

Endodontic Surgical Procedure Performed Using A Novel Ozonated Disinfection Protocol And Autologous Platelet Concentrate As Graft- Case Report.

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Abstract

Platelet rich fibrin is widely used in stimulation and acceleration of soft tissue and bone healing because of local and continuous delivery of growth factors and proteins, mimicking the needs of the physiological wound healing. This case report serves to introduce a new disinfection protocol using ozonated distilled water along with PRF as graft material for surgical endodontic procedures.

The case report describes a case in which conventional endodontic therapy failed to resolve the problem and periapical root-end surgery was required. Periapical surgery was performed after required blood work and the surgical flap was raised and the lesion was exposed and debrided. The osteotomy site was irrigated with ozonated water and filled with platelet rich fibrin as the graft and the flap was repositioned and sutures were placed. Follow up was done at end of 1, 3 and 6 months. At the end it was concluded that PRF made of intact platelets and fibrin in the absence of exogenous thrombin, yields an ideal scaffold for use in tissue repair, which is catalysed by the ozonated disinfection.

Keywords: Platelet Rich Fibrin, Ozonated Distilled Water, Apicoectomy, New Irrigation Protocol, Autologous Graft, Root-end Resection, Soft tissue healing accelerator, MTA, Exogenous Thrombin, Unconventional therapy.

Introduction

The success of endodontic therapy depends on complete periapical repair and regeneration. Most of the times teeth with periapical lesions heal satisfactorily after non-surgical endodontic intervention. Abramovitz et al. reported that treatment of 24.5% of the cases was impossible without surgical therapy^[1].

According to the Appropriateness of Care and Quality Assurance Guidelines of the American Association of Endodontists (AAE), surgical endodontics should be undertaken only when teeth cannot be treated appropriately by nonsurgical means.^[2]

The two important components of a successful surgical endodontic procedure - according to European Society of Endodontology, 2006 are:

1. Complete debridement and disinfection of the lesion with its granulation tissue.

2.Placement of an appropriate graft material into the osteotomy site to aid in faster bone and periapical tissue healing.^[3]

It was for the fulfilment of these purposes that the forthcoming case-report aimed to utilise a novel ozonated water irrigation protocol along with autologous platelet concentrate as graft.

Platelet-rich fibrin (PRF) described by Choukroun et al.^[4] is a second-generation platelet concentrate which contains platelets and growth factors in the form of fibrin membranes prepared from the patient's own blood free of any anticoagulant or other artificial biochemical modifications. The PRF clot forms a strong natural fibrin matrix, which concentrates almost all the platelets and growth factors of the blood harvest^[5,6] and shows a complex architecture as a healing matrix with unique mechanical properties which makes it distinct from other platelet concentrates. PRF enhances wound healing and regeneration and several studies show rapid and accelerated wound healing with the use of PRF than without it^[7,8].

PRF is superior to other platelet concentrates like PRP due to its ease and inexpensive method of preparation and also it does not need any addition of exogenous compounds like bovine thrombin and calcium chloride.

While PRF eliminated the need for artificial bone graft, the use of ozonated water was crucial as it was not only non toxic but at the same time provided strong oxidising effect on the bacterial cell walls thus aiding the elimination of pathologic micro-organisms.

Unlike many of the irrigants which have strong tissue dissolving capacity and are contraindicated for use in periapical surgeries,ozonated water proved to be a much tolerated and non irritant irrigant.

However, the biggest challenge was to set-up a defined irrigation protocol, which would yield maximum benefit whilst aiding the periapex to receive PRF as the graft.

Thus, this case report is a pioneering report wherein a case of periapical lesion, which was unresponsive to non surgical root canal therapy, was treated surgically with PRF as graft and a Novel Ozonated Distilled water Irrigation Protocol.

Case Report

A 20 year old male patient reported to the Department Of Conservative Dentistry And Endodontics,Sds, Sharda University, Greater Noida(figure-1).

Chief Complaint of the patient was pain and discolouration wrt 11.

History of dental treatment revealed that the patient had undergone root canal therapy two months back and reported continuous pain ever since.

Clinical examination:- upon clinical examination 11 revealed severe tenderness to percussion and coronal discolouration.

