A roentgenographic assessment of regenerative efficacy of bioactive Gengigel® in conjunction with amnion membrane in grade II furcation defect

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Abstract

Background: Nowadays, techniques are being developed to guide and instruct the specialized cellular components of the periodontium to participate in the regenerative process. This approach of reconstruction makes use of understanding of the development of the periodontium and the cellular processes that are involved. Hyaluronic acid is a naturally occurring non-sulfated high molecular weight glycosaminoglycan that forms a critical component of the extracellular matrix and contributes significantly to tissue hydrodynamics, cell migration, and proliferation. Hence, its administration to periodontal wound sites could achieve comparable beneficial effects in periodontal tissue regeneration. Hence, the purpose of the present case report was to assess roentgenographically, the regenerative capacity of Gengigel® in conjunction with bioactive amnion guided tissue regeneration (GTR) membrane in a patient with Grade II furcation defect. **Case Presentation:** A patient complained of bleeding gums from the lower back tooth region, reportedly found Grade II furcation in the lower right mandibular first molar. After Phase, I therapy, Gengigel® along with bioactive amnion membrane was placed in the furcation area during the surgical phase. Roentgenographic assessment was done at 4 months and 6 months postoperatively. It resulted in complete defect-fill and loss of radiolucency at 6 months. **Conclusion:** Surgical placement of Gengigel® along with amnion membrane in the furcation defect can significantly improve the periodontal defect morphology.

Keywords: Bioactive amnion membrane, furcation, Gengigel®, 0.2% hyaluronic acid

Background

Hyaluronic acid (HA) is a naturally occurring polysaccharide of the extracellular matrix of connective tissue, synovial fluid, and other tissues. It possesses various physiological as well structural functions which include cellular and extracellular interactions with growth factors and regulation of the osmotic pressure and tissue lubrication. All these functions help in maintaining structural and homeostatic integrity of the tissues. In the field of dentistry, preliminary trials have been conducted by Pagnacco and Vangelisti in 1997.[1] HA has a multifunctional role in periodontics: Topical application of subgingival HA gel can be used as an antimicrobial agent in adjunct to scaling and root planning,[2] bone regeneration in periodontal bony defects,[3] guided Bone regeneration,[4] nonsurgical treatment of peri-implant pockets,[5] peri-implant maintenance of immediate function implants,[6] as an autologous cell HA graft gingival augmentation in mucogingival surgery,[7] as a carrier for newer molecules in various regenerative procedures[8] and as a biomaterial scaffold in tissue engineering research.

Gengigel® (Ricerfarma, Milano, Italy) contains high molecular weight fractions of HA in gel formulation with 0.2% concentration for its effect in the treatment of plaque-induced gingivitis as an adjunct to scaling and root planning.[9] Gengigel as a product for oral use has been evaluated by skin irritation test, sensitizing potentiality and percutaneous absorption test and has been proved to be a safe nonirritant product.[10]

Amniotic sac protects and nourishes the developing fetus during the gestation period. It is a composite membrane consisting of pluripotent cellular element embedded in a semipermeable membranous structure.[11] Existence of pluripotent stem cells possessing the ability of transdifferentiation to other cellular elements of periodontium makes it a suitable candidate for guided tissue regeneration (GTR).[12]

The clinical application of amniotic membrane for GTR, while fulfilling the current mechanical concept of GTR, amends it with the modern concept of biological GTR. Biomechanical GTR proposed herein using amniotic membrane, not only maintains the structural and anatomical configuration of regenerated tissues, but also contribute to the enhancement

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of healing through reduction of postoperative scarring and subsequent loss of function and providing a rich source of stem cells.[13] Amnion has shown the ability to form an early physiologic "seal" with the host tissue precluding bacterial contamination and multiple studies support amnion's ability to decrease the host immunologic response via mechanisms such as localized suppression of polymorphonuclear cell migration.[14] Hence, the purpose of the present case report was to assess the regenerative capacity of Gengigel® in conjunction with bioactive amnion GTR membrane in a patient with Grade II furcation defect.

