CLINICAL COMPARITIVE STUDY ON SOFT TISSUE DEFECTS IN SIEBERTS CLASS I RIDGE USING COLLACOTE ™ IMPREGNATED WITH PLATELET RICH PLASMA TO AUTOGENOUS CONNECTIVE TISSUE GRAFT - 3 MONTH STUDY

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CERTIFICATE

This is to certify that this dissertation titled, **CLINICAL COMPARITIVE STUDY ON SOFT TISSUE DEFECTS IN SIEBERTS CLASS I RIDGE USING COLLACOTE ™ IMPREGNATED WITH PLATELET RICH PLASMA TO AUTOGENOUS CONNECTIVE TISSUE GRAFT - 3 MONTH STUDY** is a bonafide record work done by Dr.V.Nandhini during her postgraduate study period 2008-2011. This dissertation is submitted to the TAMILNADU DR.MGR MEDICAL UNIVERSITY in partial fulfillment for the degree of **MASTER OF DENTAL SURGERY, BRANCH – II PERIODONTICS.** It has not been submitted (partial or full) for any other degree or diploma.

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LIST OF ABBREVATIONS

ACS- Absorbable collagen sponge

BMP- Bone Morphogenetic Protein

PBBM- Porous Bovine Bone Mineral

CTG-Connective Tissue Graft

ELISA – Enzyme Linked Immunosorbant Assay

ECM-Extra Cellular Matrix

FDBA- Freeze Dried Bone Allograft

FGF- Fibroblast Growth Factor

GTR-Guided Tissue Regeneration

IGF- Insulin Growth Factor

MCC- Micro Crystalline collagen

MCAS-Modified Customized Acrylic Stent.

PDGF- Platelet Derived Growth Factor

PBCM- Porous Bovine Collagen Membrane.

PRP –Platelet Rich Plasma

RRR – Residual Ridge Resorption

TGF- Transforming Growth Factor

VEGF- Vascular Endothelial Growth factor

WKT-Width of the keratinized tissue

Abstract

BACKGROUND:

The present study was to compare and evaluate the clinical outcome of soft tissue defects in Class I Seibert's Ridge following soft tissue augmentation with the absorbable collagen (CollaCote^{TM}) impregnated with platelet rich plasma to autogenous connective tissue graft.

MATERIALS & METHOD:

Eighteen patients were selected from the Outpatient pool of the Department of Periodontics, Ragas Dental College & Hospital, Chennai for this comparative clinical trial. The horizontal soft tissue ridge was augmented using absorbable collagen (Collacote^{TM}) impregnated with platelet rich plasma to autogenous connective tissue graft .

All these patients exhibited Seibert's type I ridge defect, in the anterior region. Prior to their enrollment in to the study the entire surgical procedure and its outcome were explained to the patients following which an informed consent was obtained. All selected patients were assessed clinically for mean width of keratinized gingiva, changes in papillary height, horizontal dimensional change at mesial, midbuccal and distal region and vertical defect morphology at baseline and after 3 month follow-up. Statistical analysis was done using non parametric test- 'Mann –Whitney U test'.

RESULTS:

At the end of the 3 month period, there was no significant increase in the mean width of keratinized gingiva or vertical defect measurement in both the test and the control groups. However, there was a significant average increase in the horizontal dimension of the ridge in both the test and the control groups . (82% in group A and 79% in group B). Similarly,

papillary height measurements in group B(control) showed an average increase of 1.39±0.22 when compared to group A(mesial papailla-1.72±0.51,distal papilla-1.67±0.43)

CONCLUSION:

The present clinical study clearly demonstrates the use of the collagen sponge (Collacote™) impregnated with PRP to that of Connective tissue graft as a predictable treatment modality in the soft tissue defect of Seibert's Class I ridge regardless of the initial gingival biotype, indicating that the thin gingival biotype can be converted to the thick gingival biotype morphologically and behaviouraly after this procedure . In patients with thin palatal mucosa where the connective tissue of proper thickness cannot be harvested , Collacote™ with PRP can be a viable alternative to CTG in treating soft tissue ridge defects

KEYWORDS: soft tissue ridge augmentation/absorbable collagen sponge/ PRP/,connective tissue autograft

INTRODUCTION:

Localized alveolar ridge defects refer to volumetric deficit of limited extent of bone and the soft tissue within the alveolar process[77]. The loss of the residual ridge defect occurs as a result of traumatic avulsion, previous /existing periodontal disease, traumatic tooth extractions, hard tissue pathology or other surgical procedures. After extraction, the overlying soft tissue collapses with in the socket wall, creating an unfavorable contour that makes it difficult to fabricate a future prosthesis which is aesthetical[20]. Even if the volume of bone is maintained by ridge preservation procedures, the loss of soft tissue and papillary height is sufficient to cause compromised esthetic outcome of functional prostheses.

The height and width of the residual ridge at the edentulous site decides the type of pontic that will be seated on the ridge and in all probability should mimic the appearance of its neighboring teeth to the greatest possible extent. Residual ridge defects in the anterior region with fixed partial crowns can be unaesthetic because of dark interdental spaces (black triangles) [89], long clinical crown not resembling the natural teeth in terms of size, shape and contour[22]. Thus the integrity of the soft tissue below the existing prosthesis forms a basis for pleasing prosthesis.

Literature abounds with a plethora of prosthetic[20] and surgical options[7, 81] for improving esthetics in patients with ridge deformities. In terms of prosthetic designs, esthetic outcomes can be enhanced by the modified pontic design or pink ceramic in the cervical region. Surgical options for such soft tissue defects are treated using soft tissue autogenous graft and alloplastic material.