Radiographic Examination:- IOPA wrt 11 revealed previously root canal treated 11 with obturation material extending 2mm beyond the radiographic apex and a periapical radiolucency indicating chronic periapical abscess.(figure-2).

After the radiographic examination the patient was sent for CBCT analysis to record and locate the exact shape,size and extent of the lesion as well as the periapically extruded obturation material. Cone Beam Computed Tomography (CBCT) was done with Carestream CS 9300 with selected FOV of 5 x 5 at 84kVp and exposure time of 20 seconds. Resolution of the scan was 180µm and thickness of the cross section was 1mm. The report revealed A solitary ovoid osteolytic lesion seen in anterior region of right maxilla in the periapical region of #11. The lesion measured 8.1mm x 7.7mm in its

greatest dimension. The dimensions of the lesion were bucco-palatally (7.7mm), supero-inferiorly (8.1mm) and mesio-distally (6.8mm). Thus the final CBCT Impression was of that of a Radicular Cyst #11with faulty obturation.(figure-2).Once a non-healing lesion was established, complete blood work of the patient was done,begining from Complete Blood Count, Clotting Time, Bleeding Time, and Prothrombin Time. Once the blood work came back satisfactory, the decision to take case up surgically was made.

The procedure decided upon was that of Apicoectomy involving, raising a full thickness mucoperiosteal flap wrt 11 and 12(figure-3), followed by formation of osteotic cavity(figure-4) and locating the defect, once the defect was located, removal of the extruded obturation material (figure-5) along with root end resection was done(figure-6), followed by irrigation of the osteotomy site with ozonated distilled water and placement of Mineral Trioxide Aggregate(MTA) as retrograde filling material and PRF as graft (figure-9) and finally re-approximating the flap and placing of sutures was done (figure-10).

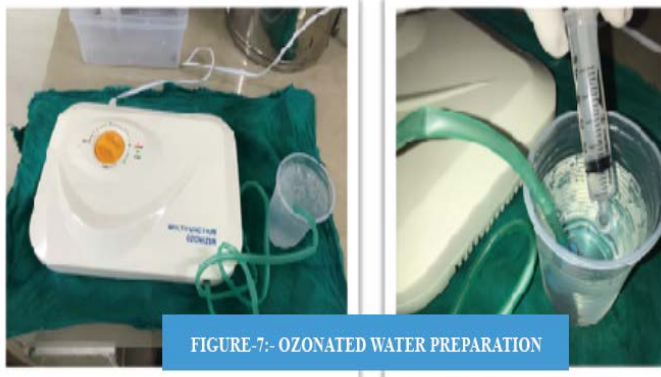
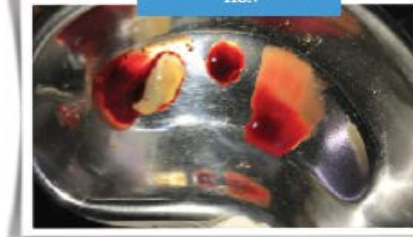
Preparation of aqueous ozone was done by treating distilled water with gaseous ozone by using an ozone generator (ozonizer; LS F9) having 4mg/L/Hr output (figure-7). The ozonated distilled water was used to irrigate the lesion at the rate of 5ml for 30secs and this cycle was repeated 4 times after the removal of granulation tissue and before the placement of retrograde filling material.

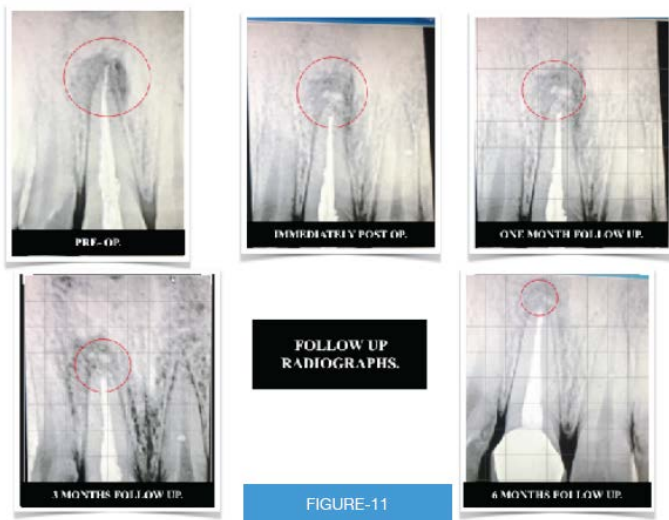
PRF preparation required an adequate table centrifuge and collection kit including: A 18 gauge needle and 10 ml blood collection tubes.A sample of blood was collected from patient without anticoagulant in 10 ml tubes which were immediately centrifuged at a rate of 3000 rpm for 10 min. After centrifugation, the resultant product consisted of three layers. The topmost layer consisting of

