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Combination of hydroxyapatite, platelet rich fibrin and amnion membrane as a novel therapeutic option in regenerative periapical endodontic surgery: Case series

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ABSTRACT

INTRODUCTION: Periapical surgery is the last resort in the arsenal of an endodontist to effectively deal with periapical lesions that result from necrosis of the pulp. Bone grafts, growth factors and membranes form an array of regenerative materials that influence the healing outcome of periapical surgery.

PRESENTATION OF CASE: The main purpose of the two cases reported here was to assess the potential benefits of a combination of bone graft, platelet-rich fibrin (PRF) and amnion membrane in terms of reduced post-operative discomfort, radiographic evidence of accelerated periapical bone healing and present a novel therapeutic option in the management of large periapical lesions. Two cases of radicular cysts were treated through a combined regenerative approach of Bio-Gen mix[®], PRF and amnion membrane. The patients were assessed for discomfort immediate post-operatively and after a week. The patients were recalled every month for the next 6 months for radiographic assessment of the periapical healing.

DISCUSSION: Literature is replete with articles that have substantiated the role of demineralized bone matrix comprising a mixture of cancellous and cortical bone graft particles in enhancing regeneration. To the best of our knowledge, there has been no evidence related to the application of a human placental membrane in periapical surgery. Hence, the rationale of using a combined approach of Bio-Gen mix[®], PRF and amnion membrane was to combine the individual advantages of these materials to enhance clinical and radiographic healing outcomes. Our present case reports provide an insight into this novel therapeutic option.

CONCLUSION: The results of this case series substantiate the credibility of using a combination of amnion membrane with a bone graft and PRF to enhance radiographic healing outcome with decreased post-operative discomfort and present a viable regenerative treatment modality in periapical surgery.

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1. Introduction

Long standing nonvital tooth usually results in a periapical pathology leading to bone destruction. The main objective of periapical surgery is to create an optimal environment for periradicular tissue healing. Though this can be accomplished by eliminating unhealthy tissues through the use of conventional surgical proce-

dures, it eventually results in connective tissue repair; a less desired outcome from the endodontist's point of view [1,2].

With the dawn of the new century, dentistry has made progress in leaps and bounds with introduction of new bone graft materials, which have, to a certain extent proved their caliber in periodontal regeneration with varied success in periapical surgery [3,4]. However, the final desired outcome and the key to true regeneration is the restoration or reconstitution of the lost periapical tissues which has been made possible with the introduction of regenerative therapies that utilized growth factors and barrier membranes [5,6].

Incorporation of biologically active molecules, particularly growth factors with platelets as the source has yielded promising

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results. This evinced clinical interest in platelet derived products and lead to the evolution of platelet concentrates; first generation platelet concentrates such as platelet – rich plasma (PRP) and second generation such as platelet- rich fibrin (PRF) [7].

Regeneration with new attachment became a reality with the introduction of guided tissue regeneration (GTR) technique and created interest in membranes, as these maintained space and formed a key to regeneration. Placement of a mechanical barrier such as a membrane, over an osseous defect can prevent proliferating oral epithelium and gingival connective tissue from growing into the defect. Proliferating cells with osteogenic potential can then repopulate the defect resulting in more predictable bone repair [8,9].

Literature is replete with articles which put forth the use of numerous forms of bone graft materials, but there is dearth of studies that documented the use of bone graft along with platelet-rich fibrin and barrier membranes in periapical surgeries [10–12]. Survey of the existing literature revealed that there was no documented evidence of the use of an amnion membrane along with PRF and bone graft as a combination in endodontic surgery to the best of our knowledge.

Hence, the aim of our present case series is to evaluate the post-operative discomfort and assess the regenerative potential in terms of radiographic evidence of accelerated periapical bone healing process by a combination of bone graft and PRF to fill the periapical osseous defects coupled with the use of an amnion membrane as a mechanical barrier. Institutional ethical approval has been obtained as well as informed consent has been taken from the participants prior to the study. Ref. No. for Ethical clearance from the institute 323/SSCDS/IRB-E/OS. This project is compliant with the PROCESS guidelines. [13]

Case report 1: A 38-year-old male patient presented to a private dental hospital with the complaint of pus discharge associated with a sinus tract in relation to 11. The patient revealed a history of trauma 3 years ago. Clinical examination revealed presence of an Ellis class 2 fracture without any discoloration. Patient's medical history was noncontributory.