Soft tissue augmentation techniques include the commonly used autogenous grafts such as the roll technique[6], pouch procedure and connective tissue grafts[1,78], inter-positional grafts[88], onlay graft procedures[81] and a combination of soft tissue graft procedures[1] which are all documented in scientific literature. However, clinical predictability were obtained using Connective tissue autogenous graft in sieberts class I ridge defects[42,7] which to this day remain the "gold standard".[83]

Autogenous graft requires meticulous surgical skill to harvest an ideal graft in terms of sufficient length, width and thickness. Moreover, the thickness of the palatal mucosa is dependent on the age, gender, body mass index[100] and to the phenotype of the gingival tissue[54]. The main drawback of palatal surgery for the tissue harvestation is the second surgical site, post operative pain, discomfort and hemorrhage accounting for the reluctance of a significant number of patients avoiding treatment of such defects. Therefore, other viable alternatives which obviate the need for a second surgical site such as the allogenic soft tissue graft materials like alloderm[26], silk gel[63], live cell tissue construct[107] and collagen[101, 82, 74] are very much in vogue today. Of all these materials, Collagen seems to be the most favorable substitute of soft tissue graft because of its highly porous structure, stable three dimensional network ,non-toxicity and biodegradable material which is readily available[84,90,66,68] in different forms. It is commercially available as Collacote[tm] (zimmer) (3/4" x 1 1/2" 10", 2 cm x 4 cm) and is derived from the bovine deep flexor (achilles) tendon and has been commonly used in periodontal surgery as a tissue scaffold[101,53]. It is a modified type I collagen, endowed with a high absorbent quality (ability to absorb many times of its own weight of saline solution)[73,80] . Further more, the spongy nature of Collagen provides a three-dimensional matrix for additional strengthening of the blood clot, in addition it enhances chemotaxis for fibroblasts, there by accelerating the wound healing[107].

Biomimetic principles are used to enhance and accelerate the wound healing process in the esthetic, regenerative periodontal surgery. Various biological mediators such as growth factors, BMP and cytokines are used in periodontal regenerative procedures. PRP is one such biological mediator with a high source of growth factors, especially PDGF and TGF-β[58] . The rationale for using PRP is its easy availability, being autologous with minimal cross reactivity[25]. Various allogenic bone grafts have been used along with PRP as it improves material handling, while concurrently providing rapid vascularization of the graft at the periodontal defect[25] .Similarly, this mediator can be used to enhance soft tissue regeneration and healing of the wound in the mucogingival defect[16,28,31,91]

Over the recent years, absorbable collagen sponge (Collacote™) impregnated with PRP has been generously used in correcting mucogingival defects [38, 91].

Taking into consideration the above mentioned objectives, this clinical study makes an attempt to compare and clinically evaluate the effectiveness of Collacote™(Zimmer) (3/4" x 1 1/2" 10", 2 cm x 4 cm) impregnated with platelet rich plasma as against the autogenous connective tissue graft in the augmentation of Sieberts class I alveolar ridge defect.

Aim & Objective

Aim & Objective

1. To compare and evaluate the clinical effect of absorbable collagen (CollaCote^{TM}) impregnated with platelet rich plasma over autogenous connective tissue graft in the treatment of soft tissue defect in Seibert's Class I ridge with a follow up period of three months.

Review of Literature

Residual ridge resorption is the morphological change of the alveolar bone that occurs following tooth extraction[3]. Soft and the hard tissue resorption following the extraction of the anterior tooth creates contour that makes if difficult or impossible to make esthetic, functional prosthesis. Such ridge defect of more than 3mm of the original contour[102, 98] prevents the establishment of harmony, balance and continuity of form between the fixed restoration and the adjacent teeth with in the esthetic zone.

Soft tissue resorption following the removal of anterior teeth presents a challenge for the restorative treatment. Therefore guided soft tissue augmentation is often prerequisite for fixed partial restoration especially in the esthetic zone[89]. Clinical situation that require the augmentation include trauma, presence of periapical pathosis and periodontal disease[2]. All these conditions results in the lack of both the hard and soft tissue volume. During healing phase, the overlying soft tissue collapse into the bony defects, with the labial aspect being the principal site for resorption which first reduces in width than height[18, 41]. Thus the localized ridge defect complicates or hinders the effort to obtain the good esthetics during restorative dentistry especially in the anterior esthetic zone.

Atwood et al in 1972[2, 3] has described residual ridge resorption (RRR) as morphologic changes of the alveolar process following tooth extraction. He studied the bone loss patterns of edentulous alveolar ridges and suggested various etiologic factors that cause Residual Ridge Resorption (RRR) and categorized the factors in four major groups[3] as follows:

- Anatomic,
- Prosthetic

- Metabolic
- Functional.

Lam[41] et al 1960, in a clinical study assessed 20 patients who underwent extraction of the maxillary anteriors and demonstrated that maximum loss of soft tissue following extraction took place during the first month (approximately 70-90%) and one year post operatively ,the loss in labial thickness was in range of 3.0-5.6mm.

Cawood & Howell[18] et al in 1988, cross sectional study from the sample of 300 dried skull showed that the resorption of the tissues after tooth loss followed predictable pattern. The labial aspect of the alveolar crest is the principal site of resorption which first reduces in width and later in height.

Christopher H.Hawkins et al 1991[19], Prospective study assessed the effect of the ridge contour on the function and esthetics of the maxillary anterior fixed prosthesis. The results of the study suggested that the patients with the class I ridges have moderatively subjective level of satisfaction except for the noted changes in the gingival adaptation.

Lars Schropp 2003[76], Prospective study assessed the bone and the soft tissue changes after the extraction of the molars and premolars in 46 patients over a 12 month period by means of measuring the study casts, linear radiographic analyses and subtraction radiography. The results demonstrated that major changes of an extraction site occurred during 1 year after tooth extraction.

Van Kestern et al 2010[97], Prospective randomized controlled study evaluated soft tissue changes in the midbuccal and proximal mucosal positions after tooth extraction from 3 to 6 months following extraction at implant placement sites. The midbuccal soft tissue margins showed minimal recession over 6 months from the time of extraction (mean 0.17 ± 0.47 mm). Interproximal tissue height decreased significantly from extraction to 6 months (mesial, 1.73 ± 0.71 mm; distal, 1.48 ± 0.80 mm).

