Case Report

Diagnosis, treatment planning & management of patient undergoing orthodontic therapy with blunderbuss canal’s in relation to multiple teeth by endo-ortho interdisciplinary approach using PRF & MTA

Supriya Gupta¹, Deepak K Sharma¹, Saurabh Kaushik², Vijay Agarwal², Sidhartha S P Behera³,*

¹ Dept. of Conservative, Jaipur Dental College, Jaipur, Rajasthan, India
² Dept. of Orthodontics, Jaipur Dental College, Jaipur, Rajasthan, India
³ Dept. of Prosthodontics, Smile Dental, Hyderabad, Telangana, India

ARTICLE INFO

Article history:
Received 19-04-2021
Accepted 27-05-2021
Available online 30-06-2021

Keywords:
Blunderbuss Canal
Apexogenesis
Endodontic therapy
Plateletrich fibrin
Bone regeneration
MTA
Self ligation

ABSTRACT

Diagnosis, treatment planning & management of patient undergoing orthodontic therapy with blunderbuss canal’s in relation to one or multiple tooth requires a precise scientific approach based on sound principles. Interdisciplinary therapy integrates individual disciplines to function as a comprehensive unit providing consistent and predictable treatment results. A thorough logical diagnostic approach and treatment planning must be executed by each member of endodontic-orthodontic team when an esthetic and healthy makeover of a patient’s dentition is planned. Precise communication is important to provide patients with desired results. This case report presents one such approach for diagnosis, treatment planning & management of patient undergoing orthodontic therapy with blunderbuss canal’s in relation to one or multiple tooth. After careful clinical and radiographic evaluation, the patient was diagnosed with Angle’s Class I malocclusion with spacing in maxillary and mandibular arch, and blunderbuss canal’s ir 35 & 45. The treatment consisted of initial endodontic approach by starting treatment ir 35 and 45, followed by fixed orthodontic approach using passive self-ligating bracket system and by-passing the endodontically treated tooth. Regular follow-up to observe apexogenesis and continuous evaluation of the case is being done.

1. Introduction

There is often the need of moving teeth, which was endodontically treated or teeth still in endodontic treatment. The goal of orthodontic treatment is minimizing the biological damage and pain besides enabling an adequate teeth movement. Orthodontic movement of endodontically treated teeth was approached with suspicion for many years, and clinicians abstain from applying orthodontic movement to these teeth. However, there are close relations between all professional fields of dentistry; the relation between endodontics-orthodontics has attracted the attention of researchers less frequently, and there have not been any definitive judgments on the subject. This makes planning and follow-up of the treatment difficult for clinicians and causes problems in terms of complications that may occur during the treatment and approaches to the complications.

The aim here is to determine issues to be considered for endodontic terms before orthodontic treatment, the alterations which may be occurred in the pulp, hard tissues, and periapical region of the teeth during and after treatment and how these changes affect the results of treatment.¹ Regenerative endodontics was proposed as an alternative to conventional endodontic therapies, including RCT and others.² Orthodontic force, which is called as controlled trauma,³ can damage the pulp because the lack of collateral circulation in the pulp makes pulp one of
the most sensitive tissues of the body. The symptoms, which can be diagnosed earlier in the pulp tissues, after orthodontic force is applied are hemodynamic changes with the increase in the volume of blood vessels and circulatory disorders within the 1st h. When an orthodontic force is applied, pulp tissue reacts with pulp hyperemia at first, and degranulation of mast cells is characterized with cell damage and biochemical reactions. These are the features of classical acute inflammation in which acute inflammatory mediators such as vasodilatation, bradykinin, neuropeptides, prostaglandins and growth factors, vascular permeability, and histamine, which causes a rise in blood flow with edema, are released. An increasing neural activity and an increasing response threshold to electrical stimulation of pulp develop after a few days. Then, because of the alteration in the metabolism of pulp, which is stated with increased enzymatic activity, apoptosis, and necrosis of pulp cells increase.

Hamersky et al. observed a significant correlation between the amount of decrease in pulp tissue respiration rate and the age of the patients. They represented that age is more relative to pulp tissue respiration than orthodontic force. While there is a negative relation between age and respiration rate, a positive correlation between apical openness amount and respiration rate was stated. Baus et al. compared vitality of traumatized teeth during orthodontic treatment with traumatized teeth without orthodontic treatment and not traumatized teeth having orthodontic treatment in their retrospective study.

