SHORT COMMUNICATION

Fibrin Sealant as an alternative for Sutures in Periodontal Surgery

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ABSTRACT

The trial compared wound healing clinically, histologically and morphometrically after the use of fibrin sealant and sutures for periodontal flap closure. Ten patients were selected for this split-mouth randomized controlled clinical trial. On the test site fibrin sealant (F) was applied for flap closure after periodontal flap surgery (n = 10) and on the control site sutures (S) were used (n = 10). Clinically wound healing was observed at 7, 14 and 21 days and biopsy was taken on the 8th day. At seventh day better healing was observed in fibrin sealant site. Histologically mature epithelium and connective tissue formation was seen in fibrin sealant site with increased density of fibroblasts (F = 70.45 ± 7.22; S = 42.95 ± 4.34, $p < 0.001$) and mature collagen fibers. The suture site had more number of inflammatory cells (S = 32.58 ± 4.29; F = 20.91 ± 4.46, $p < 0.001$) and more number of blood vessels (S = 11.89 ± 3.64; F = 5.74 ± 2.41, $p = 0.005$). Fibrin sealant can form a better alternative to sutures for periodontal flap surgery.

Key words: *Fibrin sealant. Histology. Morphometry. Tissue adhesive. Wound healing.*

Establishing a non-tension primary wound closure of various soft-tissue flaps is essential for optimal postsurgical wound healing.[1] Suturing is a common procedure done for this but it is time consuming, may get infected, with scarring, requires technical skill and understanding and an additional patient visit for its removal.[2] In search of a solution of these problems, concept of tissue adhesive came forward. Fibrin sealant is a synthetic substance used to create fibrin clot.[3] It is composed of fibrinogen and thrombin where thrombin acts as an enzyme and converts the fibrinogen to fibrin which can act as a tissue adhesive.[3] Fibrin sealant in addition to adhesive property also has an anti-enzymatic effect which promotes fibroblast aggregation, their growth and adhesion.[4]

The aim of the trial was to compare wound healing clinically, histologically and morphometrically after the use of fibrin sealant and sutures for periodontal flap closure. The specific objectives were to compare the number of fibroblasts, inflammatory cells and blood vessels in both test and control sites after 8 days of wound healing.

Ten patients were selected for this pilot single-centered intra-individual longitudinal phase-IV trial, from the Out-patient Department of Periodontics. The study was conducted from January to March, 2011. For inclusion in this study the subjects had to be between the ages of 18 and 60 years, have at least 4 teeth of either quadrant in a single jaw with pockets of ≥ 6 mm. The subjects were excluded if they had history of systemic disease, pregnancy or lactation, undergoing antibiotic or other antimicrobial therapy, undergone periodontal therapy in the past 6 months, or exhibiting poor plaque control after phase-I therapy. Since the test and control sites were present in same patient the first side to be operated was determined by a coin toss and after the debridement of the surgical site another coin toss was done to determine the flap approximation technique.

Surgical treatment was scheduled after 6 and before 10 weeks of initial periodontal therapy. All surgical procedures and fibrin sealant application were performed by a single periodontist (SJ) in order to prevent inter-operator variations. After anaesthesia, mucoperiosteal flap was raised and thorough debridement and root planning of the exposed root surfaces was done. On the test site, fibrin sealant (Reliseal®, Reliance Life Sciences) was applied. Reconstitution of fibrin sealant was done as per manufacturer's instruction. The final solution was applied on the under surface of the raised flap upto 2 mm from the coronal margin and repositioned back on to the root surface. Thereafter, the tissues were kept in position by the gentle pressure of wet gauze for 30 – 60 seconds. On the control site, the periodontal flap was elevated as in test site and was approximated using 3-0 black silk suture (independent loop sutures) (Johnson Ethicon®). Patients were instructed to rinse twice daily with 0.12% chlorhexidine. Patients were then recalled after 7 days for suture removal and clinical parameter were analyzed at 7, 14 and 21 days. Biopsy of gingival tissues was taken on the 8th day.

Histologically the epithelium and the underlying connective tissue stroma were examined with the help of

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H&E stain and Masson's trichrome stain. For morphometric analysis, sections were analyzed with a calibrated grid mounted in a light microscope.[5] The number of fibroblast, inflammatory cells and blood vessels were calculated by counting cells on the grid. Morphometric parameters were calculated with mean and standard deviation for each variable. Paired t-test was done to reveal any overall statistically significant difference between test and control samples. Differences with a p-value ≥ 0.05 at a confidence level of 95% were considered significant.

Immediately after surgery, in each case bleeding subsided quickly after the application of fibrin sealant than after suturing. Tissues were attached to the underlying layer within five minutes after the application of the sealant, while the tissues treated by sutures were still movable after completion of suturing. No post-operative complications such as swelling, bleeding or edema were observed in any patient. The amount of fibrin sealant used averaged 0.2 – 0.3 ml on both buccal and lingual aspects on each tooth. At 7th day examination postoperatively, a red halo around sutures was usually evident on the control site. Oedema was negligible on both sites. Most patients did not notice any subjective difference between the two sites but 3 patients noticed discomfort on the sutured site. Also discomfort was often noticed during suture removal. Clinical re-examination of the patients at 14th and 21st days postoperatively did not reveal any meaningful difference between test and control sites.

Histologically, the test site showed adequately formed epithelium with rete ridges formation, and characterized by young connective tissue. More number of fibroblasts was seen and comparatively less number of inflammatory cells and blood vessels. Higher density of collagen fibers was seen which was regularly arranged in the connective tissue stroma. At control site, the epithelium was still immature and thin epithelial rete ridges were seen. In the connective tissue the inflammatory characteristics were more pronounced. The mean number of fibroblasts were higher in test site (70.45 ± 7.22) than control site (42.95 ± 4.344) and it was statistically significant (p = 0.000). The number of blood vessels and inflammatory cells were more in control site (11.89 ± 3.64; 32.58 ± 4.29) than test site (5.74 ± 2.41; 20.91 ± 4.46) and the difference was statistically significant (p = 0.005, Table I).

Table I: Comparison of healing characteristics between fibrin sealant (test) and sutured (control) flaps.

Cells	Test (mean ± SD)	Control (mean ± SD)	p. Paired t-test Significance p
Fibroblast	70.45 ± 7.22	42.95 ± 4.344	< 0.001
Blood vessels	5.74 ± 2.41	11.89 ± 3.64	0.005
Inflammatory cells	20.91 ± 4.46	32.58 ± 4.29	< 0.001

Fibrin sealant is easier and quicker to use than sutures. Fibrin sealant enhances early wound healing and stimulate repair proved by morphometric and histological analysis. The fibrin sealant provides tissue fixation without any injury, this property is very useful for fixing flaps, even in microsurgical procedures. Fibrin sealant can thus form a better alternative and an effective means for fixing tissues after periodontal surgery.

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