Management of intrabony defect with Osseograft and with membrane

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Abstract

Deep intraosseous defects represent a major challenge for the clinician. Sites with intraosseous lesions are at higher risk of disease progression. Bony lesions may not be readily accessible to periodontal debridement, requiring access flap surgery alone or in association with bone-resective or regenerative procedures. The use of bone substitutes in combination with the barrier effect has been reported to enhance the regenerative clinical outcome, by providing a better support to the membrane or by adding the potential osteoinductive properties of the grafting material to the barrier effect. This article reports two cases-one where demineralised bone matrix alone and the other where DBM and GTR membrane was used to achieve regeneration

Introduction

Grafting of biomaterials and application of biological agents have been used with varying success in the past decades to accomplish the reconstruction of lost attachment apparatus in deep intraosseous defects. A number of materials and procedures have been used to achieve periodontal regeneration including various types of bone substitutes for grafting and barrier materials for Guided Tissue Regeneration. Data from various controlled clinical trials have demonstrated that some of the available grafting procedures may result in healing that can be termed 'periodontal regeneration' i.e. formation of new cementum, bone and periodontal ligament.

Demineralized bone matrix (DBM) allografts, and guided tissue regeneration (GTR) used alone or in combination are some of the therapeutic approaches applied for these purposes.[1,2] GTR is currently used for the treatment of periodontal intrabony defects,[3] class II furcations defects,[4] gingival recession defects,[5] as well as augmentation of atrophic alveolar ridges and alveolar bone defects associated with dental implants.[6] The application of GTR implies that the lesion becomes colonized by cells with the ability to regenerate the particular type of tissue that has been lost.

Demineralized bone matrix (DMBM; Osseograft, Chennai, India) is a bone inductive sterile bioresorbable xenograft prepared from bovine cortical bone samples, resulting in nonimmunogenic flowable particles of approximately 250 μm that are completely replaced by host bone in 4–24 weeks. Studies have indicated that low-molecular-weight, acid-insoluble proteins contained in small quantities in the matrix may act as modulators of the bone induction process. These proteins are known as *bone morphogenetic proteins (BMPs)*.[7,8] Healiguide is a resorbable collagen membrane (Chennai, India).

Discussed below are two cases of intraosseous defects treated with DBM and another with GTR both showing good results.

Case report-1

A 27 year old male reported with complaint of generalized bleeding gums. Patient gave no relevant medical history. His mother was reported to have lost her teeth at an early age. On examination there was deep pockets (7-8mm) associated with intra-bony pockets with respect to lower first molars Based on history, clinical and radiographic findings, a diagnosis of localized aggressive periodontitis was made. The intrabony defect associated with 46, with probing pocket depth of 8mm, (Fig-1,2) was treated by flap surgery with bone graft (Osseo graft).

Presurgical Protocol

The initial preparation phase for treatment consisted of oral hygiene instructions, scaling and root planing. Occlusal therapy and re-evaluation was done 4 weeks after the completion of this first phase of therapy. The probing measurements were done with a customized acrylic stent that was used as a fixed reference point to

Case-1

Fig 1. Preop probing depth of 8mm on mesial line angle of 46

Fig 2. After debridement, intra-bony defect of 5mm is seen

Fig 3. Bone defect is filled with Osseograft

Fig 4. Interrupted sutures in place

Fig 5. 6-months Post-op. Probing depth-4 mm

Fig 6a. Preop IOPA radiograph

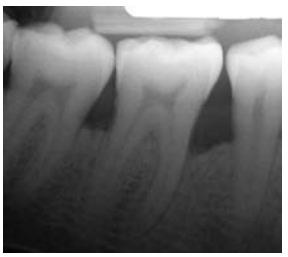

Fig 6b. 6-months post-op IOPA showing bone fill

minimize distortion. The stent was grooved in the occlusal apical direction with a tapered bur so that the UNC-15 probe was placed at the same position for each successive measurement. One site representing the same deepest point of the defect was included: the fixed reference point (FRP) to the base of the pocket (BP) and the fixed reference point to the cementoenamel junction (CEJ). All the measurements were made by 1 examiner, using a periodontal probe, before and after surgery for test and control sites at baseline, 3 months and 6 months.

