Placental membranes – A neoteric guided tissue regenerative membrane for periodontal reconstructive procedures: A Case Report

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Abstract:
Background: The placental membranes have gained a lot of popularity over the years due to their non-immunogenic property along with antibacterial and anti-inflammatory action. In periodontal therapy, they have been used as a barrier membrane during the treatment of intrabony defects and for recession coverage. The present case report provides evidence supporting the use of placental membranes in the treatment of intrabony defect.

Conclusion: The use of placental membrane- chorion, enables in accelerated wound healing. The additional advantage of non-immunogenic property makes it an ideal allogenic graft material

Keywords: Alloplast, Guided Tissue Regeneration, Intrabony defect.

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INTRODUCTION:

Regenerating the lost periodontium is the goal of periodontal therapy. Over the years, various materials such as bone grafts, guided tissue regeneration (GTR) membranes, growth factors, etc., have been used to achieve this goal. But to date, no material is said to be the gold standard for achieving complete periodontal regeneration. To promote regeneration, Melcher, in 1976, gave the concept of compartmentalization, where the periodontal ligament cells are allowed to repopulate over the root surface.[1] Periodontal ligament cell repopulation over the root surface is favorable for regeneration as it has the potential to differentiate into progenitors of the periodontal ligament, bone as well as cementum. Ever since the introduction of this concept in periodontal therapy, various materials have been tried as GTR membranes.

One of the new material which has also been tried recently includes placental membranes, i.e., amnion and chorion.[2] The placental membranes gained a lot of interest in medicine and dentistry due to their non-immunologic, antimicrobial and anti-inflammatory properties.[3] Moreover, they release various growth factors such as platelet-derived growth factor (PDGF), vascular endothelial growth factor (VEGF), epidermal growth factor (EGF), keratinocyte growth factor (KGF), as well as, they contain various collagens such as type I, III, IV, V, VI. These unique properties of the amnion and chorion

placental membranes were suggested to enhance wound healing and regeneration.[2]
The present case report imparts substantial evidence emphasizing the use of placental membranes for achieving periodontal regeneration of intrabony defects.

Materials and methods:
A 45 years old female patient reported with a chief complaint of dull aching pain and loosening of teeth in the right lower back tooth region for the past 7 months. The medical history revealed the diabetic status of the patient, and she was under metformin medication for the past 4 years. Clinical examination revealed fair oral hygiene status of the patient based on plaque index given by Silness and Loe. The patient further gave a history of chewing on hard substances on the right side of her dentition. #44 (according to FDI system) was grade II mobile with probing pocket depth (PPD) of 8 mm, and clinical attachment level (CAL) was 10 mm. The radiographic examination revealed vertical bone loss with respect to the distal aspect of #44 **(Figure 1)**.

Figure 1: Pre-operative radiograph revealing the vertical defect in relation to #44. The yellow and red line depicts the width and the height of the defect, respectively

On evaluating the occlusion, the primary etiology for PPD was identified to be trauma from occlusion (TFO). Surgical periodontal therapy for the vertical defect was planned after the root canal treatment as the defect extended up to the apical third of the tooth. Prior to the commencement of the surgery, the procedure was explained to the patient, and written informed consent was obtained.
During the periodontal examination, PPD was measured using William's probe from the gingival margin to the base of the pocket at all six sites of the tooth. CAL was measured from the fixed point, i.e., from the cementoenamel junction to the base of the pocket. Following oral prophylaxis, occlusal adjustments were performed with high-speed airotor and finishing bur to eliminate TFO. The tooth was further splinted to aid in the reduction of mobility and was maintained for 2 months. The PPD on 2 months recall visit was 8 mm **(Figure 2),** so surgical periodontal therapy was planned for the patient.

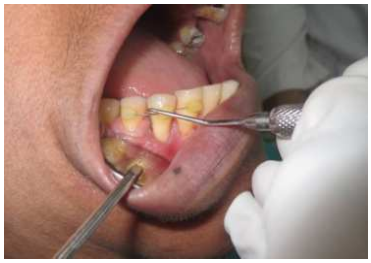


Figure 2: Pre-operative image showing the PPD in relation to #44

The surgical periodontal therapy was commenced with local anesthesia using lignocaine HCl with adrenaline 1: 1,00,000 ratio. Papilla preservation flap with two vertical releasing incisions was reflected with respect to #44. Thorough debridement was done to remove the granulation tissue, and the root surfaces were planed with Gracey's area-specific curette. On flap elevation, two walled intrabony defect in relation to #44 was observed **(Figure 3).**

