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CASE STUDY

TREATMENT OF INTRA-BONY DEFECT USING NOVEL GROWTH FACTOR

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ABSTRACT

In this report, we attempt a treatment tomanage and save a manidbular molar with angular defect with an endodontic treatment performed on it nine months prior. Intrabony defects are periodontal defects within the bone surround by one, two or three bony walls or a combination thereof. However, there are multiple treatment protocols available to treat the defect. Herein,the tooth is treated using platelet-derived growth factor and hydroxyapatite crystals as bone graft. It is observed that the induced treatment has a synergistic effect and encourages the regeneration and repair of the molar.

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INTRODUCTION

According to the glossary of terms of the American Academy of Periodontology, an intra-bony defect is defined as a "periodontal defect within the bone surrounded by one, two or three bony walls or a combination thereof". There are multipletreatmentsavailable to treat the bone defect. In this case report, we have used hydroxyapatite crystals as bone graft along with a growth factor i.e. platelet-derived growth factor (PDGF). Growth factors (GFs) have long been believed to have the potential to accelerate the healing process, and consequently, enhance tissue regeneration in challenging clinical scenarios. PDGF is the most extensively studied growth factor and has broad wound healing activities in hard and soft tissues. In the late 1980's, Lynch et al., first identified that PDGF promotes regeneration of periodontal tissues including bone, cementum and periodontal ligamentin an animal study (Lynch, 1989). While growth factor proteins have been shown to be potent stimulators of wound repair, the ability to utilize concentrated forms of these proteins contained within blood platelets for routine oral surgical treatment was not introduced until 1998, when Marx et al. proposed the use of autologous platelet concentrates (Marx, 1998). The preparation of platelet concentrates consists of isolating the platelets naturally present in whole autologous blood by a selective process of centrifugation, and subsequently activating them to release their growth factor content, including super-physiologic concentrations of PDGF, TGF-β and IGF-I, among others. An early human clinical trial to evaluate the effect of recombinant human platelet derived growth factor/insulin-like growth factor (rhPDGF/IGF) treatment applied to osseous periodontal defects was reported by Howell et al. (Howell, 1977). The experimental sites received direct application of the GFs contained in a methylcellulose matrix to improve retention. A statistically significant increase in alveolar bone formation was seen in the growth factor treated sites at nine months post-operatively, as compared to untreated control sites. Average bone height for the rhPDGF/IGF group was 2.08 mm and 43.2 % osseous defect fill was achieved, as compared to 0.75 mm new bone height and 18.5% fill in the control sites.Based on the principles of tissue engineering, the use of a growth factor enhanced matrix for periodontal regeneration consisting of rhPDGF-BB in combination with an osteoconductive scaffold (i.e., autograft, allograft, xenograft, or a synthetic matrix, such as beta-TCP) was proposed (Stephan, 2000). The principleunderlying this approach is that PDGF stimulates angiogenesis, promotes cell migration into the bone defect from the surrounding tissue margins, and upregulates cell proliferation (Hollinge, 2008). The matrix, in addition to its role as a growth factor delivery vehicle, provides mechanical support for migrating cells and contributes to the formation of new bone, cementum and/or periodontal ligament. Autogenous bone is regarded as the gold standard for bone graft materials as it provides the three elements necessary

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to generate and maintain bone: scaffolding for osteoconduction, growth factors for osteoinduction, and progenitor cells for osteogenesis (Vaccaro, 2002). Various alternate grafting materials have been advocated to fill bone defects or stimulate bone healing. These are generally grouped as naturally occurring or artificially bone substitutes. Hydroxyapatite is one such bone substitute, cheap and easily available. Hydroxyapatite has the property of osteoconduction only (Johnson, 1996 and Wolford, 1999). Hence mixing the GF with the bone graft will provide us with the added benefit of regeneration and repair.

Case Report

A 55 year old patient reported to the department of periodontics with a in lower left region of the jaw since 3 months. Patient gave a dental history of root canal treatment performed nine months wrt to 36 There was no relevant medical history. After an intraoral examination, 36 was restored using amalgam;however, there was no prosthesis present. The pocket probing depth was 6mm on the distal side of36 when measured with UNC-15 probe. The tooth was grade 2 mobile and pain on percussion was positive. Stains (intrinsic) and calculus were present.