CLASSIFICATION OF RIDGE DEFECTS

Various authors have proposed numerous classifications for ridge defects. **Seibert et al in 1983**[81] performed a study on reconstruction of deformed partially edentulous ridges using full thickness onlay grafts and he proposed a classification for ridge deformities.

SEIBERT'S CLASSIFICATION FOR RIDGE DEFORMITIES (1983)[81]

Class I: Buccolingual loss of tissue contour with normal apicocoronal height

Class II: Apicocoronal loss of tissue with normal buccolingual contour.

Class III: Combination of buccolingual and apicocoronal loss.

Allen in 1985[1] further modified the classification technique for localized ridge augmentation with quantification of the amount of soft tissue loss.

Type A: Apicocoronal loss of ridge contour

Type B: Buccolingual loss of ridge contour

Type C: Combined buccolingual and apicocoronal loss

The depth of the defect can be further classified by vertical component.

Mild: Less than 3mm

Moderate: 3-6mm

Severe: Greater than 6mm.

The morphology of the ridge defect should be considered as it will determine the technique to be used for ridge augmentation. Mucogingival reconstruction may be required if the ridge deficiency is within 3mm of its original contour, which can be achieved using soft tissue augmentation procedures such as pedicle connective tissue grafts and free onlay and inlay connective tissue grafts harvested from palatal mucosa[98,102]

David B.garber[20] in I981 Soft tissue component of the ridge defect can be defined as the adequate and the inadequate ridge for prosthetic restoration

- Flat (normal) ridge
- Collapsed ridge:
    1. Horizontal
    2. Vertical

CLASSIFICATION OF RIDGE AUGMENTATION TECHNIQUES ACCORDING TO RIDGE DEFECT (David B.Garber)[20]

Ridge defect	***Procedure***
Horizontal	connective tissue/subepithelial connective tissue graft
	Using flap/pouch procedures.
Vertical	Pediculated connective tissue graft(roll technique)
	Combined onlay ,inter-positional graft(wedge technique)

Rosenberg et al in 1993[69], Review article outlined the etiology of ridge deformities and the procedures that can be executed to achieve an esthetic, functional result. Various soft-tissue mucogingival techniques utilizing the autografts to augment collapsed ridges showed predictable results. This article states that the ridge augmentation can also be achieved through the biomaterials such as allograft, bioglasses, guided tissue regenerative procedures, and tissue expansion techniques that were previously proved to regenerate the lost periodontium.

Studer et al 1997[77] in a review article gave a proposal on the semi quantitative classification of the ridge and the various soft tissue augmentation procedures dependent on the severity of the vertical and the horizontal loss. He proposed roll flap technique where the problem is related to the ridge quality (single tooth defect with less vertical or the horizontal loss). Larger defects, in which a volumetric problem can be corrected through the subepithelial connective tissue technique. In cases with the additional mucogingival problems onlay graft is favored.

SOFT TISSUE RIDGE AUGMENTATION TECHNIQUES:

Until the 1980s, aesthetic dentistry focused its attention primarily on the replication and improvement of tooth structure by developing modifications of porcelain-fused-to-metal crown restorations[23, 62,71]. Over contoured pontic or the pink ceramic in the cervical region always had the esthetic outcome that was less than ideal. To overcome these problems

subepithelial connective tissue graft was first utilized by Langer et al in 1980[42] to augment the soft tissue. Siebert's et al in 1983[81] also considered that the Correction of mucogingival discrepancies is a prerequisite to mimic the normal gingival contours and form a concave soft tissue recipient site for the desired convex pontic and used free gingival autograft for restoring the collapsed ridge. Rosenberg et al in 1993[69] outlined the various allogenic materials that can be used for soft tissue augmentation.

Siebert's in 1983[81], Prospective clinical study, treated 21 patients in anterior edentulous region with sieberts' class III ridge defects using full thickness onlay graft. After the multiple stage onlay graft procedure following the first surgical treatment, it was that the free gingival graft was effective in gaining the tissue height of 2-3mm.

Langer B, Calagna L et al in I980[42]**,** Prospective clinical study used pouch technique with sub epithelial connective tissue grafts secured in class I ridge defects followed by the cementation of the fixed prosthesis in 30 patients. Over 2 year follow period none of the grafts have failed or receded from the post operative healed position. The augmented ridge becomes dimensionally stable approximately 2months after the graft procedure.

Allen et al 1985[1]**,** in clinical comparative trial compared soft tissue augmentation technique with ceramic materials in 21 patients. All the Connective tissue grafted site exhibited post operative shrinkage in the first 4-6- weeks but remained stable for 3 years where as the patients treated with the hydroxyapatite crystals does not exhibit any shrinkage.

P.D Miller in 1986[52], case report presented single incision tunnel technique for managing ridge defects (Allen's type B or type C) under existing fixed restorations with connective tissue graft. The stability of the augmented site was assessed for a year. The initial shrinkage was observed in first 2 months but thereafter it remained stable for the observation period .

Abrams H et al in I980[6],Clinical case report followed roll technique for treating the mild to moderate defects(Siebert's class I or II) of the ridges where the de-epithelialized connective tissue pedicle graft from the palatal surface of the edentulous area is rolled in the buccal aspect of the defect leaving the bone denuded that is filled during the healing phase. The disadvantage of this technique is that the gain in the tissue volume is limited because of the small amount of the donor tissue available.

Scharf DR Tarnow DP in I992[87],A clinical case report, modified the roll technique with a trap door approach and preserved an epithelialised layer over the donor tissue thereby maximizing the amount of connective tissue ,minimizing the amount of exposed bone and reducing the post operative discomfort .