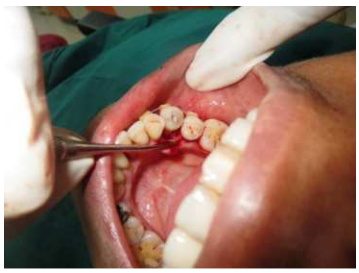
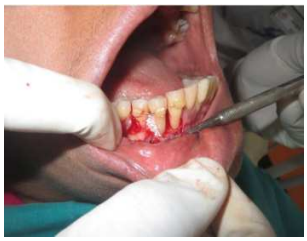


Figure 3: Deep intrabony defect noted in relation to #44

The defect was treated with nanocrystalline hydroxyapatite (HA) **(Figures 4 and 5).**



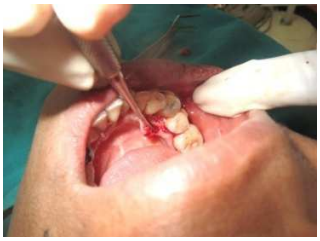


Figure 4 and 5: Bone alloplast HA placed in the defect region in relation to #44

The Chorion membrane was trimmed according to the defect and placed over the defect site for guided tissue regeneration **(Figure 6).** Once the chorion membrane comes in contact with it, it hydrates and adheres to the underlying tooth and bone surface. Flaps were re-approximated, and sutures were placed with 4-0 silk suture material.

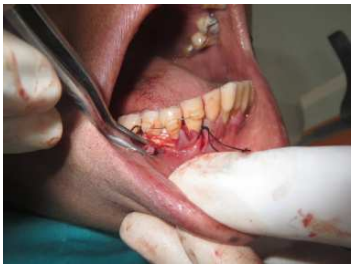


Figure 6: Chorion membrane trimmed according to the defect area and placed after pre-suturing the flap

The patient was prescribed with 500 mg of amoxicillin TID for 5 days and 400 mg of ibuprofen BD for 5 days. Moreover, the patient was instructed to use 0.2% chlorhexidine mouth rinse twice daily for two weeks. The patient was recalled after 10 days for suture removal and then appointed for further periodontal maintenance at 3-month interval. The clinical and radiographic assessment was done at 3 and 6 months post-operatively.

Uneventful healing was noted during suture removal. The patient did not report any adverse events such as pain, allergic reactions, or abscess formation during healing. The patient reported for further periodontal evaluation at 3 months. PPD was reduced to 3 mm from the pre-operative PPD of 8 mm, and CAL was 5 mm **(Figure 7).**

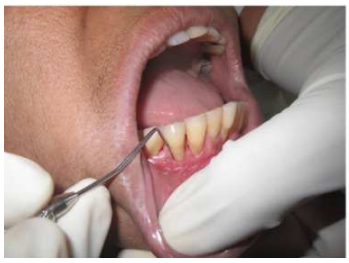


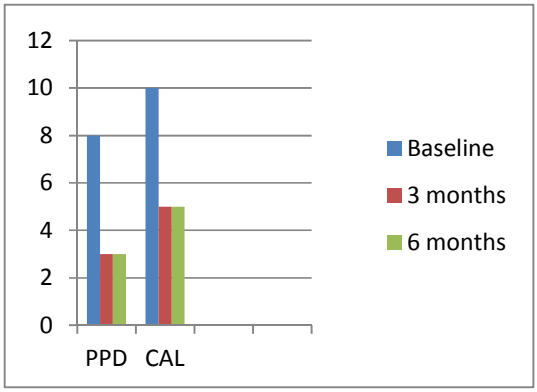
Figure 7: Reduction in PPD noted during the 6 months follow-up visit

The patient was further re-scheduled for evaluation at 6 months. The results remained stable in terms of PPD and CAL **(Table 1) and (Graph 1).**

Table 1: Showing the values of clinical parameters pre-operatively and 3 months, 6 months postoperatively (measured in millimetres)

Clinical parameter	Pre-op	3 months post-op	6 months post-op
Probing Depth	8	3	3
Clinical Attachment Level	10	5	5.5

Graph 1: Showing the improvement in clinical parameters compared from baseline to 3 months and 6 months



