

Endodontic Piezoelectric Surgery With Guided Bone Regeneration

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ABSTRACT

Background: To evaluate the efficacy of platelet rich plasma concentrate in the management of a circumferential defect associated with apicomarginal defect. Root canal treatment was performed on 21 followed by apicectomy. Apicomarginal defect was found on mesial aspect of 22. Thereby, Plasma Rich Fibrin and bone graft was placed over defect area as regenerative material. GTR was lastly adapted to the flap to prevent growth of epithelial tissue on the defect. Finally, sutures was placed followed by periodontal pack and patient was recalled after 4 months which reveals initiation of healing procedure. A successful healing was seen on the recall visits which suggests that PRF along with bone graft can be used in cases having circumferential defect.

Keywords: Periapical pathosis, Apicomarginal defect, Plasma rich fibrin, Bone graft, Guided tissue regeneration.

INTRODUCTION

Establishment of correct diagnosis is the first and foremost step for success of endodontic therapy. Normally it is not much difficult to establish diagnosis, but there are certain cases where the situation becomes more complicated, especially when there is co-existence of periodontal disease alongwith endodontic disease. Clinical endodontic diagnosis is chiefly based on the patient's history, clinical evaluation and the radiographic appearance of the lesion. Diagnosis of necrotic pulps are more difficult to establish as their symptoms and signs are poorly localized⁽¹⁾. Lesions which occur due to inflammatory products of both the periodontium and the pulpal tissues are collectively known as 'endo-perio lesion'. Endodontic-periodontal lesion is a clinical manifestation of the pathologic/inflammatory intercommunication between pulpal and periodontal tissues via open structures such as apical foramina, lateral, accessory canals, and

dentinal tubules⁽²⁾. Simon et al had given a classification of endodontic-periodontal lesions on the basis of the their pathologic origin, : primary endodontic lesions, primary endodontic lesions with secondary periodontic involvement, primary periodontic lesions, primary periodontic lesions with secondary endodontic involvement, or true combined lesions. Formulating a differential diagnosis among combined lesions has been challenging because most often clinicians do not have a complete history of the course of disease progression⁽³⁾. Retrograde periodontitis is a term which is used to describe pulpal infection which drain through the periodontal ligament space and give an appearance of periodontal destruction⁽⁴⁾. The pulp and periodontium are inter-related embryonically, anatomically, and functionally. Both are ectomesenchymal in origin, they proliferate from the dental papilla and follicle respectively. Embryonic development gives rise to anatomical connections between pulp and periodontium which remain throughout the life of the tooth⁽⁵⁾. In most

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cases of endo-perio lesions, clinical symptoms disappear after a successful endodontic therapy. However, simultaneous correction of periodontal defect becomes essential in these cases so as to prevent recurrence and to improve the functional status of the tooth⁽⁶⁾. Peri-radicular surgery is a common treatment option in endodontics for the management of non-healing periapical pathologies. The amount and location of bone adjacent to the root structures may affect the prognosis of peri-radicular surgery but it reduces significantly when bony destruction of the pathological process includes a localized loss of marginal bone⁽⁷⁾. Formation of long junctional epithelium over the dehiscenced root surface is suggested as the reason for this limited success⁽⁸⁾. Although apicomarginal defects are not very frequently found but when present gives significant challenge to healing. Guided tissue regeneration therapy was introduced in 1980s and from then onwards it has been widely used to regenerate lost periodontal structures. Guided tissue regeneration (GTR) therapy has now been widely implemented in the endodontic surgeries during the management of endo-perio lesions & apicomarginal defects has shown significantly higher success with use of GTR⁽⁹⁻¹²⁾. This may be because placement of a physical barrier over an osseous defect prevents proliferation of oral epithelium and gingival connective tissue into the bony defect, which thereby allows the cells of the periodontal ligament and endosteum to colonize the blood clot and regenerate the lost tissue⁽¹³⁾. This article presents successful management of an endodontic-periodontal combined lesion treated by GTR in conjunction with PRF.

