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Myriad Treatment Strategies for Mitigating Apicomarginal Defects - A Case Series

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ABSTRACT

Background: The endodontic periodontic continuum harbours dysbiotic microorganisms, leading to apicomarginal defects with inevitable breakdown of cortical bone. Guided tissue regeneration, using autograft, allograft, xenograft or alloplast coupled with resorbable membranes is a holistic way of achieving predictable regeneration.
Methods and Material: Two varied cases of apicomarginal defects were treated surgically. The first case had an endodontic treatment followed by regenerative surgery using autologous platelet rich fibrin and xenograft. The second case was of surgical intervention with an alloplast and bioresorbable membrane for defect elimination.
Results: Follow-up clinical and radiographic documentation of both cases shows how correct diagnosis and surgical treatment protocol can increase the longevity of compromised teeth.
Conclusions: Guided tissue regeneration with barrier membrane has demonstrated to provide favourable results and has gained wide acceptance in treating unpredictable apicomarginal defects.

Keywords: Endo Perio lesion, Guided Tissue Regeneration, Apicomarginal defect

INTRODUCTION

The dental pulp, as a sequel to caries and pulpal necrosis, undergoes pathologic changes, subsequently harbouring numerous microorganisms in the root canal system. The biological aim of endodontic treatment is to prevent or resolve apical periodontitis by controlled asepsis or through decontamination of the root canal system so as to create an environment in which periradicular healing can occur.[1] However, egress of such resident dysbiotic oral microbiota from infected root canals into the periradicular tissues, coupled with an aberrant inflammatory response evokes tissue destruction, resulting in an unremitting positive feedback loop of proteolysis, inflammation and continuous enrichment of these pathogens.[2] Concomitant involvement of pulp and periodontal tissues indicates that endo-perio lesions may exist as two dynamic independent origin processes which are advancing towards each other or have a cause-effect relationship.[3]

Initiation and progression of periapical pathosis accompanied by periodontal breakdown leads to resorption of cortical

plate.[4] The fashion in which this spread of infection occurs, leading to bone resorption, is not definitive but may lead to a formation of what is called as an apicomarginal defect, that can be defined as a localized bony defect characterized by the absence of buccal alveolar bone extending from original crestal bone to the apex of the tooth.[5] Numerous classification systems to categorise these lesion, provide prognosis and select case specific optimum treatment strategies have been described in literature by von Arx and Cochran (2001)[6], Dietrich et al. (2002)[7], Kim and Kratchman (2006)[8] and Enrique Merino (2008)[9]. In a few cases, despite corrective endodontic treatment or retreatment, periapical pathology seems to prevail. Therefore, periapical surgery may be pitched as the last therapeutic option prior to considering tooth extraction.[10] To accelerate periapical healing in compromised clinical situations, such as apicomarginal communication with a periodontal component, periradicular surgery, along with use of regeneration techniques, aims for complete restoration of the mucogingival complex architecture.[11] Osseous defect, created by the lesion and the exploratory surgical technique, have been successfully treated using guided tissue regeneration (GTR) with the use of barrier membranes and/or bone grafts to enhance new tissue formation.[12] Selective repopulation of the blood clot by the progenitor cells, originating from the periodontal ligament and endosteum, is achieved through placement of a physical barrier over an osseous defect that prevents oral epithelium and gingival connective tissue from growing into the bone defect.[13] Based on the same principle of Melcher's concept, this case series presents cases of apicomarginal defects treated holistically for achieving osseous regeneration of these defects using different biomaterials.