acellular PPP (platelet poor plasma), PRF clot in the middle and RBCs at the bottom of the test tube. The fibrin clot obtained after centrifugation was removed from the tube and the attached red blood cells were scraped off from it and discarded (figure-8). This fibrin clot obtained was used for as the graft for placement in the osteotic cavity.

Upon completion of the surgical procedure, the patient was given post-op instructions and recalled the next for immediate follow-up followed by a recall schedule at 1,3 and 6 months (figure-11). At the end of 2 months of successful follow up the patient was given a Porcelain Fused To Metal Crown wrt 11 to overcome the concern of poor aesthetics.







Discussion

The aim of endodontic treatment is to disinfect the pulp space (reducing the microbial load and removing necrotic tissue) followed by sealing this space to prevent recontamination. Success rates of 47–97% for primary orthograde root canal treatment have been reported,^[9] with failures more likely to be associated with pre-operative presence of periapical radiolucency, root fillings with voids, root fillings more than 2mm short of the radiographic apex, and unsatisfactory coronal restoration.^[10] A wide range of success rates for surgical endodontics has been reported (44–95%).^[11]

Systematic reviews comparing the outcome of non-surgical root canal re-treatment and surgical endodontics^[12,13] reveal that, to date, there have been only two randomised controlled trials.^[14,11] The data from this limited evidence suggests that although surgery may offer a more favourable outcome in the short term, non-surgical retreatment offers a more favourable long-term outcome.^[12,13] In order to attain a successful outcome, an accurate diagnosis of the aetiology of persistent pathology associated with a root-canal treated tooth and appropriate treatment planning is essential. Dodwad et al. compared the effect of oral irrigation with ozonated water, 0.2% Chlorhexidine and 10% Povidone iodine in patients with

chronic periodontitis and concluded that local ozone application served as a better and more potent atraumatic, antimicrobial agent to treat periodontal diseases.^[15]

Hems and Gulabivala, evaluated the potential of both gasiform and aqueous forms of ozone as an anti-bacterial agent using *Enterococcus faecalis* as test species and concluded that ozone in solutions had greater antibacterial effect against *Enterococcus faecalis*.^[16] Zan et al. investigated the antibacterial effect of 4 mg/L aqueous ozone against *E. faecalis* for 120 s and concluded that aqueous ozone showed remarkable antibacterial effect.^[17] Aqueous ozone has also shown to have a hydration accelerator effect on the setting of MTA which was used as the retrograde filling material in both the cases; due to the presence of the oxygen free radical which is released by ozonated water and penetrates the pores of the Portland cement and accelerates the hydration of silicates, leading to faster crystallisation and shorter setting time.^[18] PRF consists of a fibrin matrix polymerized in a tetra molecular structure, with incorporation of Cytokines, platelet, leucocytes and circulating stem cells along with various growth factors such as PDGF, TGF- β , VEGF, ILGF, EGF. Developed in France by Choukroun et al. in 2001, the PRF production protocol attempts to accumulate platelets and released cytokines in a fibrin clot which is even more coherent than natural fibrin clots.^[4] Del Corso M et al (2009):-stated that presence of cytokines within the fibrin mesh allows for their increased survival and progressive release over time (7-11 days); The cytokines are thus maintained available in situ when the cells start cicatricial matrix remodelling i.e. injured site reconstruction.^[19]

Conclusion

this case report showed promising results with the usage of OZONATED DISTILLED WATER and PRF. The six month follow up result in the case showed significant

decrease in the size of the lesion and progressive bone formation. Thus, indicating that the novel disinfection protocol and graft material, used together for the first time in these cases, had a synergistic effect on surgical management of periapical lesions of endodontic origin.

This case report is a pioneer in promoting a new and effective protocol for endodontic surgical procedures and it is important to conduct further research and studies in this direction to establish the same.

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