Journal Homepage: -www.journalijar.com

INTERNATIONAL JOURNAL OF ADVANCED RESEARCH (IJAR)

Article DOI:10.21474/IJAR01/11329
DOI URL: http://dx.doi.org/10.21474/IJAR01/11329

RESEARCH ARTICLE

MANAGEMENT OF AN OPEN APEX AND PERIAPICAL LESION WITH MTA AND RESTORING THE BONY DEFECT WITH BONE GRAFT MATERIAL AND PRF- A CASE REPORT

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Manuscript Info

Manuscript History
Received: 15 May 2020
Final Accepted: 20 June 2020
Published: July 2020

Abstract

Introduction:-

Root completion and root apex closure continues till 3 years following the eruption of the tooth. Pulpal involvement as a consequence of trauma or caries in immature permanent teeth can lead to the loss of pulpal vitality as well as directly affect root development, resulting in short roots with very thin walls producing a greater risk of fracture and thus hindering the treatment.[1]

Apexification is the most conventional method for management of immature permanent tooth with open apex. It is defined as a method to induce a calcified barrier in a root with an open apex or continued apical development of an incompletely formed root in teeth with necrotic pulp tissue. [2]

The apexification may involve one or multiple monthly appointments to place calcium hydroxide (Ca(OH)2) inside the root canal and achieve disinfection, which stimulates calcification and produces the apical closure followed by backfilling of the canal. With the advent of bioactive materials like MTA, earlier concepts to achieve apexification by traditional use of Ca (OH)2 is replaced as a one-step technique. [3]

Surgical endodontics is a method opted for the treatment of teeth with periapical lesions which do not respond to conventional root canal treatment.[4] Apical surgery includes incision and drainage, closure of perforations, and root or tooth resections. Periapical surgery is performed to gain access to the affected area, evaluate the root circumference and root canal anatomy, and provide a biocompatible seal that stimulates the regeneration of periapical hard and soft tissues. [5,6]

According to the updated guidelines by the European Society of Endodontology, indications for apical surgery comprise (1) radiological findings of apical periodontitis and/or symptoms associated with an obstructed canal (the obstruction proved not to be removable, displacement did not seem feasible or the risk of damage was too great), (2) extruded material with clinical or radiological findings of apical periodontitis and/or symptoms continuing over a prolonged period, (3) persisting or emerging disease following root-canal treatment when root canal retreatment is inappropriate, and (4) perforation of the root or the floor of the pulp chamber and where it is impossible to treat from within the pulp cavity.[7] Various studies have shown that MTA is an excellent material for use in apexification, as a root end filling material for immature permanent teeth, as a pulp capping and pulpotomy agent and for repair of perforations. Besides these uses, Mineral trioxide aggregate (MTA) has also emerged as a reliable bioactive material with extended applications in endodontics that include the obturation of the root canal space.[8,9,10]

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Case Report Proper:

A 35-year-old female patient reported to Department of Conservative Dentistry and Endodontics, College of Dental Sciences, Davangere, with a chief complaint of pain since 1 week in upper front tooth region which was attempted to treat by a private practitioner dentist. She was symptomatic 6 months ago and hence reported to a private practitioner dentist. After the initial treatment ,pain subsided. But the pain increased in intensity since 1 week. The medical history of the patient was noncontributory.

The Extraoral examination was normal. Intraorally pain on palpation was felt around the left central and lateral incisors. The teeth were not mobile and probing depth was within physiological limits. Preoperative IOPA revealed wide radiolucency at the apex in relation to 11 suggestive of open apex, obliterated root canal in relation to 21 and radio-opacity in the root canal space in relation to 22 suggestive of previous root canal treatment done with large periapical radiolucency seen around the roots of 21 and 22. IOPAR also revealed attempted root canal treatment in relation to 21 and 11. Apexification was planned for 11, conventional root canal therapy for 21 followed by apicoectomy in relation to 21 and 22. The treatment plan was discussed with the patient and consent was taken.

Fig 1:- Pre-operative IOPAR

Fig2:- Negotiation of the canal with #8K.

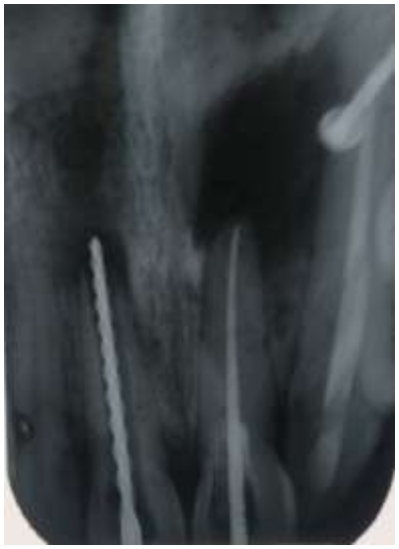

Fig 3:- MAF wrt 11 and Master cone wr 21.

Fig 4:- MTA apical plug wrt 11.