MATERIALS AND METHODS

CASE REPORT-1

A 42-year-old male patient, non smoker and systemically healthy, presented to the Dental Unit, Bhabha Atomic Research Centre and Hospital (BARCH) Mumbai, with complaints of dull pain and purulent discharge in relation to lower left molar tooth for 5 months. Patient reported no history of trauma to the tooth. Periodontal status of dentition was stable, no mobility, with a discharging sinus in relation to tooth #37 (Fig. 1). Tooth was non vital on electric pulp testing and did not elicit response to cold stimulus. According to the treatment protocols of Oh et al.[14], endodontic therapy with phase-I periodontal therapy was initiated. Intraoral periapical radiograph (IOPA) of involved tooth showed presence of furcation radiolucency, absence of periodontal ligament space and discontinuous lamina dura around mesial root was evident (Fig. 2). Root canal treatment was done with hand Ni-Ti instruments, accompanied with copious irrigation using 5.25% sodium hypochlorite between instrumentation (Fig. 3). Instructions for oral hygiene maintenance were given. After four weeks, periodontal reassessment was done, where it was found that gingival tissue appeared clinically healthy with no draining sinus tract, albeit with persistence of pocket. A decision to treat the tooth surgically was taken and periapical surgery was planned 3 months post completion of endodontic treatment. On the day of surgery, pre-procedural mouth rinse was achieved using 10ml of 0.2% undiluted chlorhexidine gluconate for 1 minute. Under local anaesthesia administration, a full thickness muco-periosteal flap was reflected, with debridement of granulomatous tissue and thorough scaling and root planing to allow complete visualization of the defect. Loss of the cortical plate was seen on the facial aspect of the tooth with a sliver of bone remaining. This was classified as a Dietrich Class I/2B defect[7] (Fig. 4). The surgical therapy involved GTR using demineralized bovine xenograft (Bio-oss, Geitlisch Pharma Zurich, Switzerland) and autologous platelet rich fibrin (PRF). As per Choukroun et al. protocol[15] PRF was prepared, intra-

operatively before flap repositioning. Intravenous blood was collected in two 10-mL sterile Vacutainer tubes without anticoagulant and centrifuged immediately by using a tabletop centrifugation machine (Remi Elektrotechnik Limited, Mumbai, India) at 3000 rpm for 10 minutes. PRF clot obtained in the middle of the tubes was separated and then squeezed between two tongue blades to obtain two membranes (Fig. 5). The first membrane was chopped into tiny pieces and mixed with the xenograft which was used to create a scaffold for repopulating cells (Fig. 6 & 7). The second PRF membrane was used to cover the grafted site (Fig. 8), then the flap was repositioned and tension free closure was done by using 3-0 braided black silk sutures (Ethicon, Johnson & Johnson, Aurangabad, India).

Fig. 1 First Visit with sinus

Fig. 2 Sinus tracing to mesial root of #37

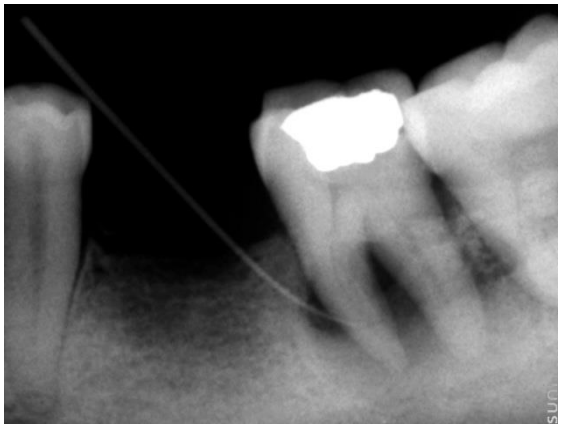


Fig. 3 Endodontic treatment completion

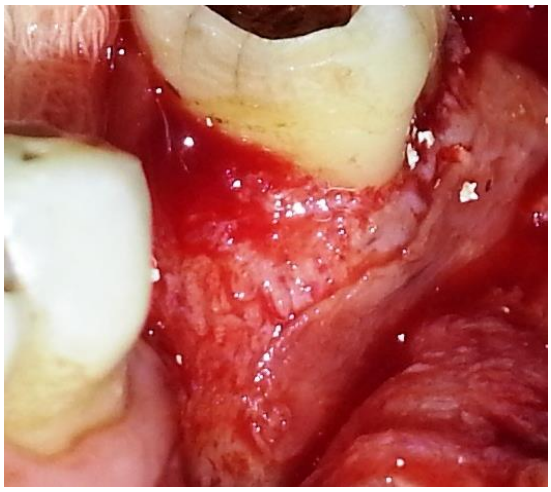
Fig. 4 Debridement of apico marginal defect