During the postoperative follow-up visit at 6 months, removal of the splint was done, and a reduction in tooth mobility was noted. The radiographic examination comparing the pre-operative (**Figure 1**) and post-operative bone level showed an increase in bone level at 6 months postoperatively **(Figure 8).**

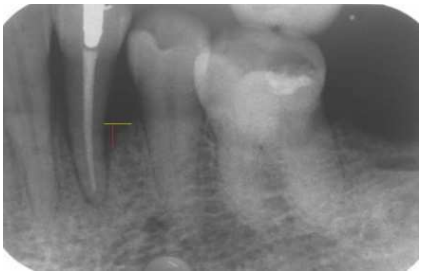


Figure 8: Gain in the height of alveolar bone observed during the 6 months follow-up visit. The yellow and red lines clearly depict the reduction in defect width and height.

DISCUSSION

The main advantage of the placental membranes is that, though they are allografts in nature, they are non-immunogenic. Lack of immunogenicity is due to HLA-A, HLA-B, HLA-D, and HLA-DR antigens in the human placental membranes.[4] Additionally, they also have anti-inflammatory and anti-scarring property. The amnion and chorion membranes used in the case report are freeze-dried and irradiated to eliminate the possibilities of immune reaction and transmission of diseases such as HIV, HBV, etc.

Placental membranes consist of various adhesion molecules like laminins. Laminin-5, present in the placental membranes, plays a vital role in the cellular adhesion of gingival cells.[5] Also, various collagens such as collagen type I, III, IV, and V play a key role in accelerating the wound healing process.[2] Above all, the placental membranes possess an innate anti-microbial property that makes ACM one of the most unique regenerative materials of the decade. Ashraf H, in 2019 through his In Vitro study, provided evidence that ACM is as bactericidal as tetracycline treated positive controls.[6]

Temraz A, in 2019 in a randomized controlled trial, compared the ACM with OFD and demineralized bone matrix putty (DBM) with OFD.[7] The results of the study suggested that ACM with OFD had clinical and radiographic outcomes similar to DBM with OFD, both the groups showing statistically significant improvement in terms of PPD, CAL and radiographic measurement of the bone defect area.

Bone alloplast containing nanocrystalline HA was chosen as the bone graft material due to easy availability, cost efficiency, and remarkable biocompatibility with little inflammatory response when implanted within connective and bone tissues. Singh VP in 2012 compared nanocrystalline HA in combination with collagen membrane and OFD alone for the treatment of periodontal intrabony defects.[8] The study promoted nanocrystalline HA as it provides a clinical advantage in achieving periodontal bone fill. So, in the present case report, nanocrystalline HA in combination with ACM was chosen as the material of choice for regenerating intrabony defects.

Ines Velez, in 2010 evaluated cryopreserved amniotic membrane (CAM) for helping cicatrization and wound healing after dental implant surgery.[9] Epithelialization, pain, infection, inflammation, and scarring were studied. In this study, CAM was placed in surgical wounds related to implant surgery. The extent of healing was evaluated by a masked investigator for lesion size, epithelialization, pain, infection, inflammation, and scarring. The results of the study showed statistically significant differences, where the experimental group showed improved outcomes when compared with the control groups regarding cicatrization, wound healing, and pain.

Holtzclaw et al., in 2013, in a retrospective observational report, documented the use of amnion-chorion membrane (ACM) for combination GTR treatment of periodontal intrabony defects with a minimum of a 12-month post-surgical observation.[10] The results of the study showed promising results in terms of improved level of clinical parameters and wound healing. The author concluded that further controlled long-term studies to evaluate the effectiveness of ACM need to be carried out.

The results of the present case report is in accordance with the above-mentioned studies, however, a systematic review and meta-analysis by Zhou S in

2018 suggested that, amongst all the biomaterials used in combination with bone grafts for periodontal regeneration, platelet-rich fibrin (PRF) showed commendable outcome.[11] Enamel matrix derivatives and placental membranes had little additive effects, but not very significant changes were appreciable.

CONCLUSION:

The use of the human placental membrane, chorion, when used as a GTR membrane, allows rapid healing and aids in periodontal regeneration. The probable mechanism of action of the membrane for attaining this improved result is the abundant supply of GFs and stem cells. Nonetheless, randomized controlled clinical trials with long-term follow-up comparing placental membranes with other GTR membranes are necessary to confirm the importance of placental membrane in periodontal regenerative procedures.

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Conflict of interest: None declared

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