Studer S P 1998[83]**,** Comparative clinical trial compared and evaluated the short-term assessment of the volumetric behavior of class III ridge defects in 61 patients teeth using

connective tissue graft and free gingival graft for 3 months. The results of the study revealed that subepithelial connective graft (*2.6 mm)* showed more volumetric gain than the onlay graft (*1.3 mm)*

Studer S P et al 2000[83],Randomized comparative clinical trial compared subepithelial connective tissue graft and free gingival graft techniques to alter contours of single-tooth pontic space and quantified changes by 3-dimensional volume changes with the optical projection Moiré method at 1 and 3.5 months 24 patients. Volumetric assessment after 3.5 months revealed significantly greater volume gain with the subepithelial connective tissue (159 mm3 than for free full-thickness gingival graft group with (104 mm3).

Deigo Orlando *Gasparini* *2004*[22],Case report proposed "double fold connective tissue pedicle graft " to restore lost ridge area in a single tooth edentulous space . This procedure has the advantage to fold and roll the connective tissue grafts thereby achieving the increase in gain of the tissue volume, with the less risk and necrosis of the palatal flap.

Salama and Siebert's et al in I996[88] in a review of alveolar ridge preservation and reconstruction, reported several drawbacks of using free gingival onlay graft in the treatment of ridge defects since, the color of the graft did not match the recipient site and also the blood supply comes only from the underlying connective tissue thereby increasing the risk of graft necrosis.

Khoury F ,Happe A 2000[38],in a clinical trial to achieve the soft tissue reconstruction and to cover the defects associated with the maxillary implant supported restoration treated 103 patients with subepithelial connective tissue graft. Over observation for 32 months,

partial flap necrosis occurred in only 2 patients. All other patients showed significant improvement over the preoperative condition.

Guiha et al 2001[28], in an animal study histologically evaluated the healing and the revascularization on the connective tissue graft in the recession defects of the dogs. The histological results after 60 days showed the revascularization of the CTG originates from the periodontal plexus, the subperiosteal plexus and the overlying flap. The attachment of the graft to the defect site is mediated by the epithelial down growth and the connective tissue attachment.

Harris J and Miller et al in 2005[32], evaluated incidence and severity of complication in 500 consequently treated patients for whom connective tissue grafts were used for root coverage and soft tissue augmentation procedures. There was no pain reported in 81.4% of the patients, no bleeding in 97.0% of the patients, no infection in 99.2% of the patients, and no swelling in 94.6% of the patients. Based on the results of the study the incidence of complication after connective tissue graft is relatively low and clinically acceptable.

Corti et al in 2006[12], to detect the palatal artery assessed the maximum dimension of the connective tissue graft that could be safely taken from the palatal vault and the results showed that distance from the gingival to greater palatine artery ranged from 12mm at the canine level to 14mm at the mid palatal aspect of the second molar .therefore in the premolar area there is possibility of harvesting 5mm of the graft in all cases and 8mm in 93% of cases.

Wara-aswapati N 2001[100]**,**case study evaluated the thickness of the palatal mucosa in association to the age and the gender. The thickness of palatal mucosa increased from the canine to second molar areas with the exception of the first molar area, and in the sites furthest from the gingival margin towards the mid-palate. The younger age group had significantly thinner mucosa (mean 2.8 +/- 0.3 mm) than the older age group (mean 3.1 +/-0.3 mm). Females had thinner mucosa than males in the same age group, but the difference was not statistically significant.

Lai YL 2007[47]**,** in a case report presented a protocol for the multidisciplinary approach that includes bone expansion, soft tissue augmentation using the connective tissue graft and provisional restoration for the immediate implant restoration with the ridge deficiency. The 18-month postoperative follow-up revealed that the implant was stable, the buccal depression of the surgical area was reconstructed. Papillae were augmented, and a harmonious soft tissue margin was achieved in the esthetic zone.

Matthews 2008[49], clinical case report discussed the single stage surgical approach for management of the soft tissue frame work in maxillary anterior esthetic zone when placing the immediate implant. The 2-year follow-up of the final prosthetic restoration presented the the stability of the harvested graft with the harmonious soft tissue margin and the functionally stable implant.

Joseph Y.K. Kan 2009[39], in a consecutive case report of 20 patients evaluated facial gingival tissue stability after immediate tooth replacement with connective tissue grafting in the esthetic zone. The mean facial level changes at the end of 2 years is +0.23 mm versus +0.06 mm and it was concluded that, the facial gingival level can be maintained after

connective tissue grafting, regardless of the initial gingival biotype, indicating that the thin gingival biotype can be converted to the thick gingival biotype morphologically and behaviorally.

Joao Carino 2005[38], in a case report where the palatal mucosa is thin before harvesting the connective graft for soft tissue augmentation, lyophilized bovine collagen sponge was surgically inserted at the prospective donor site. Eight weeks postoperative period, clinical sounding showed 3.5mm of tissue thickness at the site and histologically ,the donor tissue demonstrated fully absorbed collagen and replaced by normal connective tissue.

Eraldo L Batista in 200I[26],in a case series eight patients provided 18 sites corresponding to maxillary anterior teeth were evaluated with use of Alloderm in treating the soft tissue ridge defects before fixed prosthetic restoration. Over all mean horizontal gain of 58.5% and mean shrinkage of 41% was observed at 6 months. Clinically, 66% of the sites showed 1-2 mm of horizontal gain.

Walter et al in 2008[99]**,**illustrated in his case report the esthetic reconstruction of the moderate alveolar ridge defect (Siebert's class III) using a two staged approach ,combination of the onlay –interposition graft and the connective tissue graft. He concluded that Using different soft tissue grafting procedures might be helpful in planning and treating moderate alveolar ridge defects and the time for remodeling of the augmented tissues needs to be respected before the final prosthesis is placed.