The capacity of pulp blood vessels is insufficient to enable an adequate pulpal blood flow during the following orthodontic treatment in the teeth which are exposed to severe periodontal damage. Pulpal condition should be monitored by periapical radiographs after orthodontic treatment begins again after trauma and if progressive pulp obliteration occurs the orthodontic treatment of the teeth must be ended or limited, or the forces must be decreased to minimum.

Laser Doppler flowmetry was commonly used in human studies which were carried out to evaluate pulpal blood flow changes associated with orthodontic treatment. There was a decrease in basal blood flow regardless of type of the moved teeth and teeth movement in the most of the studies. Javed et al. asserted that applying severe force to the teeth for a long time may affect pulpal blood flow than short-term application of the same forces. Controlled mechanistic forces during orthodontic treatment can cause temporary changes in the pulp unless they are not severe. It is important to complete the treatment of teeth, which need endodontic treatment with a careful clinical and radiographical evaluation before orthodontic treatment. A successful endodontic treatment is a must for a successful orthodontic movement.

Following are the orthodontic treatment-related and the patient-related risk factors:

| Treatment-related risk factors | Patient-related risk factors |
|-------------------------------|-----------------------------|
| Treatment duration            | Previous history of EARR    |
| Magnitude of applied force    | Tooth- root morphology, length and roots with developmental abnormalities Genetic influences |
| Direction of tooth movement   | Systemic factors including drugs (nabumetone) Hormone deficiency, hypothyroidism, and hypopituitarism |
| Amount of apical displacement | Asthma Root proximity to cortical bone Alveolar bone density Chronic alcoholism |
| Method of force application   | Previous Trauma Endodontic treatment Severity and type of malocclusion and patient age |
| (continuous vs. Intermittent) | Patient gender Patient habits |
| Type of appliance             |                             |
| Treatment Technique           |                             |

2. Clinical Case Report

Patient aged 28 years was referred in Department of Conservative dentistry & endodontics from Department of Orthodontics to evaluate the condition of 35 and 45 with open apices.

![Fig. 1: Frontal; Left lateral; Right lateral](image)

Fig. 1:

![Fig. 2: a: Frontal; b: Left lateral; c: Right lateral](image)

Fig. 2: a: Frontal; b: Left lateral; c: Right lateral

2.1. Clinical evaluation revealed

1. Spacing in maxillary and mandibular anterior
2. Maxillary dental midline shifted to right by 0.5mm
3. Restored 46
4. Extraction space in 15
5. Oral hygiene status was satisfactory
2.2. **Radiographic evidence**

2.3. **Findings**

1. Internal Resorption with periapical granuloma irt 15 (After Referring – Extraction was advised and carried on).
2. Blunderbuss canals irt.

2.4. **Lateral CEPH**

2.5. **CBCT Evaluation**

Mesio-Distally: (Axial View)

1. 35—3.1 mm
2. 45—2.2 mm

Bucco-Lingually: (Coronal View)

1. 35—2.1 mm
2. 45—3.0 mm

2.6. **Radiographic evaluation revealed**

1. Skeletal Class I pattern.
2. Horizontal growth pattern.
3. Decreased anterior position of maxilla irt CB,
4. Decreased upper posterior dental height.
5. Decreased lower posterior dental height.
6. Decreased effective maxillary length.
7. Internal Resorption with periapical granuloma irt 15
8. Blunderbuss Canal irt – 35,45 (Refer to Department of Conservative Dentistry & Endodontics.
9. Protruded maxillary and mandibular incisors.
10. Proclined maxillary and mandibular incisors.
11. Straight profile.

After careful clinical and radiographic evaluation, patient aged 28 years, diagnosed with a;

1. Case of skeletal class I with horizontal growth pattern
2. Angle’s Class I malocclusion with protruded and proclined upper and lower incisors with spacing in upper and lower anterior, anterior edge to edge bite, internal resorption with periapical granuloma irt 15, blunderbous canals irt 35,45 and upper midline deviated to right by 0.5mm.
3. With simple tongue thrust

2.7. **Treatment Objectives**

1. To extract 15, follow up with IOPA in successive appointments.
2. To obtain healthy canals irt 35,45 (Refered to Dept. of Conservative and Endodontic Surgery)
3. To correct spacing in upper and lower anteriors.
4. To correct anterior edge to edge bite  
5. To correct the protruded and proclined upper & lower incisors  
6. To correct midline shift  
7. To achieve esthetic profile  
8. To achieve and maintain stable results  

2.8. Initial endodontic therapy  

Firstly, the patient was sent to dept. of conservative and endodontic dentistry for treatment with respect to 35 and 45.

