Research Article

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www.imedpub.com

Periodontics and Prosthodontics
ISSN 2471-3082

2021
Vol.7 No.4:80

Dehydrated Human Amnion-Chorion Product as an Adjunct to Scaling and Root Planing in Maintenance Patients: A Pilot Study

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Citation: Dodge JR, Rademacher AC (2021) Dehydrated Human Amnion-Chorion Product as an Adjunct to Scaling and Root Planing in Maintenance Patients: A Pilot Study. Periodon Prosthodon Vol.7 No.4:80

Abstract

Background: Adjunctive therapies are often combined with Scaling and Root Planing (SRP) procedures to limit bacterial recolonization of periodontal pockets and to modulate the wound healing environment. While local delivery antimicrobial therapies are effective, they do not promote soft tissue repair at these sites. BioXclude, a dehydrated human de-epithelialized amnion-chorion membrane product (ddACM) sourced from donated human placental tissue, has been shown to have antimicrobial properties, contain stimulatory growth factors known to activate wound healing processes, and possess critical attachment substrates for cellular adhesion and migration. Given this combination, it was hypothesized that ddACM would be an effective adjunctive therapy for the treatment of periodontal pockets following SRP procedures.

Methods: Sixteen non-smoking patients, compliant with a regular periodontal maintenance program, were included in this study. A total of 30 sites showing a ≥ 2 mm increase in periodontal probing depth (PPD), with associated bleeding on probing (BOP), were chosen for treatment. Following standard SRP procedures with local anesthesia, ddACM was placed into the treated area. A six-week periodontal re-evaluation was completed, with the primary outcome variable being PD reduction and secondary outcomes that included resolution of bleeding on probing (BOP).

Results: Mean PD reduction was 2.55 mm ± 0.34 mm, with three sites showing ≥ 4 mm ± 0.2 mm reduction in PD. BOP was resolved in 83% of the treated sites.

Conclusion: ddACM provides significant benefit as an adjunctive therapy to SRP for the treatment of periodontal pockets in terms of PD reduction and resolution of BOP.

Keywords: Periodontitis; Periodontal pocket; Root planing; Placental Allograft; Amnion; Chorion

Received: January 04, 2021; **Accepted:** July 08, 2021; **Published:** July 15, 2021

Introduction

According to a recent article published in the Journal of Clinical Periodontology, severe periodontitis is the 6th most prevalent disease worldwide, affecting nearly 743 million people globally [1]. In the United States, it is estimated that roughly half of adults over the age of 30 years old have periodontitis and that the disease is the primary cause of tooth loss in this population [2,3]. Periodontitis is a multifactorial disease of the oral cavity with resident microorganisms playing a key role in its initiation and pathogenesis [4] characterized as an inflammation of the periodontium, with the primary etiology being bacterial plaque, periodontitis results when localized infection and inflammation of the gingiva spread to the ligaments and bone that support the teeth. If left untreated in a susceptible host, this results in progressive break down of the supporting hard and soft tissues, creating periodontal pockets acting as favorable environments for continued destruction of the periodontium. Treatment approaches for periodontitis will depend on the severity of the disease. Interdental Clinical Attachment Level (CAL), Radiographic Bone Loss (RBL), and tooth loss due to periodontitis are clinical/

radiographic parameters used to determine the severity of periodontitis at specific sites. Non-surgical management of periodontitis includes supra- and subgingival scaling and root planing to remove diseased cementum and dentin to achieve a biologically acceptable root surface, promoting a gain in attachment. Scaling and Root Planing (SRP) procedures are often combined with adjunctive therapies mainly aimed at preventing the reestablishment of the bacterial infections [5,6].