CASE REPORT

A 22-year-old healthy female patient presented to Department of Conservative Dentistry & Endodontics with the chief complaint of pain in upper front region. She has a history of road traffic accident 4 years back. The medical history was noncontributory. On clinical examination, fracture as well as discoloration was present i.r.t 21 (Fig 1). There was no pain on percussion. Vitality testing of tooth 21 with electronic pulp tester as well as cold test revealed a negative response, confirming the diagnosis of a nonvital pulp. An intraoral periapical radiograph revealed a periapical lesion with an advanced bony defect extending up to the apical



Fig 1: Pre operative photograph.

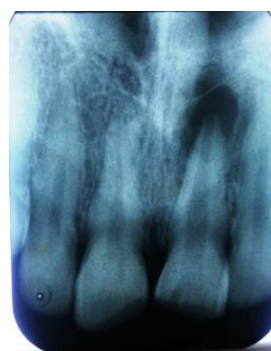


Fig 2: Pre operative Radiograph



Fig 3: Intracanal medicament placed.

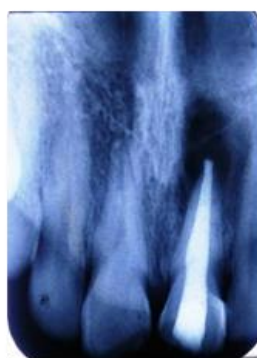


Fig 4: Obturation done.



Fig 5: Mucoperiosteal flap raised.



Fig 8: Apex prepared for retrograde filling.



Fig 6: Osteotomy done with Piezoelectric unit.



Fig 9: Apex with retrograde filling.



Fig 7: Apicoectomy done.



Fig 10: PRF placed in the bony defect.

third of the root of 21 (Fig 2). Diagnosis was pulp necrosis with periapical lesion i.r.t 21.

Endodontic access was prepared under rubber dam and the canal orifice explored. There was a single, straight canal without morphological alterations visible to the naked eye. Necrotic pulp tissue was extirpated, working length determined. Canal preparation was undertaken with K files, to size 40 apically and stepping back to size 80, with

frequent irrigation irrigated with 5.25% sodium hypochlorite. Long acting calcium hydroxide was placed as intracanal medicament for 2 months (Fig 3). However, the tooth showed no response of healing. The treatment plan was then shifted to surgical management. The root canal was obturated by warm vertical compaction of gutta-percha cones and AH plus sealer. The access cavity was sealed with composite (Fig 4) and the patient was



Fig 11: HA graft placed.

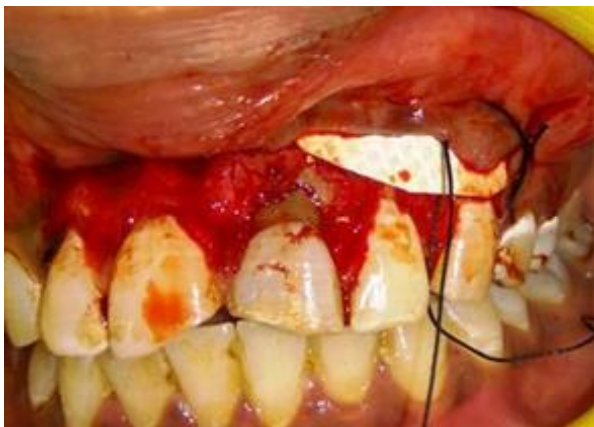


Fig 12: GTR membrane placed.



Fig 13: Repositioned and sutured flap.

reviewed after 1 week which revealed a stable situation. It was decided to correct the defect after one month of endodontic therapy, using autologous plasma rich fibrin along with an alloplastic bone graft substitute. Under local anaesthesia, a full thickness mucoperiosteal flap was raised from 12 to 21 to surgically open the site for debridement (Fig



Fig 14: One week postoperative photograph.