Endodontic access opening was done irt 35 and 45 under local anaesthesia. Working Length of both teeth were determined using 10 K-file. Thorough biomechanical preparation was done involving circumferential filing till 80 K file (Dentsply, India). Thereafter, dressing of Calcium hydroxide was placed in the canal under rubber dam isolation along with temporary was given for 14 days. Patient was recalled and did not complain of pain and there were no signs of sinus or tenderness.

Patient was given a dressing of Triple Antibiotic Paste (TAP) for another 14 days to sterile the canal. Patient was asymptomatic at recall visit.

After 28 days, in 35 PROROOT MTA (MTA\textsuperscript{tm} DENTSPLY, India) was placed with the help of pluggers (DENTSPLY, India) and access cavity was sealed using glass ionomer cement (FUJI, GC Corporation, Tokyo, Japan).

In 45, regenerative procedure was carried out. PRF was made with the help of centrifugation machine as shown in the diagram. PRF was placed inside the canal using hand pluggers (Dentsply, India) followed by sealing of access cavity using Glass ionomer Cement (Fuji, GC Corporation, Tokyo, Japan). Patient was recalled after 14 days to evaluate the status of tooth. It was asymptomatic. Thereafter, he was monitored after every 3, 6, 9 and 12 months radiographically so as to evaluate apexification.

Beginning of orthodontic therapy and various considerations for the same.
2.9. At beginning of orthodontic therapy

During initial bonding procedure, it was taken into consideration that 35 and 45 will not be bonded with the brackets and therefore be bypassed.

![Maxillary and Mandibular teeth](image)

2.10. Follow Up 2nd Appointment

![Frontal and Left/Right views](image)

2.11. Endodontic Follow-Up

![Pre-Treatment, After 3 months, 6 Months, 12 Months images](image)

3. Discussion

The concept of revascularization was introduced by Ostby in 1961. He emphasized on the role of blood clot in endodontic therapy in an experimental histologic study. There was paucity of literature regarding this until 2004, when Trope reintroduced this concept for treatment of immature permanent teeth with apical periodontitis. Since then the traditionally used calcium hydroxide apexification and surgical endodontic procedure are being replaced by biologically-based revascularization procedure, where maturogenesis takes place, so that the entire root is allowed to mature and not only the apex, as in apexification.

Basic research studies have shown that specialized secretory granules of platelets such as PDGF-αβ, TGF-β and PDGF-αβ result in soft tissue healing through collagen production and hard tissue healing through the initiation of callus formation and mineralization. The use of blood-derived products to seal wounds and stimulate healing started with the use of fibrin glues, which were first described 40 years ago and are constituted of concentrated fibrinogen (polymerization induced by thrombin and calcium). Autologous fibrin glues are considered the best choice to avoid contamination risk, but their use remains very limited owing to the complexity and the cost of their production protocols. Consequently, the use platelet concentrates to improve healing and to replace fibrin glues has been explored considerably during the last decade. Platelets contain high quantities of key growth factors, such as PDGF-αβ, TGF-β1 and VEGF which are able to stimulate cell proliferation, matrix remodelling and angiogenesis.

4. Conclusion

1. Apexification was appreciated in 45 in which PRF was placed earlier as compared to 35. Periapical healing was seen in 45 evidently as compared to 35.
2. Today’s orthodontist practice’s at the intersection of art and technology. The challenge of applying appropriate levels of technology to an artistic end result is the art of “Case Management”. The best case managers have a sound understanding of the technology they apply on daily basis.
3. Treatment planning begins with the end in mind. And therefore by planning in retrograde, the clinician can anticipate the hurdles encountered during treatment and plan for them in advance.
4. Patient’s routine follow ups and careful evaluation with an interdisciplinary approach has helped me in deducing a diagnosis that guided my treatment planning to be designed in a way so as to achieve the best possible result for the patient’s overall well-being and health.
5. Meticulous planning and management of patient’s treatment needs is of foremost priority to every clinician and it plays a pivotal role in helping the clinician to achieve their treatment goals tailor made according to the treatment needs.
6. In many instances, we come across various techniques that can help in resolving the symptoms and effects of any malocclusion, and it is one’s call on how to approach using the various techniques and skill to obtain the best possible outcome for the patient. Keeping this in mind I preferred using passive self ligating system, for its use of low force levels and comfortable wear.

