

Treatment of Intrabony Defects by Polylactic Acid Matrix Barrier— A One-Year Follow-Up Study

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ABSTRACT: The present investigation was conducted to evaluate the effect of a polylactic acid-citric acid softened membrane barrier during guided tissue regeneration (GTR) surgery on human intrabony defects. Eighteen patients were treated in the study and 16 patients completed the 1-year follow-up. In all, 27 intrabony defects were treated and clinical soft tissue measurements, including probing depth (PD), probing attachment level (PAL), and recession, were recorded. Results of the investigation demonstrated a significant reduction in PD (3.7 mm), a significant gain in PAL (4.2 mm), and a slight increase in recession (1.2 mm).

KEY WORDS: guided tissue regeneration, bioresorbable membranes, periodontal attachment, periodontal pockets

INTRODUCTION

Traditional periodontal surgical procedures have demonstrated the formation of a long junctional

epithelium instead of new attachment produced by guided tissue regeneration (GTR) [1]. Studies investigating wound healing have resulted in the development of GTR, which is based on the principle of the prevention of epithelial downgrowth on root surface tissue, thus preventing apical movement of epithelial cells toward connective and bone tissues. When this principle is accomplished, progenitor cells from both periodontal ligament (PDL) and bony defect marrow spaces may populate the defect clot space and form new collagen fibers attaching into new alveolar bone—i.e. new attachment.

Scantlebury [2] reviewed the five basic criteria for the development of a membrane barrier for guided tissue regeneration procedures. Briefly, a membrane barrier in order to be successful in its ability to perform under the guidelines of GTR surgery must: (1) be bio-compatible with human tissues, (2) be easily trimmed and placed in the oral cavity, (3) prevent downgrowth of gingival epithelial cells, (4) be capable of cell separation, and (5) provide a space for clot formation.

The present investigation was accomplished utilizing a bioresorbable membrane barrier which has been determined to fulfill the above five criteria and be absorbable in human tissues, thus obviating the need for a second surgical procedure.

PATIENTS AND METHODS

All patients were treated in a private practice setting. Eighteen patients began the study and 16 patients completed it. The age of the patients ranged from 40 to 68 years, with a mean age of 51. Ten patients were female and six were male. All were provided a complete periodontal examination, including a full-mouth set of radiographs. Probing depths (PD), PAL, and recession were recorded. All patients underwent scaling and root planing and were given oral home care instructions. Sites chosen for the study required at least a 6-mm PD and at least a 5-mm PAL with radiographic angular bone loss (Figure 1) following initial scaling and root planing. Patients were re-evaluated for surgical treatment, 4 to 6 weeks following scaling and root planing.

Before surgical intervention, PD, PAL and recession were recorded with the use of a 15-mm North Carolina periodontal probe (Hu-Friedy Instrument Co., Chicago).

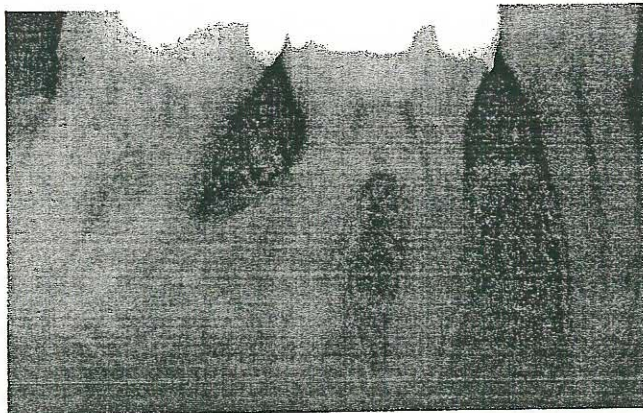


Fig. 1. Intrabony defect with previously placed alloplastic graft material.



Fig. 2. Intrabony defect following defect site and root preparation.

Probing depth and PAL were measured from the gingival margin and cemento-enamel junction (CEJ), respectively. Recession was measured from the CEJ to the gingival margin at the midlabial position of the root.

The surgical technique for the GTR procedure utilizing the polylactic acid-citric acid softened barrier, Guidor (Guidor AB, Bensenville, Illinois), for treatment of the intrabony defects is as follows. All surgical procedures were conducted under local anesthesia with full-thickness soft tissue flaps, with vertical releasing incisions as necessary for accessibility. Granulomatous tissue was removed by curette from the intra-osseous defects, and root surfaces were cleaned by ultrasonic and high-speed rotary water-cooled instrumentation (Figure 2). A molar curved and a curved Guidor membrane were chosen for GTR treatment of the molar and premolar defects, respectively. Membranes were trimmed with surgical scissors and sutured to position and secured with the preplaced ligature. The residual ligature ends were not cut and removed until membrane stability was assessed. If the matrix barrier bar or collar was snug and not movable, the ligature ends were removed and the barrier placement was complete (Figure 3). The full-thickness flaps were then occlusally positioned to completely cover the barrier by the use of interrupted vertical mattress sutures, utilizing 4-0 Vicryl (Ethicon, Somerville, NJ).

Patients were instructed not to brush the surgical sites for 6 weeks, but were prescribed a 0.12% chlorhexidine rinse, b.i.d. after meals. A mild analgesic was prescribed.