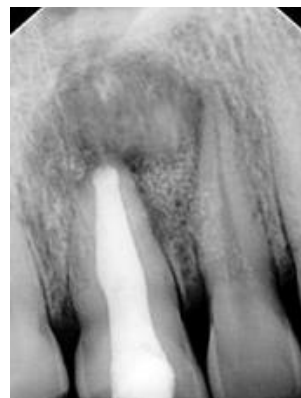


Fig 15: Four months postoperative radiograph

5). Debridement of granulomatous tissue and osteotomy of infected bone was done by piezoelectric unit. After debridement, a large circumferential defect was evident around the tooth 21 extending upto mesial aspect of root of 22 creating an apicomarginal defect (Fig 6). Apicectomy was done horizontal to the long axis of tooth, root end preparation was done followed by retrograde MTA filling (Fig 7-9). The PRF was then placed into the defect (Fig 10). Hydroxyapatite graft material was mixed with patient's blood and placed into the deep bony defect (Fig 11). To prevent growth of tissue in apico marginal defect GTR membrane was placed and adapted to the flap (Fig 12). The flap was re-adapted and stabilized with single interrupted suture and the wound site covered with non-eugenol periodontal dressing (Fig 13). Patient was advised to maintain proper oral hygiene. One week following surgery, the dressings and sutures were removed and radiographs were taken (Fig 14). The clinical appearance of the tooth had improved considerably at the time of evaluation after 4 months of treatment. Radiographs were also taken which showed a significant bony fill (Fig 15).

DISCUSSION

The occurrence of periapical pathosis in conjunction with periodontal breakdown possess a great challenge in its management as it is typically associated with a less favorable prognosis. Therefore, its treatment plan requires thorough understanding of wound healing processes of both endodontic as well as of periodontal complex. Kim et al reported that even with the aid of a microscope, the treatment success of the endodontic-periodontal combined lesion remained significantly lower than the treatment of the isolated endodontic lesions. Of 40 endodontic-periodontal combined lesions treated in their study, only 57% showed a complete healing with the re-establishment of the lamina dura⁽¹⁴⁾. Hence a strategic approach is needed in management of these cases. This case report presents a successfully treated periapical pathosis of 21 as well as apicomarginal defect of 22.

In these type of cases for complete elimination of lesion an evidence based approach is needed which can be done by proper history of patient and thorough knowledge of all routes of infection . A correct diagnosis always leads to a correct treatment plan. This case of a patient with an endo-perio lesion who was treated endodontically and followed by regenerative therapy to treat the circumferential defect, emphasizes the need for careful evaluation of complicated cases where conventional therapy fails⁽¹⁾.

There are many techniques and materials which are currently used to promote regeneration, but there still exists critical need for a therapy that can enhance the regeneration in a more predictable fashion⁽¹⁵⁾. PRF is mainly consist of high concentration of growth factors which are found in the platelets and which are required for wound healing. The PRF acts much like a fibrin bandage which accelerate the healing of wound by serving as a matrix. Amongst the various growth factors of PRF, the main factors which are believed to play important role in bone metabolism and potential regulation of cell proliferation are : platelet derived growth factor (PDGF), Transforming growth factor b (TGF b-1 & b-2), and insulin like growth factor

(IGF), epidermal growth factor, vascular endothelial factor, and fibroblast growth factors⁽¹⁶⁾.

Various authors in their experimental as well as their clinical study have concluded that in apicomarginal defect the application of GTR with an absorbable membrane enhances both the apical regeneration of bone and the regeneration of the connective tissue attachment⁽⁷⁾. Whether dehiscence is occurring naturally or pathologically its an important factor in determining the necessity of a membrane barrier. If dehiscence is naturally occurring, a fibrous connective tissue attachment is present between root surface and mucosa and a membrane barrier is not required, but if the case of dehiscence is pathologic, a membrane barrier is suggested to prevent apical migration of junctional epithelium along the root surfaces during periapical surgery⁽¹⁷⁾. In fact, Singh⁽¹⁾ and Raja et al⁽¹⁸⁾ had conducted their respective studies in which they highlighted the role of graft materials in the management of endodontic-periodontal lesions which further leads to significant radiographic bone fill. It has been postulated that the barrier facilitates healing by protecting the blood clot and ensuring its adherence to the root surface. To reach sufficient maturity so that it can withstand tissue manipulation, root surface-gingival flap interface takes several weeks⁽¹⁹⁾ and hence a barrier is must in these type of cases. These barriers allows undisturbed wound maturation and repair by preventing apical migration of the junctional epithelium⁽¹²⁾.