The efficacy of adjunctive therapies to provide additional benefit to SRP was reviewed by Smiley et al. in a 2015 article published in the Journal of the American Dental Association [7]. By systematically reviewing the results from clinical studies published in peer reviewed journals and FDA filings, the authors concluded that only systemic sub-antimicrobial dose doxycycline, systemic antimicrobials, chlorhexidine chips, and photodynamic therapy with a diode laser showed reliable, moderate benefit over SRP alone. A low level of certainty was attributed to the benefits of other adjunct therapies, including doxycycline hyclate gel, minocycline microspheres, and other non-surgical lasers. Of note, adjunctive therapies used with SRP procedures are predominantly focused on the treatment and prevention of persistent microbial infections that interfere with natural tissue repair and regeneration processes. These treatments do not, however, act to promote healing and the regeneration of healthy connective tissue to repair the periodontal pockets. Because of this, even the most efficacious adjunctive therapies provide only a moderate benefit when compared to SRP alone [7]. A product that provides anti-microbial properties to prevent the recurrence of infection and factors to promote tissue repair and regeneration would be of significant value to the treatment of periodontal disease. BioXclude® (Snoasis Medical, Golden, CO, USA), an emerging regenerative membrane product in the field of dentistry and periodontics, has been shown to have both antimicrobial and stimulatory properties, [8-14] suggesting that it may be an ideal adjunctive product for the treatment of periodontal pockets. Sourced from donated elective Caesarean section placental tissues, BioXclude is a dehydrated human de-epithelialized amnion-chorion membrane (ddACM) that is cut into sheets of defined dimensions. ddACM has been used successfully in a range of dental and periodontal procedures, including maxillary sinus membrane repairs, [15] extraction site management, [16] ridge augmentation procedures, [17] and mandibular furcation repairs [18] Importantly, ddACM has been shown to have both antimicrobial properties [8,9] and contain a multitude of growth factors that stimulate wound healing and tissue regeneration [19].

To evaluate the use of ddACM as an adjunctive treatment for periodontal pockets, 16 non-smoking patients, compliant with a regular periodontal maintenance program, with sites showing a ≥ 2 mm increase in periodontal probing depth (PPDs) and associated bleeding on probing (BOP) consented for inclusion in this study. Following standard SRP procedures, ddACM was placed into the periodontal pocket. A total of 30 sites were treated, with an average initial PD of 6.98 mm ± 1.00 mm. All patients underwent a comprehensive periodontal re-evaluation after six weeks, where PD reduction and resolution of BOP were measured. On average, PDs were improved by 2.55 mm ± 0.90 mm, with three sites showing ≥ 4 mm reduction in PD. In addition, bleeding on probing (BOP) was resolved in 83% of the treated sites. These data indicate that ddACM provides significant benefit as an adjunct to SRP for the treatment of periodontal pockets in terms of CAL gain and resolution of BOP.

Methods

Inclusion criteria

Non-smoking patients ≥ 18 years of age, currently compliant in a regular periodontal maintenance program presenting with periodontal pockets showing an increase in PPD of ≥ 2 mm and associated BOP, were identified for inclusion in the study. Patients with previous adjunctive or chemotherapeutic treatment in addition to traditional maintenance procedures were excluded from the study.

ddACM preparation

BioXclude membranes **(Figure 1A)** are individually packaged and stored at room temperature for up to five years. At the time of treatment, a membrane was removed from the sterile packaging with a cotton forceps and hydrated (1-2 seconds) in sterile water **(Figure 1B)**. Longer hydration periods are not recommended by the manufacturer to prevent a loss of soluble growth factors stored in the membranes.

Procedure

Treatment sites **(Figure 2A)** were anesthetized with 4% Articaine with 1:100,000 epinephrine. Teeth were then treated with ultrasonic instrumentation followed by mechanical instrumentation to diminish supragingival and subgingival plaque and calculus via scaling and root planing. At each treatment site, pressure was applied with gauze to achieve hemostasis **(Figure 2B)**, and a pre-hydrated ddACM membrane (8 x 8 mm) was introduced into the pocket with a cotton forceps **(Figures 2C-2D).** A Hu-Friedy CP-12 periodontal probe was then used to place the

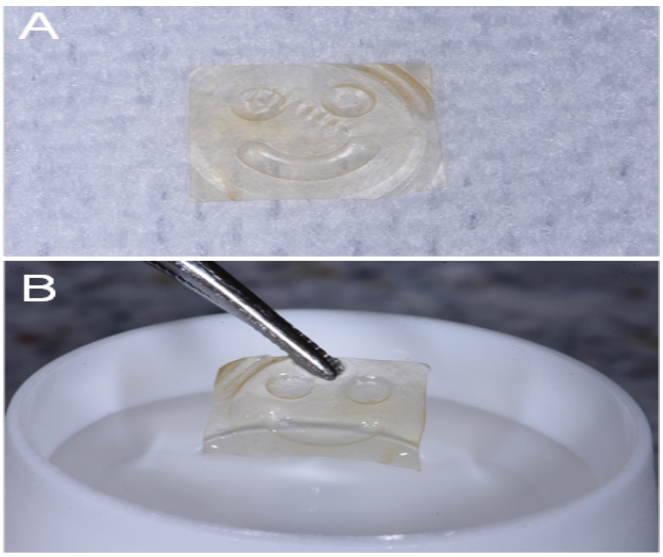

Figure 1 ddACM and pre-placement handling. (A) BioXclude membrane; (B) Pre-placement hydration of ddACM.