Calesini et al 2008[11], proposed the new technique "edentulous site enhancement "prosthetic conditioning method for augmenting the localized alveolar ridge defect. In this case report to stabilize the connective coagulum a small portion of the absorbable collagen is

placed between the exposed crestal connective tissue and the apical portion of the pontic. Post operatively Bass brushing technique along with the stillman's technique improved the new environment and the esthetic integration of the prosthesis.

Olivier Etiene et al 2009[63], in a case report used a new three dimensional scaffold made up of silk fibrin in the soft tissue augmentation. The results showed that human fibroblasts embedded in the material had a survival rate up to 68.4% and were able to proliferate and synthesize the proteins. Histological evaluation revealed revascularization of the area through the biomaterial and mild inflammatory reaction was observed in the early stage of healing that disappeared after 12 week time.

ABSORBABLE COLLAGEN SPONGE CARRIER *:*

In the 1970s and the 1980s expanding medical applications of biomaterials and connective tissue research, the booming tissue engineering technology has given research in collagen material as scaffolds . Collagen sponges were originally developed as wound dressings and hemostyptic. The manufacturing which involves lyophilization of a dispersion of bovine Achilles tendon collagen, cross-linking and sterilization by chemical means makes the ACS to act as a carrier for growth factors and as a scaffold for new hard and soft tissue formation thus facilitating the surgical implantation and retention of the growth factors at the treatment site . Major benefits of collagen include their ability to easily absorb large quantities of tissue exudates, smooth adherence to the wet wound bed with preservation of this moist micro climate as well as its shielding against mechanical harm and prevention of secondary bacterial infection[68,106] . Besides these physical effects, collagen promotes cellular mobility and growth and inflammatory cells actively penetrate the porous scaffold[13,15,68] . This

allows a highly vascularized granulation bed to form and encourages the formation of new granulation tissue on the wound. As a consequence of the scaffolding properties and the positive effects on cellular activity collagen based spongoid matrices play an important role in tissue engineering research and in combinations with growth factors [41, 46,53,7380,96]. Growth factors used in the regeneration of the tissues have poor *in vivo* stability however impregnating the carrier with the growth factor allows it to release at a desirable rate and concentration, and to linger at injury sites for a sufficient time to recruit progenitors and stimulate tissue healing processes[82] .

Abbott WM et al 1975[5] ,in vivo study compared the topical haemostatic property of the microcrystalline collagen(MCC), oxidized cellulose cloth and the pressure alone . MCC achieved hemostasis more rapidly and frequently than pressure alone or oxidized cellulose cloth. On this basis it was concluded that MCC seems to possess greater potential as a useful adjunct during the surgical procedures.

Hunt LM et al 1976[32], Evaluated microcrystalline collagen preparation in the extraction wound model and the results showed that collagen created a slightly denser and longer lasting inflammation and slightly delayed the early phases of bone repair in wound model .

Levin MP et al 1979[47], in an animal model of dogs and rabbit, enzyme-solubilized calfskin collagen was placed over the surgery sites on one side and the contralateral sides acted as controls. Results indicated that the membrane was biologically acceptable to oral mucosa and the collagen did not cause any adverse reaction and there is clinical impression of slightly more rapid healing of gingiva.

Mian M et al 1992[56], reviewed the physiological and pharmacological role of collagen. Putative mechanism of collagen in wound repair are described with particular emphasis on hemostatic effect, interaction with the platelets and fibronectin ,properties of increasing fluid exudates and their cellular components(macrophages) and scaffold role for fibroblastic proliferation .

P.R. Hyder, P. Dowell,1992[67] in a in vitro study in murine model assessed the physical and biological properties of freeze-dried cross-linked bovine type I collagen . The histological results after 21 days, showed confluent fibroblast growth of both gingival and the periodontal ligament around and underneath the bovine sponge and also apparent proliferative effect of the supernatant with both gingival and periodontal ligament fibroblasts.

Yvorchuk –St Jean K et al 1995[105], in an animal study evaluated the effect of porous bovine derived collagen membrane(PBCM) on the rate of wound healing. Fibrin score, neutrophil score, and degree of inflammation were significantly greater in the PBCM-treated wounds and there is no stastical difference in the rate of wound healing. Application of a porous collagen bandage was not detrimental to full thickness cutaneous wound healing in horses .

Neil M. Bluementhal in 2002[61],specific carrier chacteristics for enhancing the periodontal regeneration adequate concentration of the factors must be appropriately localized ,sustained and released to the wound. The carrier must be clinically and mechanically manageable, biologically acceptable and support the wound stability and space provision.

PLATELET RICH PLASMA:

The use of platelet-rich plasma as a source of growth factors in bone and periodontal regeneration has been proposed. [57]. Autologous blood is drawn and separated into three fractions:

1. Platelet-poor plasma (fibrin glue or adhesive)
2. Platelet-rich plasma
3. Red blood cells

Platelets are enriched by 338% in the PRP preparation and the concentrations of platelet-derived growth factor and transforming growth factor – beta 1 in PRP have been reported to be 41.1 and 45.9ng/ml respectively. [44] and basic FGF-2, epidermal growth factor and vascular endothelial growth factor[27] and also high concentration of fibrinogen. In clinical use, calcium and thrombin are added to the PRP preparation to activate the proteolytic cleavage of fibrinogen into fibrin. The active secretion of the growth factors in PRP begins within 10 minutes after clotting. More than 95% of the presynthesized growth factors are secreted within 1 hour.2 Therefore, PRP is developed in an anticoagulated state and used within 10 minutes of clot initiation.[8,58] ,the growth factor protein secreted ,in turn ,sets the stages of wound healing ,which includes cellular chemo taxis, proliferation and differentiation ,removal of removal debris ,angiogenesis,laying of extracellular matrix and regeneration of appropriate type of tissue

Wagner PR 1996[103], in a series of in vitro tests, compared three types of the collagen sponges collagen ,gelatin, oxidized regenerated cellulose impregnated with the PRP, quantitatively in terms of their ability to mediate platelet aggregation, deposition and activation, and initiation of gross clot formation. The activity ranking generally reflects the materials used in these agents collagen > gelatin > oxidized regenerated cellulose, as well as their processing chemical crosslinking in collagen sponges may lower activity.

