Section: Dentistry

Original Research Article

PLACENTAL MEMBRANE AS GUIDED TISSUE REGENERATING AGENT FOR PERIODONTAL RECONSTRUCTION

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Abstract

Background: Owing to its antibacterial, anti-inflammatory, and non-immunogenic qualities, placental membranes have become increasingly popular over time. They have been employed as a barrier membrane in periodontal treatments to cover recessions and cure intrabony defects. The use of placental membranes to correct intrabony defects is supported by the findings presented in this case study. **Materials and Methods:** Total of 20 patients with 28 sites of two-walled or three-walled intrabony were assessed for plaque index (PI), probing pocket depth (PPD), and clinical attachment level (CAL) at baseline, 3-months and 6-months post-operatively. All the patients underwent open-flap debridement with nano-hydroxy apatite crystal bone alloplast placement. **Result:** All the enrolled patients completed the study duration and follow-up visit. No adverse events such as allergy, hematoma formation, abscess, etc noted. When compared to baseline values, considerable reduction in PI, PPD, and CAL were noted at 3-months and 6-months post-operative follow-up visits. The values were statistically significant with the p-value<0.001. **Conclusion:** The present interventional study observed that the application of placental membrane-chorion facilitates faster wound healing. It is the perfect allogenic graft material due to its non-immunogenic characteristic.

INTRODUCTION

In order to promote regeneration, Melcher introduced the concept of compartmentalisation in 1976, wherein the periodontal ligament cells are allowed to repopulate over the root surface.[1] This is advantageous for regeneration because the periodontal ligament cells have the ability to differentiate into progenitors of the periodontal ligament, bone, and cementum. Since the introduction of this concept in periodontal therapy, a variety of materials have been tried as GTR membranes. Throughout the years, a variety of materials, including bone grafts, growth factors, and guided tissue regeneration (GTR) membranes, have been used to achieve the goal of restoring the lost periodontium. However, no material has been considered the gold standard for achieving complete periodontal regeneration.

Placental membranes, such as amnion and chorion, are among the novel materials that have lately been tested.[2] Because of their antibacterial, anti-inflammatory, and non-immunologic qualities, placental membranes have attracted a lot of attention in the fields of medicine and dentistry.[3] Additionally, they include different types of collagens (type I, III, IV, V, and VI) and release a variety of growth factors, including vascular endothelial growth factor (VEGF), platelet-derived growth factor (PDGF), keratinocyte growth factor (KGF), and epidermal growth factor (EGF). It was thought that these special qualities of the placental membranes of the amnion and chorion would promote wound healing and regeneration.[2]

Therefore, the aim of the present study is to evaluate the efficacy of placental membranes to achieve periodontal regeneration of intrabony lesions.

MATERIALS AND METHODS

A total of 20 patients with who reported to the department of dentistry in a private medical college were included in the study. The patients were included in the study only when the radiographic interpretation revealed presence of vertical defects in one or more sites. The exclusion criteria comprised of patients with any debilitating diseases, habits such as smoking, consumption of antibiotics in the past 6 months, pregnant and/or lactating women. Additionally, patients who doesn't comply with the supportive periodontal therapy regime were also excluded from the study. The clinical parameters assessed in the present study plaque index (PI),

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probing pocket depth (PPD), clinical attachment level (CAL) at baseline, 3 months, and 6 months. Figure 1 shows the distal part of #44 had vertical bone loss, according to the radiographic assessment in one of the patients.

Trauma from occlusion (TFO) was determined to be the main cause of PPD in most of the cases once the occlusion was evaluated. All the patients were informed about the procedure and given signed informed consent before the surgery started. William's probe was used to measure PPD at each of the tooth's six locations during the periodontal examination, extending from the gingival margin to the base of the pocket. CAL was measured from the fixed position, which is the base of the pocket to the cementoenamel junction.

After oral prophylaxis, TFO was removed by occlusal adjustments using a high-speed airotor and finishing bur. To help with the decreased movement, the teeth that required splinted underwent the procedure and kept in place for two months. The patients were scheduled for surgical periodontal therapy in areas with PPD at the two-month recall visit was >5 mm [Figure 2].

Under local anesthesia, the surgical periodontal therapy was started. A papilla preservation flap or Kirkland with two vertical releasing incisions were reflected in all the cases. The granulation tissue was thoroughly debrided, and Gracey's area-specific curette was used to plane the root surfaces. A two-walled or three-walled intrabony defect were found upon flap elevation in all the selected cases. Nanocrystalline hydroxyapatite (HA) was used to correct the defect [Figure 3]. For directed tissue regeneration, the Chorion membrane was placed over the defect site after being cut to fit the defect [Figure 4]. It hydrates and sticks to the surface of the tooth and bone beneath it as soon as the chorion membrane touches it. Sutures were made using 4-0 silk suture material after the flaps were re-approximated. When the sutures were removed, uneventful healing was observed.