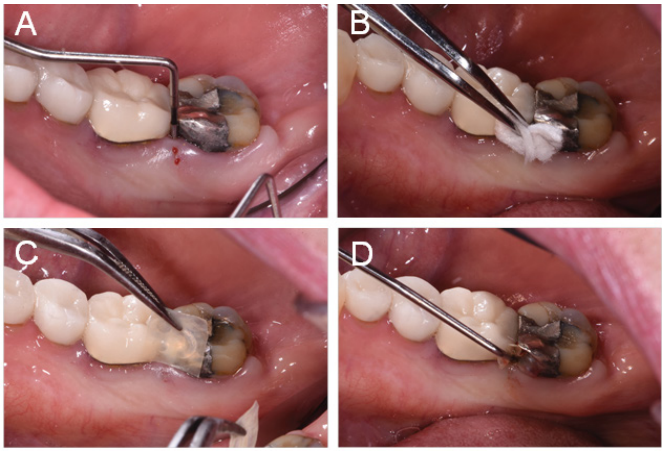

Figure 2 Site preparation and ddACM placement into periodontal pocket following scaling and root planning. (A) Evaluation of PD of periodontal pocket; (B) Hemostasis following scaling and root planing; (C) Placement of ddACM into instrumented pocket; (D) Use of probe to place ddACM to the apical extent of treated site.

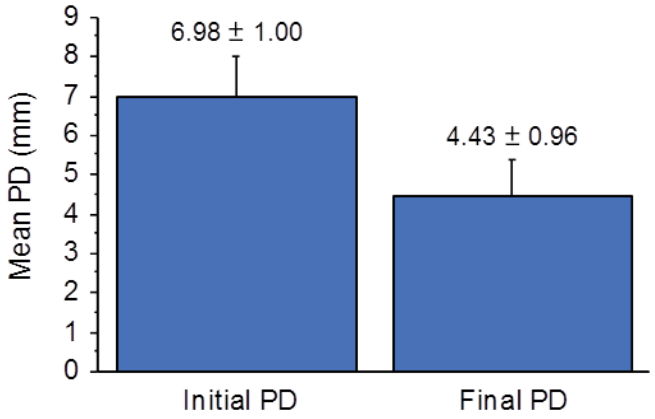

Figure 3 Comparison of Initial and Final Mean PD. PDs OD periodontal pockets were measured at the time of treatment and at the 6-week follow-up appointments. PD mean shown as the average of all measurements ± SD.

membrane into the deepest extent of the periodontal pocket achieving stability within the pocket and incorporation into the forming fibrin clot created by localized bleeding following SRP. No traditional antimicrobial agents (e.g. systemic antibiotics, chlorohexidine washes, doxycycline hyclate gel, minocycline microspheres, etc.) were used in these procedures.

Post-operative instructions

Patients were provided post-operative instructions to continue normal daily oral hygiene, implementing the modified Bass brushing technique with gentle flossing; additionally, patients were instructed to avoid any subgingival instrumentation, including Perio-Aids, proxy brushes, and/or subgingival irrigation for a period of six weeks.

Clinical evaluation

Measurements of PD, CAL, and presence of BOP were recorded at the time of treatment by the doctor performing the procedure(s). Six weeks after treatment, PD reduction and presence/absence of BOP were recorded by a doctor who was blinded to the location of sites treated with ddACM.

Results and Discussion

At the periodontal re-evaluation appointments, scheduled six weeks after initial procedures, the average PD measurement was 4.43 mm ± 0.96 mm, down from initial PD measures of 6.98 mm ± 1.00 mm. A nested plot showing PD measurements at the time of treatment ("Initial PD") and at the 6-week periodontal re-evaluation ("Final PD") is shown in **Figure 3**. Mean PD reduction was 2.55 mm ± 0.90 mm, with three sites showing ≥ 4 mm reduction in PD. BOP was resolved in 83% of the treated sites. These data are summarized in **Table 1**.