James D. Kassolis 2000[36],case series used freeze dried bone allograft and PRP in a concentration of 1:4 in treating 15 patients for sinus augmentation/ridge augmentation procedures. Though the degree of osseous regeneration following the use of FDBA is generally considerd acceptable,the ability of PRP to enhance the osseous wound healing improved the quality of regenerative outcome and reduce the healing time.

Neil M. Bluementhal in 2002[61],in animal study evaluated the regeneration of the periodontium following the surgical implantation of rhBMP-2 in an absorbable collagen sponge or the calcium sulphate putty carrier and the associated root resorption and ankylosis in the intra bony defects. Newly formed cementum in ACS device (2.32mm) is significantly greater than CaPO4 (1.2mm)group. Therefore refinement in the carrier system may provide a key to the enhancement of the periodontal regeneration

Jakse N,Gilli R 2003[35], in an experimental animal study assessed the effect of PRP and autogenous graft in sinus lift procedure. It was observed that PRP improves the handling and accelerated vascularization of the graft, enhanced soft tissue healing, less post operative morbidity. The advantage of using an autologous blood product includes no cross reactivity, immune reaction, or disease transmission.

Tomoyuki Kawase et al 2003[92],designed an in vitro study to investigate PRPs action on the extracellular matrix production in periodontal ligament and osteoblastic MG63 cell line Gel like fibrin clot is formed on cell culture within 30 min of addition of PRP . PRP changed the cell shape and upregulated the type I collagen in 24 hours this data suggests that fibrin clot in combination with growth factors present in PRP effectively promotes wound healing .

Terrence J .Griffin 2004[91],case report used platelet concentrate gel in a collagen sponge carrier(Collacote ^{TM}) combined with the coronally advanced flap procedures in treating the gingival reccesion. He observed 1.5mm of gain in keratinized tissue the width was observed after 6 months period and the treated site was strikingly mature after 2 week period.

Freymiller EG 2004[29],The application of PRP to full thickness skin wound improved overall healing by reducing the contraction and show a trend towards increased regenerative healing and stimulate angiogenesis. PRP has got more positive effect on healing rate, tissue fill and volume fraction of various cells and blood vessels during the first one week.

Camargo in 2005[18] , Compared the clinical effectiveness of combination therapy consisting of bovine porous bone mineral , guided tissue regeneration and platelet rich plasma in intrabony defects in a split mouth design. The experimental group presented with a significantly greater defect fill of(5.1±1.3mm) than the control sites .combining porous bovine bone mineral (BPBM) ,Guided tissue regeneration(GTR) and Platelet rich plasma (PRP) was an effective treatment modality in treating advanced periodontitis.

Masahiko Nagai 2005[59], examined the in vivo effects of the impregnated collagen sponge with platelet rich plasma in class II furcation defects of molars. The histological results showed 96.3% of the treated site with test group when compared with the control 83.4% .the cementum formation was found in 74.6% of the test groups. 12.9% of the control sites healed by the formation of the long junctional epithelium.

Lindeboom et al in 2006[45], Case report in bilateral sinus lift procedure evaluated the capillary density on oral mucosal wound healing with or without PRP. Wound healing was significantly accelerated in the PRP-treated mucosal wounds during the first 10 postoperative days. After the second week, no obvious differences between the PRP or placebo side could be noted. PRP has a strong stimulant effect on capillary regeneration, mainly noticeable during the early stages of wound healing. .

Duretti Fufa 2008[24]**,** in vitro study investigated and compared the use of type I collagen with bovine thrombin for activating PRP using ELIZA**.** The release of platelet-derived growth factor (PDGF)-AB, transforming growth factor (TGF)-1, and vascular endothelial growth factor (VEGF) from both types of clots was measured over 10 days using ELIZA. The use of collagen results in less clot retraction and equal release of PDGF-AB and VEGF compared with currently available methods of clot activation.

Tae –Gyun Kim 2009[96],evaluated the use of dose dependent implantation of rhPDGF-5 in an absorbable collagen sponge (ACS) carrier using an established periodontal defect model in an animal study. Surgical implantaton of the biological mediator in collagen carrier showed significant periodontal regeneration when compared with the control and it supported the wound healing/regeneration in intrabony defects without complication

Shyamal Chandra Bir 2009[79], in vitro study investigated to determine the effectiveness of sustained release PRP on endothelial cell proliferation in a murine model of hind limb ischemia**.** Sustained release of PRP using gelatin hydrogel can be a highly potent and effective modality for restoring blood perfusion to ischemic sites , because sustained release of PRP stimulates all possible aspects of vascular remodeling such as angiogenesis, arteriogenesis, and also vasculogenesis.

Georgios Kontovazinities 2008[31], Case series used PRP gel in a collagen sponge carrier (Collacote^{TM}) combined with the bioabsorbable membrane in treating gingival recession. Six months post operative results showed 2-3mm of reduction in the ridge defect and 1-2mm of reduction in clinical probing depth. In both the cases there was no change in keratinized tissue width .

Powell in 2009[16], case study histologically evaluated the flap strength of oral mucoperiosteal flap with and without addition of PRP determined by the histological examination. No histological difference in wound healing between the test and control group were seen at different time points. The study has concluded that the variability in the PRP count, may have contributed to the lack of positive findings in the study.

Sammartino et al in 2009[75], investigated the effect of collagan membrane and PRP on bone regeneration after the extraction of the 3rd molar extraction with the use of the PRP alone. Histiologically the association of the PRP to the collagen membrane showed the earlier sign of bone maturation but not a higher grade of bone regeneration.