Fig. 5 Platelet Rich fibrin membranes

Fig. 6 PRF incorporated with xenograft

Fig. 7 Grafting of defect

Fig. 8 PRF membrane for closure



CASE REPORT-2

A 50-yr old male patient came with a swelling in upper left back region that gradually appeared over a span of three days, accompanied with pain on chewing. No contributory factors were found on anamnesis. On clinical examination, a probing depth of 9mm was recorded in relation to tooth #24. The tooth was found to be vital on electric pulp testing. Radiographic examination revealed presence of bone till middle third of the tooth and widened lamina dura (Fig. 9 &10). Antibiotics were prescribed and completion of scaling and root planing under local anaesthesia was performed. Post resolution of acute symptoms, the case was planned for surgical exploration after 4 weeks. Intra crevicular incisions were given to raise a full thickness flap post usage of pre procedural mouth rinse and local anaesthesia administration. An apicomarginal defect on the buccal aspect with an interfurcal component was exposed, classified as Deitrich Class I/1A (Fig. 11). Debrided defect was packed with alloplast (PerioGlas NovaBone Products LLC, India) wetted with blood from the surgical site, and a resorbable collagen membrane (Bio Gide, Geitlisch Pharma Zurich, Switzerland) was applied on buccal side circumscribing and extending 2-3 mm in coronal, apical, mesial and distal area around the defect (Fig. 12&13), After customizing the membrane to the defect size, it was stabilized by applying gentle digital pressure and the flap was re-approximated with 4-0 reverse cutting black silk suture (Ethicon, Johnson & Johnson, Aurangabad, India fig. 14).

Fig. 9 Probing pocket depth 9mm

Fig. 10 Periodontal bone loss #25

Fig. 11 Defect on debridement

Fig. 12 Grafting with alloplast

Fig. 13 Membrane extending beyond defect

Fig. 14 Suturing

POST OPERATIVE CARE

Antibiotics (500 mg amoxicillin 3 times daily), analgesics (50 mg diclofenac sodium every 12 hours) were prescribed for 5 days post-operatively. A postoperative mouthwash with 0.2% chlorhexidine gluconate was prescribed for plaque control for 2 weeks. Patients were requested to avoid brushing, flossing, and chewing in the treated area for periods of two weeks. Strict adherence to oral prophylaxis instructions was reinforced. All sutures were removed ten days after surgery, and healing was uneventful. The patients were recalled at 3 and 6 months, with follow-up demonstrating clinical and radiographic resolution (Fig. 15-18).

Fig. 15 Clinical Follow Up of Case I

Fig. 16 Radiographic 6 month Follow Up of Case I

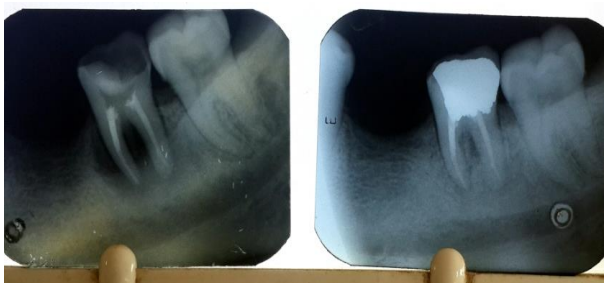
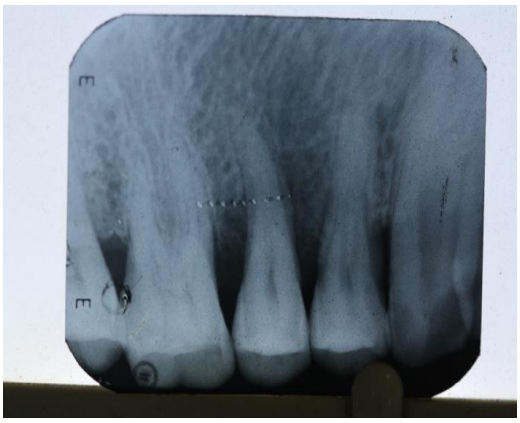


