Apicoectomy with PRF-mixed particulated autogenous bone graft in the treatment of bone defects.

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Abstract :-

Endodontic surgery is a safe and passable alternative when teeth are not responding to traditional endodontic therapy and don't acquire favourable outcomes. Apicoectomy involves surgical management of a tooth with a periapical lesion which cannot be resolved by routine endodontic treatment. Because the term "apicoectomy" consists of only one aspect of a multifaceted series of surgical procedures, i.e removal of root apex, the terms "periapical surgery" or "periradicular surgery" are more apposite. Various materials and techniques have been developed to facilitate bone healing process and reduce its healing period. In recent studies, it is pointed out that, platelet-rich fibrin (PRF) which is derived autogenously from the own blood of the individuals, increase regeneration and accelerate the healing of the wound, due to the consisting various growing factors. The aim of this case report is to evaluate the efficiency of PRF/autogenous bone graft combination on bone healing in different time intervals.

Keyword :
Endodontic Surgery, Apicoectomy, Periapical Surgery, Periradicular Surgery, PRF, Bone Graft

Introduction :

Apicoectomy Procedure was well described and defined by **European Society of Endodontology** as "a bold act, which removes the entire cause [of disease] and which will lead to a permanent cure which may not be the best in the end, but the most humane[1]." According to Black, the root-resection technique i.e. amputation of the root apex has been originated as a treatment for "pyorrhea alveolaris" complicated by a dental abscess in the late years of the 19th century as a valid alternative to a dental extraction[2].

Fig 1: Pre operative

Fig 2: Obturation

Apicoectomy (root resection or root amputation) signifies the removal of the apices of pulpless teeth in which satisfactory root or pulp canal therapy has been performed. This operation is performed to remove known or unknown infection, granulation tissue or cystic areas that involve these teeth; yet retaining the major portion of the roots in situ. Thus, the success relies on different factors and is verified through clinical and radiographic evaluations during follow up[3-4].

Fig 4: Surgical Incision

Platelet-rich fibrin (PRF) is a modification of PRP. It is indicated for alveolar bone augmentation, sinus lift procedure, extraction socket preservation, defect reconstruction following cyst enucleation

or tumor excision, and also alveolar cleft repair[5]. PRF is an autologous fibrin with a large quantity of platelets and leukocyte cytokines.This concentrate contains high levels of growth factors, including the platelet-derived growth factor (PDGF), TGF, vascular endothelial growth factor, insulin-like growth factor (IGF), and epidermal growth factor (EGF). These growth factors play a central role in hemostasis and the bone healing process, which makes PRF advantageous. In many studies, PRF has a direct or indirect effects on bone regeneration in bone grafting or bone defect healing[6]. In the literature, authors have reported many advantages of PRF for bone regeneration. There are also much controversies in the literature over the use of different grafts as bone substitutes. The ideal biomaterials should provide osteoconductive and osteoinductive features similar to autogenous bone grafts, which are still considered the gold standard in reconstructive bone surgery[7]. However, there is no ideal biomaterial. Although some studies have focused on the applications of PRF, few used animal models for experiments on bone regeneration with sole or combined applications of PRF and autogenous bone graft[8].

Fig 5: Mucoperiosteal Traphezoidal Flap

Fig 6 : Removal of pathology from Bony cavity

Fig 7 : Retrograde Cavity preparation

Fig 8 : Retrograde MTA Filling Radiograph

Case Description :

A 33Yr. male patient came to the Department of conservative dentistry and endodontics of Chandra Dental College & Hospital with a chief complain of severe pain and mobile tooth in his lower anterior tooth.

On Clinical examination, Grade I Mobility was seen in respect to 41 42 and also discoloration of tooth was seen. Tooth Vitality Test was performed and both the tooth i.e. 41 and 42 were found to be Non Vital. After examining radiographically, large periapical lesion was found in respect to 41 42 confirming the diagnosis of Chronic Periapical Granuloma.

After examination, the access opening was done under Rubber Dam followed with drainage of pus, copious irrigation was done in respect to tooth number 41 and 42.

First all the non surgical methods were tried using Calcium hydroxide and iodoform paste and also with antibiotic paste as intra canal medicament to disinfect the Root Canal but the patient was still symptomatic. So it was decided to go for the surgical method.

The ethical approval for this case was obtained from Chandra Dental College and Hospital ethical committee and informed consent was obtained from the patients.

Blood heamogram tests were conducted prior to surgical procedure.

Surgical Procedure :

The procedure of apicoectomy was planned, instruments were sterilized (Fig 3). Firstly, the perioral soft tissues were cleaned, washed and painted with povidone-iodine in order to minimize contamination of the surgical wound. Under local anaesthesia with lidocaine HCl 2% injection [1:100000], the most commonly used mucoperiosteal trapezoidal flap (Fig 5) was performed with mesial and distal vertical releasing incision. Once the full thickness flap was raised to expose the apical pathology. The periapical pathological tissue was curetted properly to enhance the accessibility and visibility of the surgical field. Subsequently, root end resection was completed followed by formation of small retro-cavity at the root end. After isolation of the surgical area, MTA CEM (Mineral Trioxide Aggregate, LONDON, UNITED KINGDOM) was used as root end sealing (Fig 8) material in order to provide a tight apical seal. Flap was repositioned at surgical site and secured using 3-0 silk suture(Fig 11).