Case Presentation

A 29-year-old female patient reported to the outpatient Department of Periodontics with a chief complaint of bleeding gums while brushing from the lower back tooth region. Clinical examination revealed Miller Grade I mobility in mandibular right first molar. On radiovisiographic examination of the region, a radiolucency of around 3 mm (vertical dimension) was noted [Figure 1]. Treatment was divided into Phase I and Phase II therapy. Phase I therapy included scaling and polishing, and general oral hygiene instruction were given, routine hematological examinations were done before surgical intervention, which were found to be within normal limits. After adequate local anesthesia (2% xylocaine with epinephrine, 1:200,000), an intrasulcular incision was made around the involved tooth and extending to the adjacent tooth for adequate access [Figure 2]. Mucoperiosteal flap was reflected to access the underlying bone morphology in the furcation area. After thorough debridement [Figure 3], the furcation area was assessed using Q2N Naber's probe [Figure 4]. The assessed defect was around 3 mm horizontally and 3 mm vertically [Figure 4]. The area was properly debrided using Gracey curettes. Gengigel® (Ricerfarma, Milano, Italy), was applied in the furcation area (slightly overfilled) [Figure 5]. The processed dehydrated amniotic membrane was placed onto the furcation area and proximal bone as GTR membrane [Figure 6]. Upon placement, the processed dehydrated amnion membrane became hydrated and self-adhered to the area thus eliminating the need for suturing. Immediately after placing

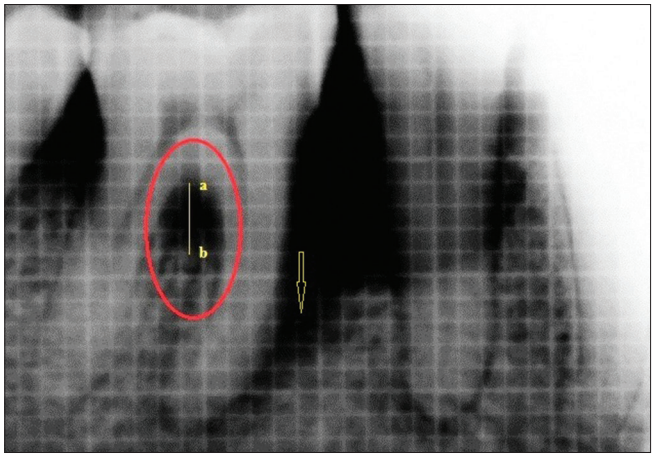

Figure 1: Preoperative radiograph showing furcation defect having ~ 3 mm vertical dimension (a and b) (Also, arrow showing large intrabony defect on the mesial of right mandibular first molar)

Figure 3: Exposure of defect site after debridement

Figure 2: Crevicular incision

Figure 4: Intra-operative furcation defect measurement using Q2N Naber's probe having horizontal dimension ~ 3 mm (Grade II furcation)

the membrane, the reflected flap was repositioned over the amnion membrane and secured with interrupted direct loop 3-0 nonresorbable silk sutures. The patient was put on systemic analgesics and antibiotics consisting of 500 mg of paracetamol every 6 h and 500 mg of amoxicillin every 8 h for 5 days. The patient was instructed to continue her regular home hygiene care, except in the operated area, in which toothbrushing was discontinued for the 1st 15 days after surgery and plaque control was maintained by means of gentle topical applications of chlorhexidine gluconate in saturated cotton swabs twice a day. Gentle toothbrushing with an extra soft-bristle toothbrush (Postsurgical toothbrush) using Charter's method was then initiated. The sutures were removed 1-week after the surgery. Healing was uneventful and at 4 months and 6 months of follow-up, there was substantial defect fill in the furcation area with residual vertical dimension of <2 mm at 4 months [Figure 7] and residual vertical dimension of <1 mm at 6 months [Figure 8], representing a significant percentage of bone deposition.

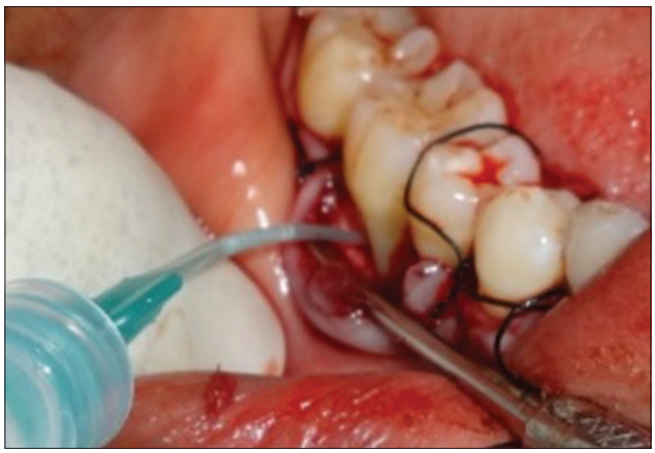

Figure 5: Application of Gengigel® (0.2% Hyaluronic acid) in the defect site after presuturing