Radiographic examination revealed the presence of large well-defined periapical radiolucency in relation to the apices of 11,12 and 13. The teeth were non responsive to thermal and electric tests. Teeth 11 and 13 exhibited tenderness on percussion test.

Case management was discussed with the patient with the primary treatment that comprised of a root canal treatment, but the necessity of a periapical surgery was explained and an informed consent was obtained.

Root canal treatment was performed in relation to all the effected teeth. Calcium hydroxide was used for frequent dressings as the intra canal medicament throughout the visits. Though an intra-canal medicament was used, weeping canals were evident at every subsequent visit. Hence, endodontic surgery was incorporated into the treatment plan apart from the root canal treatment to effectively treat the periapical lesion. Under proper isolation, the root canals were obturated using gutta percha (Dentsply Maillefer, Ballaigues, Switzerland) and AH plus sealer (Dentsply DeTrey GmbH, Philadelphia, USA) prior to the surgery. A radiograph was taken to assess the root canal treatment (Fig. 1).

Surgical intervention was facilitated using a crevicular incision aided with a unilateral posterior release after thorough anesthesia was attained using 2% lignocaine. Following the reflection of the full-thickness mucoperiosteal flap, a bony window was created through the cortical bone (Fig. 2). This facilitated access to the cystic lining and the granulation tissue, which was carefully curetted and sent for a biopsy. Residual inflammatory connective tissue was curetted, the root ends were resected. Root end cavities were prepared with low speed bur and filled with Glass-ionomer cement (GIC) as a retrograde filling material. The surgical area was thoroughly irrigated and isolated.



Fig. 1. Pre-surgical radiograph representing the root canal treatment in the effected teeth.

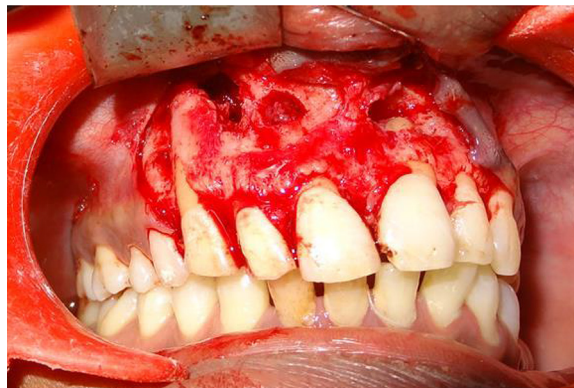


Fig. 2. Intra-operative picture of the lesion curetted and root end resection completed.

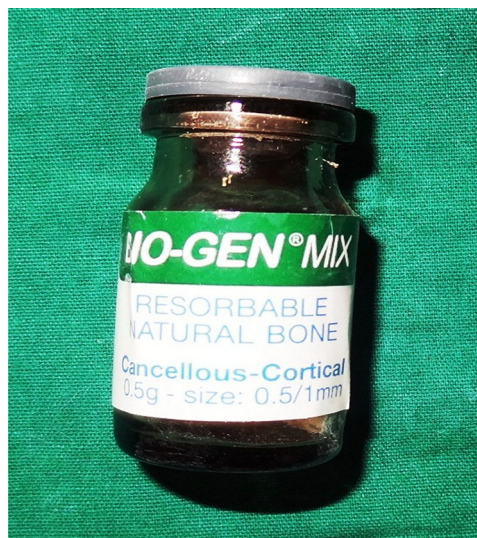


Fig. 3. Bio-Gen mix® bone graft material.

A xenograft bone graft material (derived from Horse femur bone) Bio-GenMix® (Bioteck Company, Italy) consisting of a mix of cancellous and cortical bone particles was used (Fig. 3). Platelet-rich fibrin (PRF) preparation protocol described by Choukroun et al.

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