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surgery" or "periradicular surgery" are more apposite. Various materials and techniques have been developed to facilitate bone healing process and reduce its healing period. In recent studies, it is pointed out that, platelet-rich fibrin (PRF) which is derived autogenously from the own blood of the individuals, increase regeneration and accelerate the healing of the wound, due to the consisting various growing factors. The aim of this case report is to evaluate the efficiency of PRF/autogenous bone graft combination on bone healing in different time intervals.

Post-Operative Instructions :

Patient was adviced cold pack application upon surgical site and was prescribed Analgesic, Antibiotics and Anti- inflammatory for 5 days. Oral hygiene procedures were instructed such as careful brushing and flossing (to begin after 24 hours). Proper nutrition and fluids were advised along with chlorhexidine rinse twice a day.

Suture Removal and Evaluation

Sutures were removed 5 days after the surgery as short periods are preferred to enhance healing. There was indication of primary wound closure. Follow-up visits were at 4 weeks, 3 month and 6 months. The post-operative healing was classified as complete, partial healing (incomplete), uncertain, and no healing (or failure).

Discussion

The most conventional or historical pathway to current surgical endodontic procedures and their applications has been tortuous and complex. Many newer techniques, defined as "revolutionary" that are being practiced today are simply re-interpretation of surgical concepts that were lost in the archives of time.Among all these concepts, apical surgery proves to be the best resort to preserve natural teeth after its failed endodontic treatment. The use of moderm surgical techniques and equipments has resulted in an increase in the success rate upto 92% for the same procedure.

" In 1930, **Seldin SD et al** emphasized the importance of a well-sealed root canal prior to apicoectomy. The apical portion was cut at 45° to the long axis of the tooth. Regardless of some authors who advocate that larger the cut angle, larger will be the dentinal tubule exposure, this inclination degree was needed to allow total root surface exposure, aimed at facilitating the requisite operative procedures[7].98Also, the apical cut must involve anatomical variations such as the presence of isthmuses and accessory canals as these act as a reservoir for bacteria and necrotic pulp tissue, which can lead to treatment failure[9].

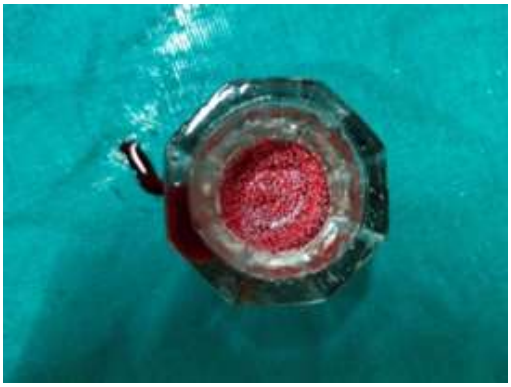

Fig 9 : PRF with autogenous Bone Graft

Regarding apical filling materials, a number of biocompatible materials have been introduced like MTA, Super EBA and IRM. Nowadays, Guided tissue regeneration (GTR) techniques have also been projected as an adjunct with the intention to promote healing after periapical surgery

Weine FS compared the outcomes of traditional apicoectomy [trapezoidal flap and retrograde obturation with silver amalgam (without zinc non Ygamma- 2)] with modern apicoectomy [MTA (ProRoot)], as root-end filling material] by means of a controlled clinical trial with 5-year follow-up. They investigated 938 teeth in 843 patients and put forward that modern apicoectomy has a 5 times higher success rate compared with the traditional technique[10].

Fig 10 : Placement of PRF with Bone Graft

Fig 11 : Reposition and Suture(3-0) of flap

In recent times. GTR techniques ie use of bone graft along with barrier membranes in adjunct to endodontic surgeries has been used to promote bone healing[11].

In an animal study, **Whitman DH**. have demonstrated that clinical outcomes are better using autogenous bone mixed with platelet-enriched fibrin glue than using autogenous bone alone.

The experimental group received bovine bone graft material combined with PRF, whereas the control group received only bovine bone graft material[12]. The results revealed that PRF led to the production of new bone, even at 106 days. Ozdemir *et al*. assessed the effects of PRF on bone augmentation in an animal model. PRF and bovine bone showed a greater area of new bone formation at 3 month than the other two tested group.

PRF in addition to particulate autogenous bone graft may favor the formation of new bone and PRF keep the graft particles together. Based on our results, applying PRF to the bone defects may accelerate the bone graft healing and shorten the time period for rehabilitation. The hemostatic effect of the PRF (stopping bleeding in a short time) is important for keeping graft particles together in the bone defects; so in such defects, this may reduce the necessity of using the membrane to stabilize graft particles[13].

Fig 12: Suture Removal

Fig 13: Six month follow up Radiograph

They suggested that these procedure can be used to save teeth with questionable prognosis and is also favourable for osseous healing It also aids in the regeneration of bone, periodontal ligament and cementum after periapical surgery[14].

Conclusion :

Based on the contemporary understanding of endodontic concepts for success and failure, assessment and subsequent treatment of apicoectomy procedures have greatly improved. Advances in apicoectomy armamentaria and materials have enabled endodontists to treat challenging cases with much greater efficacy. The surgical technique which has been applied in this case ie. Apicoectomy with PRF mixed bone graft, was appropriate and the results were satisfactory[15-16].

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