Fig 5: Post-obturation IOPAR

Fig 6: Post apicoectomy wrt 21 22

Fig 7:- MTA Root end filling wrt 21 22.

Fig 8:- After 3 months follow up.

First visit:

Endodontic treatment was already attempted to the tooth so anesthesia was not needed. Using # 4 round bur temporary restoration was removed and the access cavity was finished by Endo Access bur in relation to 11 and 21.

The root canal was obliterated in relation to 21. Canal negotiation was done with #8k file with the help of RC Prep and working length was determined using #10k file. Canal was mechanically prepared till 50.06. Copious irrigation was done with 2.5 % NaOCl followed by normal saline as final rinse.

Minimum instrumentation was performed in relation to 11 and circumferential filing was done with 80 K file. Copious irrigation was performed with 2% Chlorhexidine and normal saline using side vented irrigation needle . After cleaning and shaping working length was established by radiograph. Intracanal dressing with calcium hydroxide [Ultradent Products Inc., USA] was given for 2 week in relation to 11 and 21 and access cavity was temporized with Cavit.

Second Visit:
On recall visit, the tooth was asymptomatic. After removing the provisional restoration copious irrigation and circumferential filing was done again to remove calcium hydroxide from the canal. The canal was completely dried with size 80 absorbent paper point [Ultradent Products Inc.,USA]. Suitable plugger was selected to condense MTA. MTA was mixed with distilled water until it reached a consistency of wet sand and later placed in increments in the apical region of the canal . MTA was condensed with light pressure using prefitted hand pluggers until 5 mm canal was filled with MTA. Wet sterile cotton was placed in the canal above MTA. The tooth was then given a temporary restoration with Cavit.

Third Visit:
On recall visit, the patient was asymptomatic , temporary dressing was removed and the canal was irrigated with normal saline. Paper Points were used to dry the canal and the remaining portion of the canal was obturated with GuttaFlow® Bioseal (Roeko-Coltène/Whaledent) .Post-endodontic restoration was done with composite (Coltene NT Premium).

Fourth Visit:
The patient was recalled after 7days for re-evaluation and complete blood investigation. In the next appointment, apicoectomy was performed in relation to 21 and 22. After administration, of local anesthesia, a full thickness trapezoidal mucoperiosteal flap was raised extending from distal aspect of 23 to distal aspect of 12 using Bard Parker (B.P) blade size #15 (BD, Sao Paulo, Brazil) and periosteal elevator (SS White, Lakewood New Jersey). Apical curettage was performed for the removal of granulation tissue. Surgical site was irrigated using normal saline and betadiene. Following the raising of a flap, surgical osteotomy was done to get access to the root end. 3.0 mm of the apex was horizontally excised using a Lindeman Surgical Bur (Brasseler USA) and the root end was exposed. Ultrasonic tips (BEST TIPS 1 and 2 [Brasseler USA]) were used to make a 3.0-mm deep retro preparation. Hemostasis was obtained in the osseous crypt, and then the surgical field was disinfected and dried. The retrograde filling was done with MTA (Angelus, Londrina, PR Brazil). PRF was placed in the bone defect. Nearly 5 ml of whole venous blood was collected in two sterile vacutainer tubes of 6 ml capacity without anticoagulant. The vacutainer tubes were then placed in a centrifugal machine at a speed of 3000 revolutions per minute (rpm) for 10 minutes. After centrifugation collected blood settled into the following layers: red lower fraction containing red blood cells, upper straw coloured cellular plasma and the middle fraction containing the fibrin clot . The upper straw coloured layer was removed and middle fraction was collected, 2 mm below lower dividing line, known as PRF. PRF and Osseomold (Advanced Biotech) was placed in defect. The flap was then repositioned and approximated with moderated digital pressure and moist gauze and then sutured. Post-operatively antibiotics and analgesics were prescribed to the patient along with 0.12% chlorhexidine mouth rinse for maintenance of oral hygiene. The patient was recalled after 7 days for removal of sutures and treatment evaluation. Radiographic evaluation on the recall visit at the end of third month, revealed continued healing of the periapical lesion and bony trabeculae formation.

Fig 9:- Armamentarium.

Fig 10:- Initial probing before incision.

Fig 11:- Post incision.

Fig 12:- After flap raising.

Fig 13:- After removal of granulation tissue.

Fig 14:- After apicoectomywrt 21 22.

Fig 15:- Root end filling with MTA wrt 21 22.

Fig 16:- Placement of Osseomold in the cavity.

Fig 17:- Centrifuged Blood.

Fig18:- PRF on top.

