESIS I AND LIN S[9]

1. Pulpal infection root resorption.
2. Periodontal infection root resorption.
3. Orthodontic pressure root resorption.
4. Impacted tooth or tumor pressure root resorption.
5. Ankylotic root resorption.

**Mechanisms of Root Resorption**



**FACTORS AFFECTING ROOT RESORPTION**: Naphtali Brezniak, Atalia Wasserstein (1993) have described the following factors responsible for root resorption[5]

1) BIOLOGIC FACTORS: -

A. Individual susceptibility
B. Genetics
C. Systemic factors
D. Nutrition
E. Chronologic Age
F. Dental age
G. Gender
H. The presence of root resorption before orthodontic treatment
I. Habits
J. Tooth structure
K. Previously traumatized teeth
L. Endodontically treated teeth
M. Alveolar bone density
N. Types of malocclusion
O. Specific tooth vulnerability to root resorption

2) MECHANICAL FACTORS

A. Orthodontic appliances: -
    a) Fixed versus Removable
    b) Begg versus Edgewise
    c) Magnets
    d) Intermaxillary elastics
    e) Expansion appliances
B. Extraction versus nonextraction
C. Serial extractions
D. Types of orthodontic tooth movement
E. Orthodontic force
F. Continuous versus intermittent force
G. Jiggling and occlusal trauma
H. The extent of tooth movement

3) BIOLOGIC AND MECHANICAL FACTORS:-

A. Treatment duration
B. Relapse
C. Root resorption after appliance removal

**CLINICAL CONSIDERATIONS**

According to Naphtali Brezniak and Atalia Wasserstein[5] (1993), following points should be considered clinically before and during orthodontic treatment,

BEFORE TREATMENT

1. General considerations
2. Familial considerations
3. General health
4. Gender [10].
5. Age
6. The dentition
7. The malocclusion
8. Treatment of choice

DURING TREATMENT:

1. The new light-force rectangular wires that are used in treatment as initial wires have become very popular in the last decade.
2. Activations should be done over longer intervals.
3. No definitive conclusion has been drawn regarding tooth extraction being an important factor in occurrence of root resorption.
4. There is a possible correlation between the duration of active treatment and the incidence and extent of root resorption.
5. After 6 months of treatment, periapical radiographs of the teeth involved in the treatment should be obtained.

AFTER TREATMENT:

1. Final records including radiographs are recommended and are even mandatory. If root resorption is present on the final radiographs, the patient/parents should be informed.
2. For teeth with severe resorption, follow-up radiographic examinations are recommended until root resorption is no longer evident. In cases of extreme resorption, endodontic treatment may be considered. Cemental repair or termination of the active process of root resorption occurs naturally after the removal of bands and brackets.
3. Retaining the teeth with fixed appliances should be done with caution. Occlusal trauma of the fixed teeth or segments might lead to extreme root resorption.[6]

**DIAGNOSTIC AIDS:** According to Naphtali Brezniak and Atalia Wasserstein[5] (1993) radiographs are commonly used as a diagnostic aid for investigating root resorption. Following are the various radiographic techniques used as diagnostic aids for assessing root resorption:

1) Periapical bisecting angle
2) Periapical paralleling
3) Orthopantomogram
4) Cephalogram
5) Lamogram
6) Computed tomography

**CONCLUSION**: Root resorption of the deciduous dentition is a normal, essential and physiologic process. Permanent teeth have the potential to clinically undergo significant external root resorption when affected by several stimuli. The extent of treatment duration and mechanical factors definitely influence root resorption.

In most root resorption studies, it is not always possible to compare the results because of various factors and methods of studies. Further research in this field is necessary.

The question if there is any ideal (optimal) force to move teeth without root resorption and whether root resorption is predictable remains unanswered.

**REFERENCES**


1. Abass, SK and Hartsfield Jr, JK 2007 'Orthodontics and external apical root resorption', Seminars in orthodontics ,vol. 13, no. 4, pp. 246-256.
2. Acar, A, Canyürek, U, Kocaaga, M and Erverdi, N,1999,'Continuous vs. discontinuous force application and root resorption,' The Angle Orthodontist, vol.69, no.2, pp.159-163.
3. Alfuriji, S, Alhazmi, N, Alhamlan, N, Al-Ehaideb, A, Alruwaithi, M, Alkatheeri, N and Geevarghese, A, 2014,' The effect of orthodontic therapy on periodontal health: a review of the literature' International journal of dentistry.
4. Al-Qawasmi, RA, Hartsfield Jr, JK, Everett, ET, Flury, L, Liu, L, Foroud, TM, Macri, JV and Roberts, WE 2003,' Genetic predisposition to external apical root resorption. American Journal of Orthodontics and Dentofacial Orthopedics', vol.123, no.3, pp.242-252.
5. Brezniak, N and Wasserstein, A, 1993, 'Root resorption after orthodontic treatment: Part I. Literature review,' American Journal of Orthodontics and Dentofacial Orthopedics,vol. 103 vol.2, pp.138-146.
6. Brezniak, N and Wasserstein, A, 2002,' Orthodontically induced inflammatory root resorption. Part II: The clinical aspects,' The Angle Orthodontist, vol.72 no.2, pp.180-184.
7. Fuss, Z, Tsesis, I and Lin, S, 2003,' Root resorption–diagnosis, classification and treatment choices based on stimulation factors,' Dental Traumatology, vol.19, no.4, pp.175-182.
8. Graber,TM & Swain BF 1985,' Orthodontics Current Principal and Techniques,'CV Mosby
9. Hartsfield Jr, JK, Everett, ET and Al-Qawasmi, RA, 2004,' Genetic factors in external apical root resorption and orthodontic treatment,' Critical Reviews in Oral Biology & Medicine, vol.15, no.2, pp.115-122.
10. Kjær, I, 1995.,' Morphological characteristics of dentitions developing excessive root resorption during orthodontic treatment,' The European Journal of Orthodontics, vol.17,no.1, pp.25-34.
11. Linge, BO and Linge, L, 1983,' Apical root resorption in upper anterior teeth,' The European Journal of Orthodontics, vol.5, no.3, pp.173-183.
12. Linge, L and Linge, BO, 1991,' Patient characteristics and treatment variables associated with apical root resorption during orthodontic treatment,' American Journal of Orthodontics and Dentofacial Orthopedics, vol.99, no.1, pp.35-43.
13. Proffit,WR, Fields jr,HW & Sarver,DM2006, : Contemporary Orthodontics', The biologic basis of orthodontic therapy, 4th edition,Elsevier Health Sciences.
14. Shafer, Hine, Levy, 1999,' A textbook of oral pathology. Regressive alterations of the teeth,' 4th edition,CV Elsevier Mosby.
15. Vardimon, AD, Graber, TM and Pitaru, S, 1993,' Repair process of external root resorption subsequent to palatal expansion treatment,' American Journal of Orthodontics and Dentofacial Orthopedics, vol.103 no.2, pp.120-130.