Discussion

Hyaluronic acid within the extracellular matrix has been shown to promote or inhibit the state of differentiation of several mesenchymal progenitor cell types and to participate directly in cell aggregation events. These matrix-induced effects on cells are in turn supported and directed by a wide variety of HA-binding proteins. Through its osteoconductive properties, HA accelerates the bone regeneration by means of chemotaxis, proliferation and successive differentiation of mesenchymal cells. HA shares bone induction characteristics with osteogenic substances such as bone morphogenetic protein-2 and osteopontin.[15]

The ability of processed dehydrated allograft amnion to self-adhere eliminates the need for sutures, making the procedure less technically demanding and significantly decreasing surgical time. This ability to self-adhere makes processed dehydrated allograft amnion an attractive option

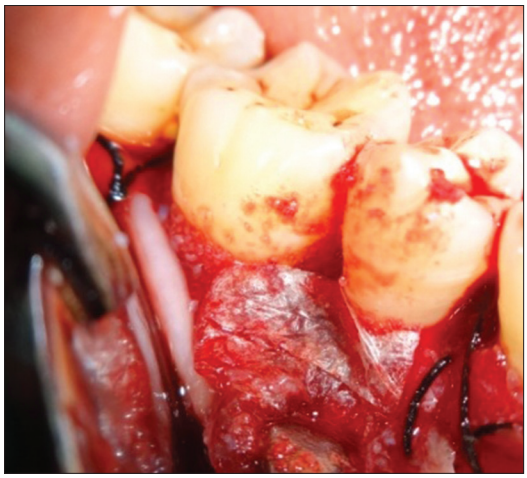

Figure 6: Placement of bioactive amnion membrane to cover the Gengigel®

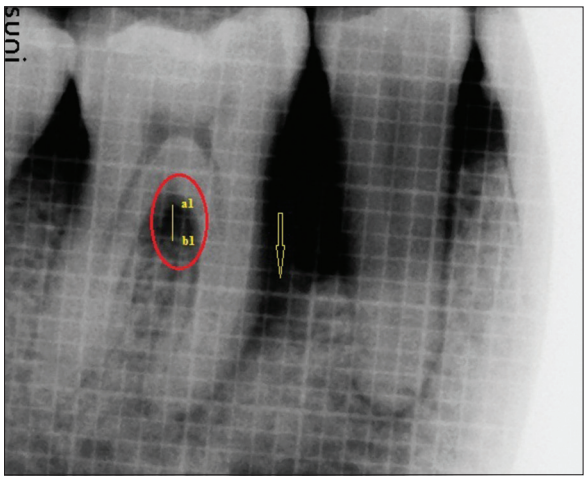

Figure 7: 4 months postoperative radiograph showing reduction furcation defect having ~ 1.5 mm vertical dimension (a1 and b1) (Also, arrow showing defect fill mesial to the right mandibular molar)

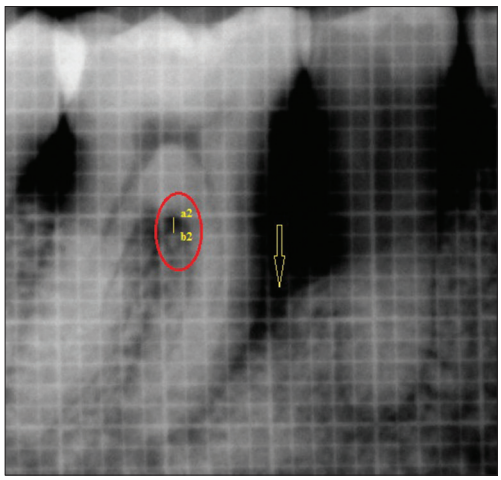

Figure 8: Six months postoperative radiograph showing almost complete furcation defect fill having vertical residual radiolucency of <0.5 mm (a2 and b2)

for the purpose of GTR procedure in particularly hard to reach areas such as the molar region.[16]

To the best of our knowledge, this is the only surgical application of Gengigel® in conjunction with bioactive amnion membrane in the treatment of furcation defect. In this study, the regenerative effects of Gengigel® along with bioactive amnion membrane were assessed in the furcation area. Clearly, postoperatively at 4 months [Figure 7] and 6 months [Figure 8], obvious defect fill was noticed roentgenographically. The clinical application of hyaluronan and amniotic membrane for GTR while fulfilling the current mechanical concept of regeneration amends it with the modern concept of biological regeneration.