Pocket depth and clinical attachment level were calculated from the clinical measurements:

Pocket depth = (FRP to BP) – (FRP to gingival margin [GM])

Clinical attachment level = (FRP to BP) – (FRP to CEJ)

Surgical Protocol

The surgical procedure was done under local anesthesia (2% lidocaine with epinephrine 1:100,000). Intrasulcular incisions were made and full thickness flaps were raised. Debridement and root planing were done. Osseograft was mixed with 4 to 6 drops of saline in a sterile dappen dish and to form a paste-like consistency. Graft material was condensed in the 3-walled defect until the intrabony was completely filled (Fig. 3). The soft-tissue flap was repositioned at the original level and closed with interrupted direct-loop sutures of silk to achieve a tension-free primary closure (Fig. 4). The surgical site was protected with a periodontal dressing. Post-operative antibiotics and analgesics were administered along with 0.12% Chlorhexidine rinse twice daily for 14 days to help control plaque. Also patient was advised to avoid chewing in area of the surgery for 2-week period and told not to brush at the surgical site or manipulate it for 10 days. After 10 days, the dressing and sutures were removed. Recall appointments were scheduled at 3 and 6 months after the surgery for soft-tissue evaluation and plaque control. Radiographic evaluation and clinical variables were recorded at 6 months. (Fig-5, 6)

Result

Clinical healing was uneventful with no signs of adverse tissue reactions indicating that the implant material fulfilled the demands of biocompatibility. Patient showed excellent maintenance at the post-operative evaluation. The treated site showed probing depth reduction of 3mm and CAL gain of 3mm at 6-month post-evaluation. Radiograph showed considerable bone fill at the end of 6 months (Fig. 6).

Case -2

Fig 7. Preop probing depth of 7mm on distal line angle of 46

Fig 8. After debridement, intra-bony defect on distal of 46 is seen

Fig 9. Healiguide membrane is cut to the defect size

Fig 10. Healiguide membrane is adapted to the defect.

Fig 11. Interrupted sutures in place

Fig 12. 6-months Post-op. Probing depth-5 mm

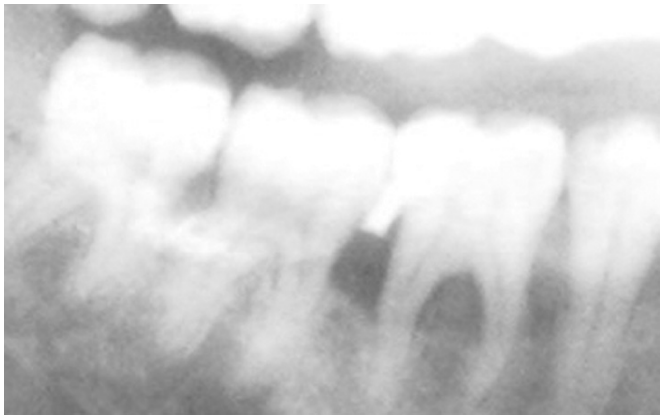

Fig 13a. Pre-op radiograph

Fig 13b. 6-month post-op radiograph

Case report-2

A 32-year old female patient reported with chief complaint of bleeding from the gums noticed since about 5-6 months. There was no relevant medical history or history of any dental treatment in the past. Examination, revealed generalized deep pockets 6-8 mm deep, deep intraosseous defect of 7mm with respect to distal of 46. (Figure -7) Based on the history, clinical and radiographic findings, a diagnosis of chronic generalized periodontitis was made.

Surgical Protocol

The same presurgical and surgical protocol was followed as above. After achieving anesthesia, full thickness flap was raised. Debridement and root planing were done dressing with hand instruments (Gracey Curettes). Osseograft mixed with saline was condensed in the 2-walled intra-bony defect on distal aspect of 46 (fig-8) until the defect was completely filled. Healiguide barrier membrane was then adapted over the grafted site. The soft-tissue flap was repositioned at the original

level and closed with interrupted direct-loop sutures of silk to achieve a tension-free primary closure. The surgical site was protected with a periodontal dressing. Post–surgical instructions were given; antibiotics and analgesics were administered along with 0.2% Chlorhexidine rinse twice daily for 14 days to help control plaque. After 10 days, the dressing, sutures were removed. Recall appointments were scheduled at 3 and 6 months after the surgery for soft-tissue evaluation and plaque control. Radiographic evaluation and clinical variables were recorded at 6 months.

Result

No signs of adverse tissue reaction were observed and healing was uneventful indicating that the combination of both implant materials fulfilled the demands of biocompatibility. Patient showed excellent maintenance at the post-operative evaluation. A probing depth reduction of 3mm and CAL gain of 3 mm was observed (Fig. 12). Radiograph showed bone fill at the end of 6 months (Fig. 13).