CONCLUSION

Within the limits of this study, this case report suggests that with proper case selection criteria, multiple regenerative procedures could be beneficial in treatment of periapical inflammatory lesion complicated with apicomarginal defect. The success of this case can be contributed to the following key factors:

- Appropriate diagnosis
- Effective endodontic therapy
- Placement of PRF and bone graft
- Periodontal maintenance
- Use of GTR to prevent epithelial growth over defect area

CONFLICT OF INTEREST

No potential conflict of interest relevant to this article was reported.

REFERENCES

1. Singh S. Management of an endo perio lesion in a maxillary canine using platelet-rich plasma concentrate and an alloplastic bone substitute. *Journal of Indian Society of Periodontology*. 2009 May;13(2):97.
2. Meng HX. Periodontic-endodontic lesions. *Ann Periodontol* 1999;4:84–90.
3. Oh SL, Fouad AF, Park SH. Treatment strategy for guided tissue regeneration in combined endodontic-periodontal lesions: case report and review. *Journal of endodontics*. 2009 Oct 31;35(10):1331-6.
4. Shenoy N, Shenoy A. Endo-perio lesions: Diagnosis and clinical considerations. *Indian J Dent Res* 2010;21:579-85.
5. Ten Cate AR. Oral histology development, structure and function. 4th ed. Mosby: 1994.
6. Solomon C, Chalfin H, Kellert M, Weseley P. The endodontic periodontal lesion: A rational approach to treatment. *J Am Dent Assoc*. 1995;126:473–9.
7. Goyal B, Tewari S, Duhan J, Sehgal PK. Comparative evaluation of platelet-rich plasma and guided tissue regeneration membrane in the healing of apicomarginal defects: a clinical study. *Journal of endodontics*. 2011 Jun;37(6):773.
8. Rankow HJ, Krasner PR. Endodontic applications of guided tissue regeneration in endodontic surgery. *J Endod* 1996;22:34–43.
9. Britain SK, Arx T, Schenk RK, Buser D, Nummikowski P, Cochran DL. The use of guided tissue regeneration principles in endodontic surgery for induced chronic periodontic-endodontic lesions: a clinical, radiographic, and histologic evaluation. *J Periodontol* 2005;76:450–60.
10. Marin-Botero ML, Dominguez-Mejia JS, Arismendi-Echavarria JA, Mesa-Jaramillo AL, Florez-Moreno GA, Tobon-Arroyave SI. Healing response of apicomarginal defects to two guided tissue regeneration techniques in periradicular surgery: a double-blind, randomized-clinical trial. *Int Endod J* 2006;39:368–77.
11. Tobon SI, Arismendi JA, Marin ML, Mesa AL, Valencia JA. Comparison between a conventional technique and two bone regeneration techniques in periradicular surgery. *Int Endod J* 2002;35:635–41.
12. Douthitt JC, Gutmann JL, Witherspoon DE. Histologic assessment of healing after the use of a bioresorbable membrane in the management of buccal bone loss concomitant with periradicular surgery. *J Endod* 2001;27:404–10.
13. Dahlin C, Linde A, Gottlow J, Nyman S. Healing of bone defects by guided tissue regeneration. *Plast Reconstr Surg* 1988;81:672–6.
14. Kim E, Song JS, Jung IY, Lee SJ, Kim S. Prospective clinical study evaluating endodontic microsurgery outcomes for cases with lesions of endodontic origin compared with cases with lesions of combined periodontal-endodontic origin. *J Endod* 2008;34:546–51.
15. Bashutsk JD, Wang Hom-lay. Periodontal and endodontic regeneration. *J Endod* 2009;35:321–8.
16. Mazumdar, Paromita, Sanjib Bhunia, and Debabrata Nag. "Treatment of Periapical Lesion with Platelet Rich Fibrin." (2013).
17. Oh S-L, Fouad AF, Park S-H. Treatment strategy for guided tissue regeneration in combined endodontic-periodontic lesions: case report and review. *J Endod* 2009;35:1331–6.
18. Raja S, Nath G, Emmadi P, Ramakrishnan, Ahathya. Treatment of an isolated furcation involved endodontically treated teeth: a case report. *J Conserv Dent* 2007;10: 129–33.
19. Markou N, Pepelassi E, Vavouraki H. Treatment of periodontal endosseous defects with platelet rich plasma alone or in combination with demineralized freeze- dried bone allograft: a comparative clinical trial. *J Periodontol* 2009;80:1911–9.