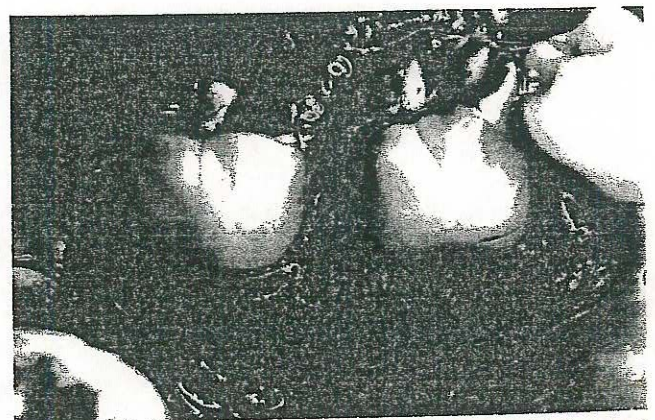


Fig. 3. Polylactic acid barrier placed over intrabony defect and stabilized.

Patients were seen at 1, 3, and 6 weeks postoperatively. Supragingival scaling was performed at these visits, with polishing as necessary. Periodontal maintenance visits continued at 3, 6, 9, and 12 months postoperatively. Subgingival scaling was allowed at the 6-month maintenance visit. Final soft tissue measurements, PD, PAL, and recession were recorded at the 12-month visit. A final postoperative radiograph was also obtained.

RESULTS

Results of this investigation have been based on 16 patients in the treatment of 27 intrabony defect sites. Presurgical PD ranged from 5 to 12 mm, with an average of 6.7 mm. Presurgical PAL ranged from 5 to 13 mm and averaged 6.6 mm, and recession ranged from -1.0 mm to -5.0 mm, with a mean of -0.3 mm. Postsurgical PD ranged from 0.5 mm to 6 mm, with a mean of 3.7 mm. Periodontal attachment levels gained a mean of 4.2 mm in an overall range of 2 to 8 mm. Postsurgical recession ranged from -1.0 mm to 6.0 mm, with a mean of 1.2 mm.

A paired *t* test was utilized to determine statistical significance in the change of PD, PAL, and recession, following 1 year of postoperative healing. Probing depth change demonstrated a significant reduction ($P < .00001$), with a mean change of 3.7 mm. Periodontal attachment levels demonstrated a significant gain ($P < .00001$), with a mean gain of 4.2 mm. Increase in recession was significant ($P < .0002$) at 1 year post-surgery, with an average of 1.2 mm and a change of -1.3 mm compared to presurgical measurements (Table 1).

Table 1

Soft Tissue Measurement	Pre-surgery	1 Year Post-surgery
Probing Depth Level	6.7 mm	3.7 mm
Periodontal Attachment	6.6 mm	4.2 mm
Recession	-0.3 mm	1.2 mm

Radiographic analysis demonstrated increased bone density and bone fill at the original bony defect sites. The angular defects appeared to be obliterated with bony tissue (Figure 4).

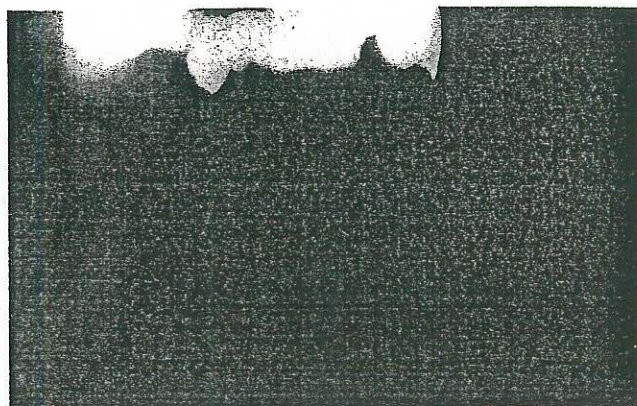


Fig. 4. Remineralization of molar intrabony defect at 1 year post-treatment.

DISCUSSION

This 1-year follow-up investigation demonstrated significant reduction in PD, gains in PAL, and minimal changes in recession following GTR surgery utilizing a polylactic acid-citric acid softened matrix barrier. This present study shows results comparable to those of other studies utilizing both nonresorbable and resorbable devices. In the case of recession, the present study shows an increase of 1.2 mm which is comparable to that reported by Gottlow [3] and Becker and Becker [4], of 2.2 mm and 1.2 mm, respectively. Attachment levels demonstrated a mean gain of 4.2 mm, comparable to 4.1 mm reported by Becker and Becker and 4.9 mm reported by Gottlow.

All defects were treated without the use of bone supplements or bone graft materials. The GTR surgical procedure was performed with the membrane barrier alone and the formation of a stable blood clot beneath the barrier and within the confines of the bony defect. The undifferentiated mesenchymal cells from marrow spaces [5] and periodontal ligament-generated fibroblasts [6] have been shown to have the capability of providing new attachment, i.e., insertion of new collagen fibers into new cementum and alveolar bone.

At the present time studies are being carried out to assess the possibility of using an absorbable pin [7,8] to assure clot space by "tenting" the membrane barrier device, to provide the maximum allowable space for clot formation. Furthermore, the absorbable pin might act as the absorbable vehicle to introduce tissue growth factors to the intrabony defect site. Further research studies are necessary to investigate these and other unanswered hypotheses.

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