Discussion

Autogenous bone grafts are the undisputed 'gold standard' in bone grafting, considered far superior to any type of bone grafts; However with the more widespread application of bone grafting as in replacement of large bony defects caused due to trauma or wide resection of tumors, large amounts of bone are required. Procuring autografts requires an additional surgical procedure on the same patient increasing the risk of infection, increasing blood loss, lengthening the operating time and leading to possible increased morbidity. Consequently extensive research and various methods of preparing preserved allografts and xenografts have been explored.[9]

Osseograft consists of demineralised bone matrix that is prepared from bovine cortical bone samples. Bovine derived xenograft has been reported to possess good osteoconductive properties and is well integrated into bone tissue.[10] The material is very well tolerated and, until now, no allergic reactions related to the material have been reported.[11] The clinical results following treatment of intra-bony defects with Bovine Derived Xenograft were comparable with those obtained with demineralized freeze dried bone allograft (DFDBA).[12] The risk of bovine spongiform encephalopathy spreading through the graft is several orders of magnitude less than the risk of death due to lightning, tornadoes and other remote events, given the strict protocols followed in sourcing and processing of raw bovine bone for human use.[13]

Filling the defect with the bone material facilitated placement of the barrier and also prevented collapse of the barrier into the defect in Case-2. The uneventful clinical healing with no signs of adverse tissue reactions indicates that the combination of the two implant materials fulfills the demands of biocompatibility.

Sampath and Reddi[14] reported that subcutaneous implantation of coarse powders (74–420 μm) of DMBM results in local differentiation of bone. Once the Osseograft is placed in the osseous defect, a sequential differentiation of mesenchymal-type cell occurs to form cartilage and bone. There are 4 stages of cell differentiation and bone formation. Stage 1 includes mesenchymal-cell migration into the vascular spaces of matrix within 2 days. In stage 2, mesenchymal cells differentiate into giant cells and chondrocytes between day 2 and 18. In stage 3, the poorly vascularized areas of matrix show cartilage formation at day 8 and 20, and from day 10 to 20 woven bone develops in the vascularized areas of matrix. During stage 4, bone formation occurs between day 20 and 30.[15]

Guided tissue regeneration (GTR), techniques has been proven histologically in animals and humans[16,17] that substantial gain of new attachment, i.e., newly formed periodontal ligament fibers inserting in new cementum will be obtained on roots deprived of periodontal ligament and cementum. Considerable CAL gain has been demonstrated in case reports following bioresorbable barrier treatment of two- and three-wall intrabony defects.[18,19]

The properties of the collagen barrier as reported by Chen et al.(1995)[20] are the following: (1) It is either incorporated into the healing connective tissues or degraded by macrophages in 6–8 weeks. (2) It is chemotactic to fibroblasts from periodontal ligament and gingivae. (3) It creates a thrombogenic surface that stimulates platelet attachment, producing hemostasis. In addition, collagen materials possess additional advantages including weak immunogenicity, ease of manipulation and the ability to augment tissue thickness by providing a collagenous scaffold.

Using graft material in conjunction with GTR may prevent membrane collapse and promote bone formation. The combined treatment with GTR and implantation of DBM was shown to be effective in producing bone regeneration in calvarial defects,[21] and in alveolar bone defects associated with dental implants in dogs and humans.[22] However, other investigators using GTR and DBM implantation for bone regeneration in various types of peri-implant defects in dogs and in extraction sites in humans failed to demonstrate any added effect of the DBM implantation.[23,24]

The fact that 3mm CAL gain could be achieved in both Case-1 treated by Osseograft and Case-2 treated by Osseograft and Healiguide, could be due to the difference in the intra-osseous defect morphology. Case-1 presented with a three-walled defect ideal for regeneration, whereas in case of Case-2 the defect was 2-walled and still 3mm of CAL gain could be achieved.

Conclusion

DMBM (Osseograft) alone and in combination with Guided tissue barrier membrane (Healiguide) improved healing outcomes i.e., reduction of probing depth, resolution of osseous defects and gain in clinical attachment. Better biocompatibility, excellent handling properties and the improved response of tissues to the material are definite benefits of using DMBM (Osseograft). Controlled clinical trials with more patients and standardized radiographic techniques are necessary to analyze the maximum potential of xenografts for regenerative periodontal therapy and to compare the results obtained by using only graft and / or graft and membrane together.

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