5. Acknowledgement
The author thanks to Dr Deepak Kumar Sharma for their clinical guidance and encouragement.

6. Conflict of Interest
The authors declare that there are no conflicts of interest in this paper.

7. Source of Funding
This research did not receive any specific grant from funding agencies in the public, commercial, or not-for-profit sectors.

References
1. Er K, Aydin H. The effect of orthodontic tooth movement on endodontically treated teeth. J Res Dent. 2016;4(2):31–41. doi:10.4103/2321-4619.181001
2. Murray PE, Garcia-Godoy F, Hargreaves KM. Regenerative Endodontics: A Review of Current Status and a Call for Action. J Endod. 2007;33(4):377–90. doi:10.1016/j.joen.2006.09.013
3. Popp TW, Årtun J, Linge L. Pulpal response to orthodontic tooth movement in adolescents: A radiographic study. Am J Orthod Dentofac Orthop. 1992;101(3):228–33. doi:10.1016/0889-5406(92)70091-n
4. Sano Y, Ikawa M, Sugawara J, Horiuchi H, Mitani H. The effect of continuous intrusive force on human pulp blood flow. Eur J Orthod. 2002;24:159–66.
5. Vandevska-Radunovic V, Kristiansen AB, Heyeraas KJ, Kvinnsland S. Changes in blood circulation in teeth and supporting tissues incident to experimental tooth movement. Eur J Orthod. 1994;16(5):361–9. doi:10.1093/ejo/16.5.361
6. Veberiene R, Smailiene D, Danielyte J, Toleikis A, Dagys A, Machiulskiene V, et al. Effects of Intrusive Force on Selected Determinants of Pulp Vitality. Angle Orthod. 2009;79(6):1114–8. doi:10.1016/j.ano.2009.09.014
7. Veberiene R, Smailiene D, Baseviciene N, Toleikis A, Machiulskiene V. Change in dental pulp parameters in response to different modes of orthodontic force application. Angle Orthod. 2010;80(6):1018–22. doi:10.1016/j.ano.2009.09.014
8. Hamersky PA, Weimer AD, Taintor JF. The effect of orthodontic force application on the pulpal tissue respiration rate in the human premolar. Am J Orthod. 1980;77(4):368–78. doi:10.1016/0002-9416(80)90103-7
9. Hamilton RS, Gutmann J.L. Endodontic-orthodontic relationships: a review of integrated treatment planning challenges. Int Endod J. 1999;32(5):343–60. doi:10.1046/j.1365-2991.1999.00522.x
10. Bauss O, Röhlting J, Meyer K, Kiliaridis S. Pulp Vitality in Teeth Suffering Trauma during Orthodontic Therapy. Angle Orthod. 2009;79(1):166–71. doi:10.1016/j.ano.2009.08.011
11. Er K, Aydin H. The effect of orthodontic tooth movement on endodontically treated teeth. J Res Dent. 2016;4(2):31–41. doi:10.4103/2321-4619.181001
12. Justus R. Prevention of external apical root resorption during orthodontic treatment. Clin Dent Rev. 2018;2(1). doi:10.1007/s41894-018-0035-3

Author biography
Supriya Gupta, Post Graduate Student Deepak K Sharma, HOD Saurabh Kaushik, Post Graduate Student Vijay Agarwal, HOD Sidhartha S P Behera, Associate Professor (PhD. Scholar)

Cite this article: Gupta S, Sharma DK, Kaushik S, Agarwal V, Behera SSP. Diagnosis, treatment planning & management of patient undergoing orthodontic therapy with blunderbuss canal’s in relation to multiple teeth by endo-ortho interdisciplinary approach using PRF & MTA. IP Indian J Conserv Endod 2021;6(2):124-129.