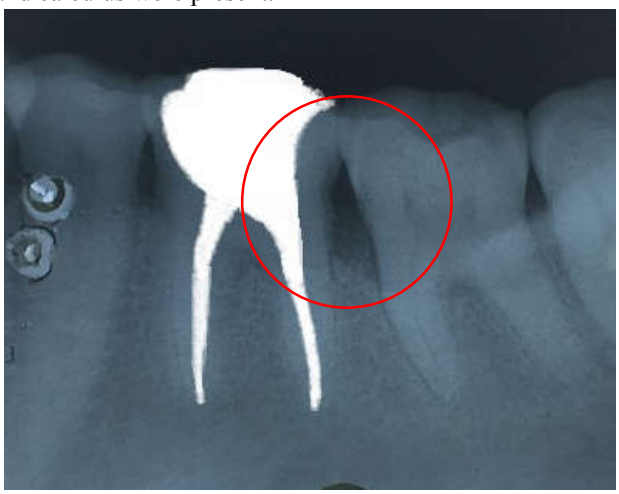

Figure 1. Radiograph showing vertical bone loss

Figure 2. Pocket probing depth measured using UNC-15 probe

Subsequently, a treatment protocol was carried out taking into consideration that the tooth was already endodontically treated and an angular bone defect was seen on the distal side of 36.
Treatment plan

- Scaling and root planning was done,after which the patient was informed to maintain oral hygiene.
- If the pocket persisted after four weeks of scaling, it was concluded that an open flap debridement would be carried out along with guided tissue regeneration.

However, after four weeks, there was no significant difference seen upon a clinical examination. Hence a periodontal regenerative procedure was carried out using hydroxyapatite crystals and PDGF(Plermin gel)

Surgical protocol

After taking care of asepsis and sterilization the surgery was planned. The area selected for surgery was anesthetized using lidocaine hydrochloride 2% with adrenaline 1:80,000. A full thickness flap was raised at the buccal aspect following intra-crevicular incision extending from distal aspect of 35 to 37. Subsequently, the area was thoroughly debrided and the granulation tissues were removed along with the local irritants such as calculus.

Figure 3.

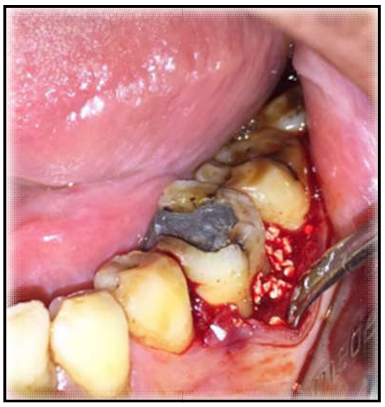

Figure 4. Post open flap debridement, the hydroxyapatite crystals are mixed with PDGF and placed into the defect

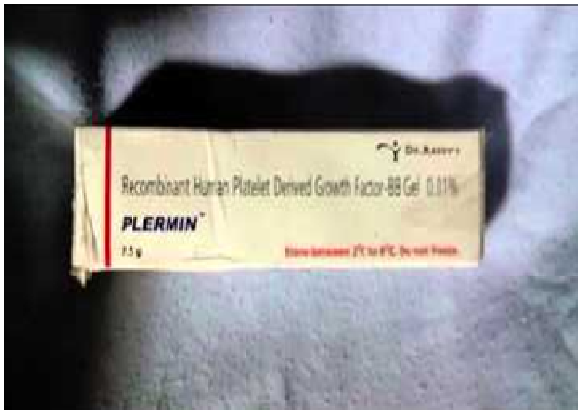

Figure 5. Commercially available PDGF

Hydroxyapatite crystals were mixed withPDGF gel and placed in the distal aspect of the tooth 36 post which it was sutured.

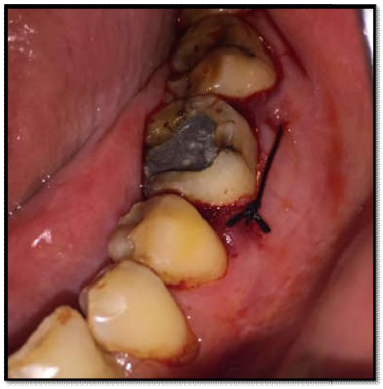

Figure 6. The area is sutured

The patient was then given the standard post-operative instructions. The following medications were prescribed:

- Cap Mox 500 mg 3 times a day for 5 days
- Tab Enzoflam 3 times a day for 3 days.

Suture was removed after seven days followed by placement of prosthesis with respect to 36. The patient was recalled after tenmonths and a radiograph was taken.

Figure 7. Post-op radiograph after ten months

A significant difference was observed on the distal aspect of 36.

DISCUSSION

Bone substitute materials are primarily applied to serve as a filler and scaffold to facilitate bone formation and wound healing. Hydroxyapatite crystals have good advantage as biomaterials as they are extremely biocompatible and do notreact with foreign bodies. As a result, when the bone graft along with PDGF is mixed it is easy to manipulate and the mix is conveniently placed in the defect site. When the mixture is placed into the site, it comes in contact with the fresh bone and blood without intervening with the fibrous tissue. The use of PDGF and hydroxyapatite crystals have been proven beneficial to the patient.

Conclusion

PDGF based growth factors along with bone grafts have a synergistic effect and help with the recovery of intra-bony defects.

This case report, performed on a 55 year old patient with regular follow-ups proves the importance of growth factors in such treatments. To conclude,weobserve that proper diagnosis, followed by removal of etiological factors and utilizing the combined treatment modalities will restore health and function of the teeth with severe attachment loss.

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