Statistical analysis: IBM SPSS version 20 statistical software was used to analyse the measured values of the clinical parameters. Post-hoc Bonferroni test was used to compare the baseline and postoperative values (3 months and 6 months). P-value < 0.001 was regarded as a statistically significant value.

RESULTS

A total number of 20 patients (11 males and 9 females) with 28 sites were treated in the study. All the patients completed their 6-months follow-up visit, therefore, there were no drop-outs reported in the present study. No negative side effects, including pain, allergic reactions, or the development of an abscess throughout the healing process, were reported by the patients. The baseline PI score was 1.82± 0.21, that reduced to 1.04±0.11 and 0.96±0.15 during the 3-months and 6-months follow-up visit. The PPD was 5.02±0.43 at baseline, and it showed considerable and favourable reduction to 3.54±1.2 and 2.69±0.72 during the consecutive follow-up visits. Similarly, the CAL also showed favourable improvement with values being 6.22±1.44, 4.01±0.36, and 3.13±0.81 at baseline, 3-months, and 6-months visits, respectively. All the measured parameters showed statistical significance with the p-value of <0.001. All the clinical data are depicted in [Table 1].

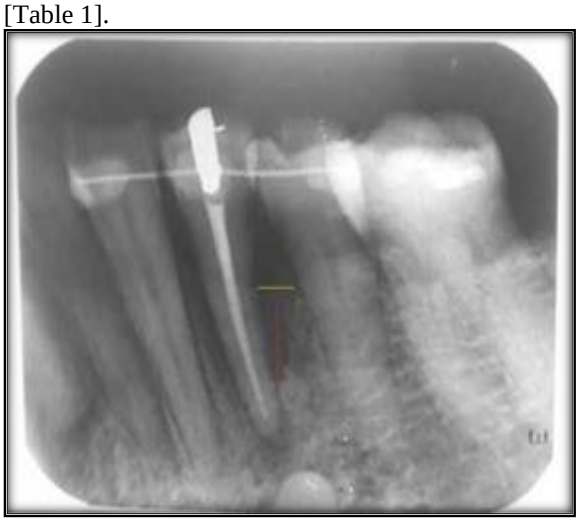

Figure 1: The vertical bone deficit in respect to #44 is seen on the pre-operative radiograph.

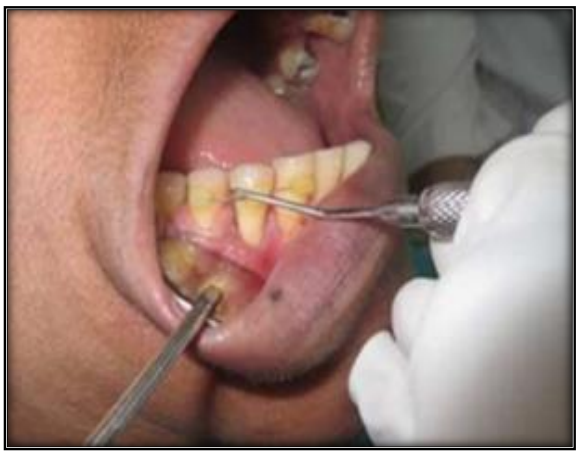

Figure 2: Pre-operative image showing the PPD in relation to #44

Figure 3: Bone alloplast HA placed in the defect region in relation to #44

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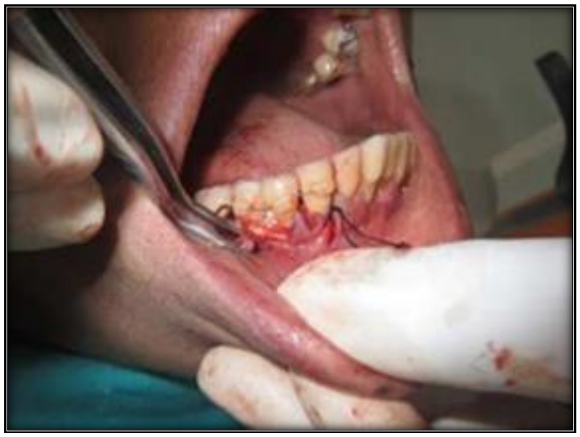

Figure 4: After pre-suturing the flap, the chorion membrane is positioned and cut to fit the defect location.

Figure 5: Reduction in PPD noted during the 6 months follow-up visit

Table 1: Comparison of clinical parameters at baseline, 3-months and 6-months follow-up.