Given the success of ddACM to promote rapid healing in a wide range of periodontal procedures [15-18] it was hypothesized that

Table 1 Summary of PD, PD reduction, and resolution of BOP measurements.

Patients	Sites	Initial PD (mm)		Final PD (mm)		PD Reduction (mm)		Resolution of BOP
		Mean	SD	Mean	SD	Mean	SD	
16	30	6.98	1	4.43	0.96	2.55	0.9	83%

it would also provide benefit in the treatment of periodontal pockets. Adjunctive therapies are frequently combined with SRP procedures to prevent the bacterial recolonization of the pockets, but little is done to actively promote the healing of damaged connective tissues and reattachment of at-risk teeth. As a membrane product that possesses antimicrobial properties to fight bacterial infections, stimulatory growth factors to activate natural wound healing processes, and scaffolding matrix proteins to support cellular attachment and migration, ddACM appeared to have a potent combination of properties that would be of use for the treatment of periodontal pockets. Historically, SRP procedures lead to an average PD reduction of 0.49 mm (range: 0.36-0.62 mm), a number that is only improved by an additional average reduction of ≤ 0.64 mm if adjunctive antimicrobial therapies are included in the treatment regimen [19] As presented in the results, periodontal pockets treated with ddACM following standard SRP procedures had an average reduction in depth of 2.55 mm ± 0.34 mm after six weeks, suggesting that the use of ddACM in these procedures is an effective adjunct to SRP and that it may have additional benefit over therapies that are purely antimicrobial in nature (SRP + antimicrobial adjuncts have a combined effect of 1.13 mm average reduction in PD). The utility of ddACM in a wide range of dental and periodontal procedures is rapidly emerging. Originally considered a competitor in only the membrane market, ddACM is proving to have a collection of properties that makes it highly versatile and ideally suited for use in a wide range of oral procedures.

In addition to the barrier function that is common to all membrane products, ddACM's ability to naturally prevent bacterial growth

helps it to inhibit infections that are inherent to the oral cavity. The innate growth factors and extracellular matrix contents of ddACM, however, are what provide it with its additional versatility. Growth factors and chemotactic signaling molecules in ddACM activate wound healing responses while the extracellular matrix proteins of ddACM scaffold critical cellular processes, including attachment, migration, and new tissue deposition. In the treatment of periodontal pockets, a procedure in which barrier membranes are not traditionally used, the placement of ddACM serves to prevent bacterial recolonization while simultaneously activating would repair processes and providing substrates for cellular migration and new tissue deposition. The rationale for ddACM use in oral regenerative procedures arose from documented use of placental tissues and ddACM specifically in the medical arena. ddACM is proving to be an effective product in the treatment of chronic wounds, including diabetic foot ulcers, venous ulcers, and burns [20-23].

Conclusion

Based on the same ddACM technology, MiMedx (Marietta, GA, USA) offers a portfolio of dehydrated human amnion-chorion membrane products that are quickly gaining market share due to their efficacy in treating these hard-to-treat indications. Like dental and periodontal indications, chronic wounds are characterized by high bacterial loads that benefit from both the barrier function and antimicrobial activity of the ddACM product. In addition, chronic wounds are often accompanied by co-morbidities (i.e., diabetes, poor vascularity, etc.) that benefit from the active stimulation and support of wound healing processes that ddACM also provides.

References

1 Tonetti MS, Jepsen S, Jin L, Otomo-Corgel J (2017) Impact of the global burden of periodontal diseases on health, nutrition and wellbeing of mankind: A call for global action. J Clin Periodontol 44: 456-462.

2 Palmer A (2013) Periodontitis among adults aged≥ 30 years—United States, 2009–2010. CDC Health Disparities and Inequalities Report—United States. MMWR Supplements 62: 129.

3 Eke PI, Dye BA, Wei L, Slade GD, Thornton-Evans GO, et al. (2015) Update on prevalence of periodontitis in adults in the United States: NHANES 2009 to 2012. J Periodontol 86: 611-622.