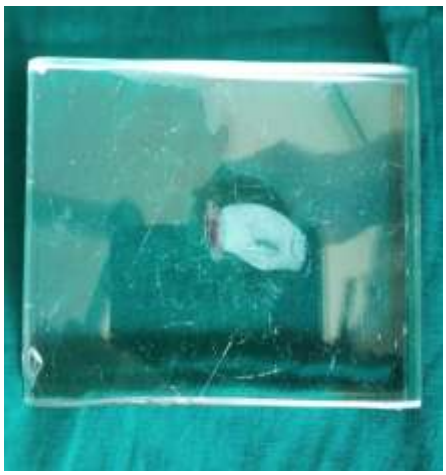

Fig19:- PRF membrane.

Fig 20:- Placement of PRF on top of Osseomold.

Fig 21:- Suturing of the flap.

Discussion:-

The presented case shows successful management of immature permanent teeth and apicoectomy of teeth with chronic periapical lesion. Literature suggests that goal of apexification procedure is to obtain an apical barrier to

prevent the passage of toxins and bacteria into periapical tissues from root canal. Technically, this barrier is required for compaction of root filling material. [11]

Previously Calcium Hydroxide was the most commonly used material for inducing biological seal in open apex cases. The technique had some disadvantages such as the prolonged treatment time, risk of recontamination of the root canal system and a chance of cervical tooth fracture during treatment. MTA is the preferred material for single visit apexification owing to its bio-compatibility, less cytotoxicity, osteo-conductive properties, bio-remineralisation abilities and hydrophilic nature. MTA offers faster treatment outcome in comparison with Ca(OH)2, with high clinical success rates**.** [12]

Aminoshariae et al. (2003) suggested from their laboratory study that hand condensation resulted in better adaptation and fewer voids than ultrasonic compaction. In the present study, the MTA apical plugs were placed by a standardized hand condensation technique. The apical plug created with MTA can be interpreted as an artificial barrier to condense the subsequent root canal filling material, in order to prevent reinfection of the canal system and to prevent extrusion of filling material into periapical area. A study conducted by de Leimburg et al (2004) reported that the orthograde use of MTA provided an adequate seal against bacterial infiltration regardless of the thickness of the apical plug. In general, the outcomes in this case are similar to previously reported cases of successful MTA apical plug procedures in teeth with necrotic pulps and open apices (Shabahang&Torabinejad 2000, Giuliani et al. 2002, Maroto et al. 2003). [13]

Apicoectomy is a surgical procedure which involves the excision of pathological periapical tissue from root surface (including apical accessory canals) and sealing the canals against pathological agents thereby aiding in tissue regeneration and creation of new structural support to the tooth. It is the principal modality available to manage failure of conventional orthograde endodontic treatment of a large nonhealingperiapical lesion. The reported success rate for periapical surgery varies between 44% and 90%. Harty et al. (1970) found that the success rate of 1016 cases of apicoectomy was 90%. Oginni and Olusile concluded that the success rate of apicoectomy of anterior teeth was 71.9%. Peterson and Gutmann reported a success rate of 64%. [14-18]

Inadequate bone healing is caused by ingrowth of connective tissue into the bone space, preventing osteogenesis. In order to prevent this soft-tissue ingrowth, and faster bone healing bone grafts can be used to fill the bony space in case of large bony defects. The hydroxyapatite will act as a filling materials as well as a scaffold, which gradually gets resorbed while preosteoblasts and osteoblasts migrate from the adjacent bone (Osteoconduction).[19]In the current study, Osseomold was used as bone graft material. Osseomold is high Purity Type-I collagen derived from bone is essential for tissue regeneration and remodelling in any osseous defect. Xenograft Material/DMBM is one such de-mineralized bone derived Type-I collagen for flap surgery, implants, sinus lift, ridge augumentation etc. Osseomold is osseo-inductive and ossse-conductive and also totally resorbable.

PRF is a second generation platelet concentrate. PRF is easy to obtain, inexpensive, and possibly a very beneficial ingredient to add to the “regenerative mix.” PRF represents a new step in the platelet gel therapeutic concept with simplified processing minus artificial biochemical modification. Unlike other platelet concentrates, this technique requires neither anticoagulants nor bovine thrombin (nor any other gelifying agent), making it no more than centrifuged natural blood without additives. PRF consists of a fibrin matrix polymerized in a tetra molecular structure, with incorporation of Cytokines, platelet, leucocytes and circulating stem cells. PRF results from a natural and progressive polymerization occurring during centrifugation. The fibrin network thus formed presents a particularly homogeneous 3-dimensional organization, even more highly coherent than natural fibrin clots. The cytokines are thus maintained available ***in situ*** for a convenient period, when the cells start cicatricial matrix remodelling, i.e., when they have to be stimulated to launch injured site reconstruction. The easily applied PRF membrane acts much like a fibrin bandage, serving as a matrix to accelerate the healing of wound edges.[20]

Conclusion:-

MTA has showed favourable outcome as an apexification material. Advances in apicoectomy armamentarium, retrofilling with bioactive materials and clinical techniques for their efficient use have enabled endodontists to treat challenging cases with much greater efficiency. This case report was a combination approach of apexification and apicoectomy which showed a successful outcome.

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