Bard et al 2010[9]**,** randomized controlled parallel clinical trial assessed the soft tissue healing response with and without PRP when augmenting the ridge defect with the autograft.PRP groups showed statistically significant stability values than the control group, but no appreciable clinical effect could be observed when using PRP with autologous graft in the maxilla.

Torres J 2010[94], comparative clinical study investigated the effectiveness of the PRP in preventing the soft tissue dehiscence when augmenting the anterior ridge defect. Ti mesh exposure was seen in 28.5% of the control group where as been no exposure was seen in the PRP group. From the results of the study it was concluded that this positive effect of the PRP on preventing the soft tissue exposure is due to its capacity to improvise the soft tissue healing.

Materials &Methods

STUDY DESIGN:

Eighteen patients were referred to the Department of Periodontics, Ragas Dental College & Hospital, Chennai who are willing to go for fixed prosthesis with insufficient single edentulous residual ridge defect (Seibert's Type I). All these patients exhibited ridge defect, with single or two missing teeth in the anterior region and were clinically assessed for periodontal status before enrollment into the study. At the baseline examination the soft tissue deformities before therapy were documented with study casts, clinical photographs and clinical parameters

Patients were randomly divided to two groups for soft tissue augmentation using absorbable collagen impregnated with platelet rich plasma over autogenous connective tissue graft.

Group A (Test) received treatment with absorbable collagen (CollaCote^{TM}) impregnated with platelet rich plasma

Group B (control) have been rendered treatment with autogenous connective tissue graft only. The Clinical measurement were assessed preoperatively and reassessed post-operatively at baseline, 1 month and 3 months time interval. All 18 patients who participated in the study group were assessed throughout the study period for any complication including infection, inflammation, wound dehiscence and resorption. Clinical evaluation of the ridge defect was measured by a standard William periodontal probe and Modified Customized acrylic stent to measure the ridge dimension horizontally and vertically with the standard reference point and easy reproducibility during recall visits.

PATIENT SELECTION

Eighteen systemically healthy patients (males and 2 females) in the age group of 18 - 50 years, who were deemed from fixed partial denture because of insufficient ridge volume referred to the Outpatient Department of Periodontics, Ragas Dental College, Chennai. All these patients exhibited anterior edentulous spaces with Sieberts class I ridge defects. Patients were informed and written consent was obtained from each patient prior to his or her inclusion into this study.

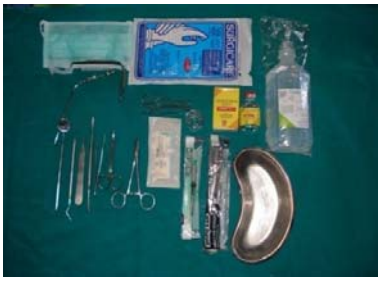
Inclusion Criteria:

1. Patient with Gingival index score <1 through the study period
2. No active periodontal disease present.
3. Single/multiple edentulous sites in the anterior region to enhance the esthetics of the fixed restorations.
4. The bone crest to CEJ of adjacent tooth distance not greater than 3- 5mm
5. No caries or the periapical pathology of the adjacent tooth. .

Exclusion Criteria:

1. Non compliant patient
2. Any systemic illness or drugs that can interfere with the treatment and the outcome of the therapy.
3. Patients with known risk factor or modifier.
4. Pregnant or lactating women

ARMAMENTARIUM



- Mouth mirror
- William's periodontal probe with marking up to 10mm(Equinox™)
- Tweezers
- Custom made Acrylic Stent(MCAS)- 2 Nos
- 2.5 ml disposable syringes (unilock) – 1 ½ inch
- Dappen dish – 2 Nos.
- Kidney trays – 1 No.
- 20 ml irrigation syringes – 3 Nos.
- Physiological saline 500ml bottles (0.9%W/V)
- 0.2% Chlorhexidine Mouthrinse
- Disposable suction tips
- Metal surgical suction tips (NO 4,5)
- 2% Lignocaine hydrochloride with 1:80000 Adrenaline.
- Bard Parker handle No. 3 – 1 No.
- Bard Parker blade No.15
- Austin's Cheek Retractor
- Periosteal elevator
- Surgical curettes(area specific1-14 nos)
- Curved Goldman fox scissors
- Tissue Holding forceps
- Needle holder
- 3-0 Mersilk non - absorbable sutures
- 4-0 Vicryl absorbable sutures

MATERIALS:

- Collacote™ (3/4"x11/2"10",2cmx4cm)
- I0% gluconate of calcium
- Heamocoagulase(Botropase ™)
- Sterile disposable test tubes.

CLINICAL PARAMETERS

All Clinical data regarding of the soft tissue dimensions at the augmented sites were collected at each visit by one calibrated examiner using a standard Williams periodontal probe. All measurements were made to the nearest 0.5mm. Custom made modified acrylic stent (MCAS) with reference point was fabricated for each patient to assist in the standardization of measurements[26]. Two modified acrylic stents (MCAS) were prepared, one for measuring the horizontal component of the soft tissue defect and the other for measuring the vertical component of the same defect ,papillary height.

The desired gain that would fulfill the requirements of ideal ridge contour was waxed up on the study casts. Acrylic copings were constructed around the teeth adjacent to the edentulous area to be treated ,and then an orthodontic wire was shaped to reproduce the gain and attached to the copings .color dotted markings were then made on the orthodontic wire at the point of the missing teeth to determine the exact point of measurement ,ensuring reproducibility during re- evaluation. The distance from the orthodontic wire to the buccal aspect of the defect was considered to be baseline horizontal component of the defect. The following marking were used as a reference point for reproducibility during recall visit at 3months postoperatively.

1. Mesiobuccal
2. Midbuccal
3. Distobuccal

The other MCAS is used to measure the papillary height and vertical component of the same defect.

Clinical Measurements (Eraldo L.batista 2001)[26]

Soft tissue measurement

The following soft tissue measurements were taken at baseline and 3 months.