Fig. 17 Clinical Follow Up of Case II

Fig.18 Radiographic 6 month follow up of Case II



DISCUSSION

The intricacies of periodontal and endodontic diseases exist due to the variegated pathways of communication between the root canal system and the supporting periodontium, complicated with the ever present biofilm ecosystem. Discerning the propinquity that exists in the endo-perio continuum, it is critical to establish a correct diagnosis, setting precedence for meticulous treatment planning, that ultimately leads to better patient outcomes.[16] An untoward sequel of endo perio pathology is the apicomarginal defect that poses an authentic challenge to successful healing. Peri-radicular surgery is an established treatment option for the management of periradicular pathologies. The outcome of surgical intervention to treat such defects hinges on tooth related factors such as amount and location of bone loss. In general, the prognosis of peri-radicular surgery varies between 25% and 90%.[11]However, when bony destruction of the pathological process includes a localized loss of marginal bone, as in apico marginal defect, the prognosis for success is reported to be 27% and 37%. In growth of non-osteogenic tissues into the periradicular surgical site including formation of long junctional epithelium over the dehisced root surface is a grave post surgical concern that may contribute to poor post surgical prognosis.[17] Regenerative procedures, ranging from debridement approaches in the 19th century, bone grafts in the early 20th century, epithelial excision procedures, root conditioning, coronally positioned flaps, GTR and various amalgamations of techniques, have been introduced with the goal of improving the quality of healing replacing damaged or lost tissue by cells of the same healthy tissue.[6,18] To allow accelerated healing in compromised clinical situations like large periapical lesions, through-and-through lesions and lesions with a periodontal component as apicomarginal lesions, GTR with barrier membrane has demonstrated to provide favourable results and has gained wide acceptance in treating such unpredictable lesions.[7]

The simultaneous use of membranes and bone grafts seems to allow a more predictable healing than isolated techniques. Wang and Boyapati proposed the PASS principle to identify critical requirements for predictable bone regeneration: Primary wound closure, angiogenesis as a source of blood supply and undifferentiated mesenchymal cells, space maintenance, and stability of the wound.[19] Current literature shows a tendency towards the use of bone graft substitutes and tangible results are obtained in combining it with resorbable membrane for the treatment of apicomarginal defects.[10] Hence we used this approach to treat our cases. The supplemental use of PRF provided insular micro-environmental cues for proliferation

and differentiation of the desired stem cells, their attachment and migration, flooding the defect with growth factors mediating signals between adhesion molecules, as well as extracellular matrix and associated non-collagenous protein molecules.[20] The lack of any of these elements may result in tissue repair rather than regeneration. Besides being an osseoinductive material that enhances osteogenesis, the PRF membrane also acts as a barrier, accelerating wound closure and mucosal healing due to immune regulation and timely growth factor release.[21] For the second case, bioresorbable membrane and alloplastic graft was used as resorbable membranes score over non-resorbables in having less exposure and may remain in place despite exposure.[6,10]

Combined endo perio lesion has been shown to benefit from performing root canal treatment prior to regenerative periodontal treatment as pulpal infection may promote marginal epithelial downgrowth along a denuded dentin surface or external root resorption due to possible cementum removal during periodontal treatment. A waiting period of two to three months following endodontic treatment is warranted before commencing with surgical phase as this sequence of treatment allows sufficient time for initial tissue healing, better assessment of the periodontal condition, and less potential risk of introducing bacteria and their byproducts.[22]

CONCLUSION

One of the aims of the pre-operative assessment is to anticipate and minimize procedural or healing complications. Potential risks, difficulties and complications should be discussed with the patient as part of the process of obtaining informed consent before surgery. Furthermore, systemic conditions have to be taken into consideration because they have been shown to affect the prognosis of surgical treatment. Integration of correct endodontic and periodontic procedures, adhering to astute regenerative technique and post operative care definitely result in favourable outcomes for apicomarginal defects.

Declaration by Authors

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