



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

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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 in 35 & 45. The treatment consisted of initial endodontic approach by starting treatment in 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.

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1. Introduction

There is often the need of moving teeth, which were 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

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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 vessels⁴ and circulatory disorders within the 1st h.⁵ 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.⁶ Then, because of the alteration in the metabolism of pulp, which is stated with increased enzymatic activity, apoptosis, and necrosis of pulp cells increase.⁷

Hamersky et al.⁸ 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.⁹ Bauss 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.¹⁰

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 mechanic 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.¹¹

Following are the orthodontic treatment-related and the patient-related risk factors¹² :

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

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:

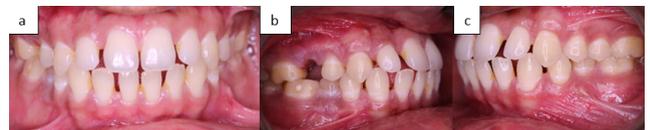


Fig. 2: a:Frontal; b: Left lateral; c: Right lateral

2.1. Clinical evaluation revealed

1. Spacing irt maxillary and mandibular anteriors
2. Maxillary dental midline shifted to right by 0.5mm
3. Restored irt 46
4. Extraction space irt 15
5. Oral hygiene status was satisfactory

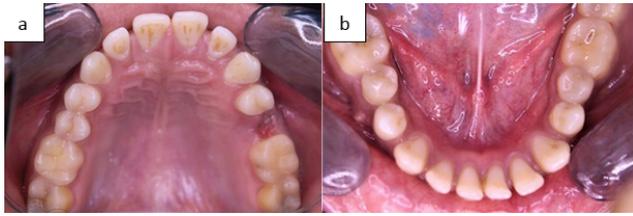
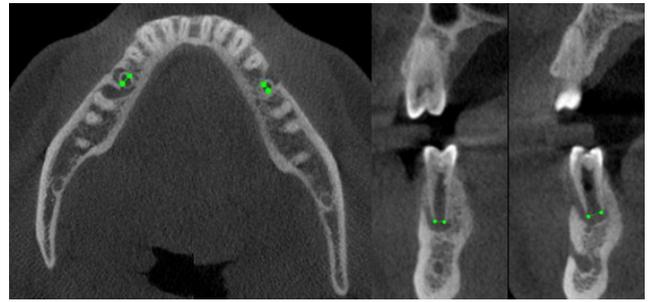
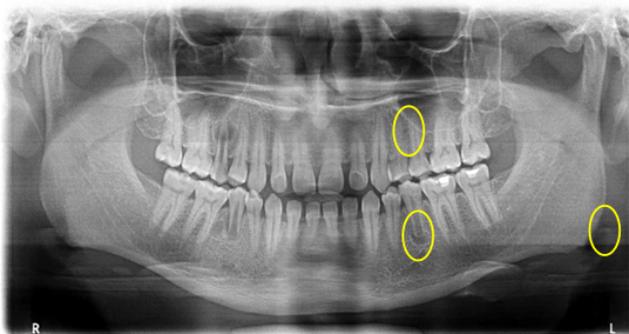


Fig. 3: a:Maxillary arch; b: Mandibular arch



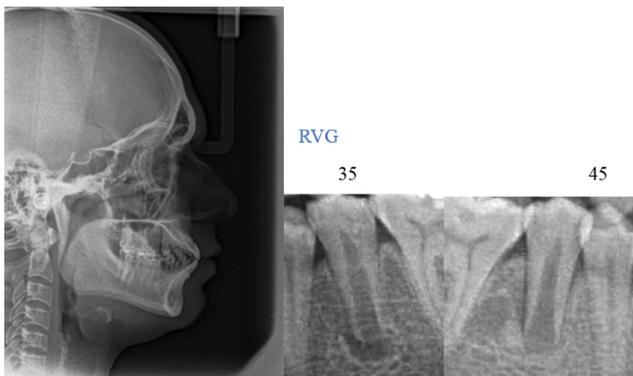
2.2. Radiographic evidence



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 28years, 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 incisorswith spacing in upper and lower anteriors, anterior edge to edge bite, internal resorption with periapical granuloma irt15, 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 (Referred 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.



MTA Placement irt 35



PRF Placement irt 45



(Access Opening irt 35, 45)

PRF Preparation (for 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™ 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.

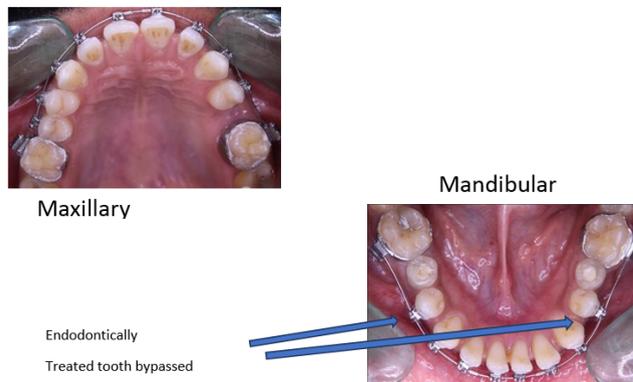
Beginning of orthodontic therapy and various considerations for the same.



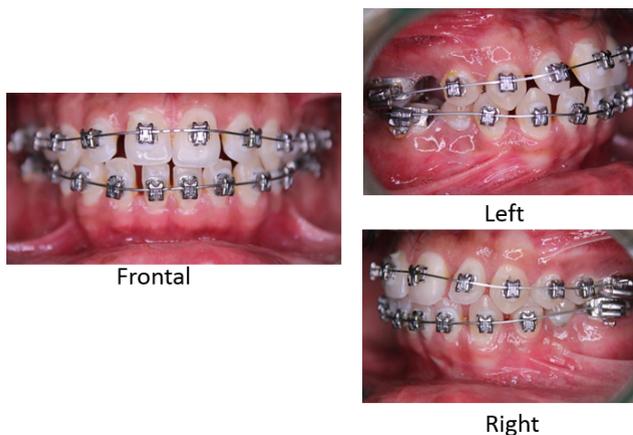
Working Length Determination

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.



2.10. Follow Up 2nd Appointment



2.11. Endodontic Follow-Up



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- $\alpha\beta$, TGF- β and PDGF- $\alpha\beta$ 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- $\alpha\beta$, TGFb-1 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.

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6. Conflict of Interest

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

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