Biomechanical regeneration proposed herein using amniotic membrane, not only maintains the structural and anatomical configuration of regenerated tissues, but also contribute to the enhancement of healing through reduction of postoperative scarring and subsequent loss of function and providing a rich source of stem cells. Furthermore, study by Singh *et al*., in which bioactive amnion membrane was successfully placed as a GTR membrane for the treatment of gingival recession.[16] Wallace *et al*. compared the regenerative response of GTR using expanded polytetrafluoroethylene (ePTFE) membranes with or without demineralized freeze-dried bone allograft (DFDBA) in 17 mandibular Class II molar furcations. After 6 months, no significant differences in soft-or hard-tissue measurements were obtained between sites treated with ePTFE alone and those treated with ePTFE and DFDBA.[17] Conversely, a study done by Chen *et al*. in which regenerative capacity of collagen membrane alone and collagen + DFDBA was done. However, the result came out to be statistically nonsignificant.[18] Hence, taking into consideration the parameters to assess the success of furcation defect fill, the results suggest that the use of bioactive regenerative materials (Gengigel® + Amnion) provides a more favorable approach in the treatment of periodontal defects.

Acknowledgments

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References

1. Dahiya P, Kamal R. Hyaluronic acid: A boon in periodontal therapy. N Am J Med Sci 2013;5:309-15.
2. Jentsch H, Pomowski R, Kundt G, Göcke R. Treatment of gingivitis with hyaluronan. J Clin Periodontol 2003;30:159-64.
3. Vanden Bogaerde L. Treatment of infrabony periodontal defects with esterified hyaluronic acid: Clinical report of 19 consecutive lesions. Int J Periodontics Restorative Dent 2009;29:315-23.
4. Park JK, Yeom J, Oh EJ, Reddy M, Kim JY, Cho DW, *et al*. Guided bone regeneration by poly (lactic-co-glycolic acid) grafted hyaluronic acid bi-layer films for periodontal barrier applications. Acta Biomater 2009;5:3394-403.
5. De Araújo Nobre M, Carvalho R, Malo P. Non surgical treatment of periimplant pockets: An exploratory study comparing 0.2% chlorhexidine and 0.8% hyaluronic acid. Can J Dent Hyg 2009;43:25-30.
6. de Araújo Nobre M, Cintra N, Maló P. Peri-implant maintenance of immediate function implants: A pilot study comparing hyaluronic acid and chlorhexidine. Int J Dent Hyg 2007;5:87-94.
7. Prato GP, Rotundo R, Magnani C, Soranzo C, Muzzi L, Cairo F. An autologous cell hyaluronic acid graft technique for gingival augmentation: A case series. J Periodontol 2003;74:262-7.
8. Ballini A, Cantore S, Capodiferro S, Grassi FR. Esterified hyaluronic acid and autologous bone in the surgical correction of the infra-bone defects. Int J Med Sci 2009;6:65-71.
9. Koshal A, Patel P, Robert B, Galgut PN. A comparison in postoperative healing of sites receiving non-surgical debridement augmented with and without a single application of hyaluronan 0.8% gel. Prev Dent 2007;2:34-8.
10. Nowicki D, Vogel RI, Melcer S, Deasy MJ. The gingival bleeding time index. J Periodontol 1981;52:260-62.
11. Jones CJ, Jauniaux E. Ultrastructure of the materno-embryonic interface in the first trimester of pregnancy. Micron 1995;26:145-73.
12. Mahgoub MA, Ammar A, Fayez M, Edris A, Hazem A, Akl M, *et al*. Neovascularization of the amniotic membrane as a biological immune barrier. Transplant Proc 2004;36:1194-8.
13. Koizumi NJ, Inatomi TJ, Sotozono CJ, Fullwood NJ, Quantock AJ, Kinoshita S. Growth factor mRNA and protein in preserved human amniotic membrane. Curr Eye Res 2000;20:173-7.
14. Hao Y, Ma DH, Hwang DG, Kim WS, Zhang F. Identification of antiangiogenic and antiinflammatory proteins in human amniotic membrane. Cornea 2000;19:348-52.
15. Gontiya G, Galgali SR. Effect of hyaluronan on periodontitis: A clinical and histological study. J Indian Soc Periodontol 2012;16:184-92.
16. Singh H, Singh H. Bioactive amnion as a guided tissue regeneration (GTR) membrane for treatment of isolated gingival recession. A case report. Indian J Dent 2013;4:110-3.
17. Wallace SC, Gellin RG, Miller MC, Mishkin DJ. Guided tissue regeneration with and without decalcified freeze-dried bone in mandibular Class II furcation invasions. J Periodontol 1994;65:244-54.
18. Chen CC, Wang HL, Smith F, Glickman GN, Shyr Y, O'Neal RB. Evaluation of a collagen membrane with and without bone grafts in treating periodontal intrabony defects. J Periodontol 1995;66:838-47.

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