Parameter	Baseline	3 months	6 months	P-value
PI	1.82± 0.21	1.04±0.11	0.96±0.15	<0.001*
PPD	5.02±0.43	3.54±1.2	2.69±0.72	<0.001*
CAL	6.22±1.44	4.01±0.36	3.13±0.81	<0.001*

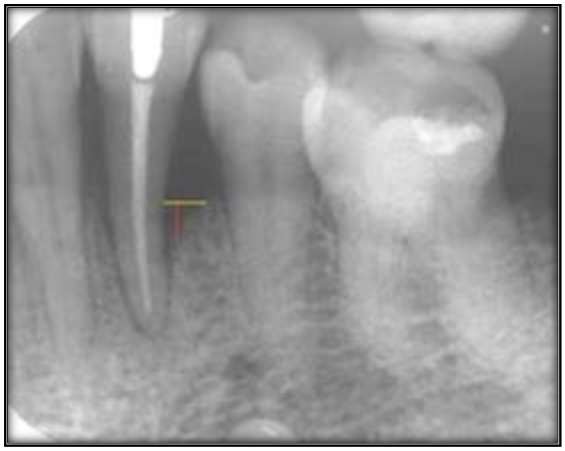

Figure 6: Gain in the height of alveolar bone observed during the 6 months follow-up visit.

DISCUSSION

Despite being allografts by nature, the placental membranes primary benefit is that they are not immunogenic. The human placental membranes' HLA-A, HLA-B, HLA-D, and HLA-DR antigens are the cause of the lack of immunogenicity.[4] Moreover, they possess anti-inflammatory and anti-scarring qualities. In order to prevent immunological reactions and the spread of illnesses like HIV, HBV, and others, the chorion membranes utilised in this study are freeze-dried and irradiated.

Laminins and other adhesion molecules make up placental membranes.

Laminin-5, which is found in placental membranes, is essential for gingival cell cellular adhesion.[5] Additionally, a number of collagens, including collagen types I, III, IV, and V, are essential for hastening the healing process of wounds.[2] Amnion-Chorion membrane (ACM) is one of the most distinctive regeneration materials of the decade because placental membranes have an inherent antibacterial property.[6] Through his in vitro research, Ashraf H has shown in 2019 that ACM is just as bactericidal as positive controls treated with tetracycline.[7]

In a randomized controlled experiment conducted in 2019, Temraz A contrasted demineralized bone matrix putty (DBM) with open-flap debridement (OFD) and ACM with OFD. In terms of PPD, CAL, and radiographic measurement of the bone defect area, the study's findings indicated that ACM with OFD had comparable clinical and radiographic outcomes to DBM with OFD.[8] Both groups also shown statistically significant improvement. Because of its easy availability, affordability, and exceptional biocompatibility with minimal inflammatory reaction when implanted within connective and bone tissues, bone alloplast containing nanocrystalline HA was selected as the bone graft material.

In 2012, Singh VP studied the comparison between OFD alone and nanocrystalline HA in conjunction with collagen membrane for the treatment of periodontal intrabony defects.[9] Because nanocrystalline HA offers a clinical benefit in establishing periodontal bone fill, the study promoted it. Therefore, the preferred material for regenerating intrabony defects in the current investigation is nanocrystalline HA combined with ACM.

In 2010, Ines Velez assessed the potential of cryopreserved amniotic membrane (CAM) to aid in wound healing and cicatrisation following dental implant surgery.[10] The study evaluated for post-operative scarring, inflammation, infection, discomfort, and epithelialisation through a blinded investigator. The study's findings revealed statistically significant changes, with the experimental group outperforming the control groups in terms of pain, wound healing, and cicatrisation.

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ACM was used for combination GTR treatment of periodontal intrabony abnormalities with at least a 12-month post-operative surveillance, according to a retrospective observational report by Holtzclaw et al in 2013.[11] The study's findings indicated encouraging outcomes in terms of wound healing and an improvement in clinical indicators. The author came to the conclusion that more controlled, long-term research is required to assess ACM's efficacy. The current study's findings are consistent with the previously mentioned research; however, a 2018 systematic review and meta-analysis by Zhou S revealed that platelet-rich fibrin demonstrated a noteworthy result among all the biomaterials used in conjunction with bone grafts for periodontal regeneration.[12] Placental membranes and enamel matrix derivatives demonstrated minimal additive effects, but there were no discernible modifications.

CONCLUSION

Rapid healing and periodontal regeneration are made possible by the use of the human placental membrane, chorion, as a GTR membrane. The membrane's enormous supply of growth factors and stem cells is most likely how it achieves this better outcome. Randomized controlled clinical trials with larger sample size and longer duration of follow-up is essential to validate the clinical outcome obtained in the current study.

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