4 Page RC, Kornman KS (1997) The pathogenesis of human periodontitis: An introduction. Periodontol 14: 9-11.

5 Bonito AJ, Lux L, Lohr KN (2005) Impact of local adjuncts to scaling and root planing in periodontal disease therapy: a systematic review. J Periodontol 76: 1227-1236.

6 Smiley CJ, Tracy SL, Abt E, Michalowicz BS, John MT, et al. (2015) Evidence-based clinical practice guideline on the nonsurgical treatment of chronic periodontitis by means of scaling and root planing with or without adjuncts. J Am Dent Assoc 146: 525-535.

7 Smiley CJ, Tracy SL, Abt E, Michalowicz BS, John MT, et al. (2015) Systematic review and meta-analysis on the nonsurgical treatment of chronic periodontitis by means of scaling and root planing with or without adjuncts. J Am Dent Assoc 146: 508-524.

8 Kjaergaard N, Hein M, Hyttel L, Helmig RB, Schønheyder HC, et al. (2001) Antibacterial properties of human amnion and chorion in vitro. Eur J Obstet Gynecol Reprod Biol 94: 224-229.

9 Ashraf H, Font K, Powell C, Schurr M (2019) Antimicrobial activity of an amnion-chorion membrane to oral microbes. Int J Dent 2019:7.

10 Koob TJ, Young CS, Lim JJ, Chinn K, Massee M, et al. (2016) A primer on amniotic membrane regenerative healing. MiMedx 170.

11 Massee M, Chinn K, Lei J, Lim JJ, Young CS, et al. (2016) Dehydrated human amnion/chorion membrane regulates stem cell activity in vitro. J Biomed Mater Res 104: 1495-1503.

12 Koob TJ, Lim JJ, Massee M, Zabek N, Rennert R, et al. (2014) Angiogenic properties of dehydrated human amnion/chorion allografts: therapeutic potential for soft tissue repair and regeneration. Vascul Cell 6: 1-10.

13 Koob TJ, Rennert R, Zabek N, Massee M, Lim JJ, et al. (2013) Biological properties of dehydrated human amnion/chorion composite graft: implications for chronic wound healing. Int Wound J 10: 493-500.

14 Maan ZN, Rennert RC, Koob TJ, Januszyk M, Li WW, et al. (2015) Cell recruitment by amnion chorion grafts promotes neovascularization. J Surg Res, 193: 953-962.

15 Holtzclaw D (2015) Maxillary sinus membrane repair with amnion–chorion barriers: A retrospective case series. J periodontol 86: 936-940.

16 Cullum D, Lucas M (2019) Minimally invasive extraction site management with Dehydrated Amnion/Chorion Membrane (dHACM): Open-socket grafting. Compend Contin Educ Dent 40: 178-183.

17 Rosen P, Yardley PA (2012) BioXclude Amnion Chorion Allograft in Combined Therapy for Ridge Augmentation with Immediate Implant Placement: A Case Report. Bioxclude/Snoasis Medical.

18 Paul S, Stuart J, Cohen D (2015). Consecutive case series using a composite allograft containing mesenchymal cells with an amnion chorion barriers to treat mandibular class III/IV furcations. Int JPeriodon Restor Dent 35: 453-60.

19 Koob TJ, Lim JJ, Zabek N, Massee M (2015) Cytokines in single layer amnion allografts compared to multilayer amnion/chorion allografts for wound healing. J Biomed Mater Res 103: 1133-1140.

20 Zelen CM, Snyder RJ, Serena TE, Li WW (2015) The use of human amnion/chorion membrane in the clinical setting for lower extremity repair: A review. Clin Podiatr Med Surg 32: 135-146.

21 Garoufalis M, Nagesh D, Sanchez PJ, Lenz R, Park SJ, et al. (2018) Use of dehydrated human amnion/chorion membrane allografts in more than 100 patients with six major types of refractory nonhealing wounds. J Am Podiatr Med Assoc 108: 84-89.

22 Puyana S, Ruiz S, Elkbuli A, Bernal E, McKenney M, et al. (2020) The use of dehydrated human amniotic membrane versus amniotic/chorionic membrane allografts to treat partial thickness facial burns. J Craniofac Surg 31: 201-203.

23 Berhane CC, Brantley K, Williams S, Sutton E, Kappy C (2019) An evaluation of dehydrated human amnion/chorion membrane allografts for pressure ulcer treatment: A case series. J Wound Care 28: S4-S10.