1. **Width of the keratinized gingiva.**

   Width of attached gingiva – cementoenamel junction of the adjacent teeth to the mucogingival was measured at three regions, mesial, mid buccal and distal of the edentulous site and mean width of the keratinized gingiva was calculated during baseline, 1 month and 3 month period.

2. **Horizontal gain in soft tissue thickness**

   Soft tissue gain of the edentulous ridge in horizontal dimension at the mid of the edentulous ridge was measured with modified customized acrylic stent at baseline, 1month and 3 months at three regions

   - Mesiobuccal
   - Midbuccal
   - Distobuccal

Post operative change in the soft tissue dimensions was subtracted from the desired gain to measure the amount of the original gain of the tissue.

3. **Papillary height**

Papillary height adjacent to the edentulous site was calculated using the acrylic stent at baseline, 1month and 3months. Modified acrylic stent was used to measure the distance between the stent to the mid buccal preparatory margin(A) and the tip of the papilla(B). the papillary height was calculated by measuring the difference of the two values(A-B)

4. Vertical component of the defect

Vertical component of the same defect was measured at the centre of the crest using the acrylic stent at baseline, 1 month and 3months.

STATEMENT OF INFORMED CONSENT

Patient name: Date:

I have been explained about the nature and purpose of the study in which I have been asked to participate. I understand that, I am free to with draw my consent and discontinue at any time without prejudice to me or effect on my treatment.

I have been given the opportunity to ask questions about the procedure. I have also given consent for taking photographs and blood samples for the study purpose. I have fully agreed to participate in this study.

I hereby give consent to be included in the clinical study "Clinical Comparative on soft tissue defects in Sieberts class I ridge defects using the absorbable collagen sponge (Collacote^{TM}) impregnated with PRP to autogenous connective tissue graft"

Signature of the PG Student Signature of the patient

Signature of HOD

SURGICAL PROCEDURE

All the patients enrolled in the study at the initial examination were assessed for the clinical parameters. Surgery was carried out under aseptic sterile condition. The patients preoperatively rinsed with 10ml of 0.2% Chlorhexidine mouthwash.

Local anesthesia with Lignocaine Hydrochloride 2% with adrenaline 1: 80,000 was administered at the recipient site. The initial crestal incision slightly lingual/palatal to preserve the keratinized mucosa was placed and the incision was continued intrasulcularly one tooth mesial and distal to the edentulous site. A vertical releasing incision was made at the mesial and the distal aspect of the edentulous flap and Split thickness flap was elevated at the edentulous site. Patients were randomly allocated in to two groups:

Group A:

Harvesting PRP for Group A:

PRP has been prepared using the Curasan's method[60,104]

One hour before the procedure ,20ml of blood was drawn from the patient through a venipuncture in the antecubital vein. The drawn blood was collected in two sterile test tubes, 10ml in each tube containing 1ml of 10% tri sodium citrate anticoagulant solution . The two tubes containing the blood were centrifuged for 2400 rpm for 15 minutes ,resulting in separation of two fractions plasma at the top and the blood cells at the bottom .

The plasma along with the top 2 ml of RBC was aspirated with the help of eppendorf pipette. This fraction was again centrifuged for 1200 rpm for 15 minutes to get three basic fractions :platelet poor plasma at the top of the preparation (supernatant),PRP in the midde

and the RBC at the bottom. The top 80% fraction corresponding to PPP was aspirated with the eppendorff pipette ,leaving the residual (0.5-2ml)platelet concentrate . PRP was collected from each tube to ensure the largest and the fresh platelets were collected.

2ml of the PRP obtained was activated by adding the 1ml hemocoagulase(Botropase) and 1ml of 10% calcium gluconate which was agitated in a sterile tube for approximately 30 seconds to obtain within a minute and now the absorbable collagen sponge is impregnated with the gel .

The PRP impregnated collagen sponge impregnated was placed in the defect and the graft was stabilized with the sling sutures using 4-0 absorbable sutures, the flap was now repositioned and 3-0 mersilk sutures were placed.

GROUP B

In the control group (CTG) trap door technique[42] was used to harvest the graft from the palate(distal to canine &mesial to first molar).A partial thickness flap reflected,and a subepithelial connective tissue graft was harvested.The donor site was closed using 4-0 polyglactin sutures. A prefabricated stent was placed to reduce postoperative discomfort. The graft was trimmed and shaped to fit the recipient site and was placed over defect .The graft

was stabilized at the defect using 4-0 polyglactin sutures. The overlying flap is now approximated with the simple interrupted sutures.

In both the groups, the provisional fixed partial denture is cemented immediately after the surgery and the care was taken that the pontic in the augmented edentulous site is in contact with the soft tissue to enhance and favor esthetics and gingival contour.

POST OPERATIVE CARE:

Patients were prescribed post-operative antibiotics and analgesic, Amoxycillin 500mg one tablet thrice daily for 3 days and Ibuprofen 400mg thrice daily for 3 day. Patients were instructed to use external icepack for 3 hours intermittently and a soft diet for the first few weeks and avoidance of stretching the surgical area. Patients were instructed to limit tooth brushing at the surgical site. Chemical plaque control with 10 ml of 0.2% Chlorhexidine rinse for 10 days was instructed. Sutures were removed after two weeks.

RECALL VISITS:

Eighteen patients who underwent soft tissue ridge argumentation were recalled at the end of first month and third month time interval. At one month time interval any adverse changes in the surgical site such as infection, wound dehiscence were assessed. The mean width of the keratinized gingiva was calculated and the attained gain of the soft tissue and papillary height were recorded and tabulated at the end of third month time interval. At the end of the 3 months permanent fixed restoration were given replacing the existing temporary crown

PROTOCOL

Name: Age/Sex:

Address: Date:

Phone No:

Chief Complaint:

History of Chief Complaint:

Past Dental History:

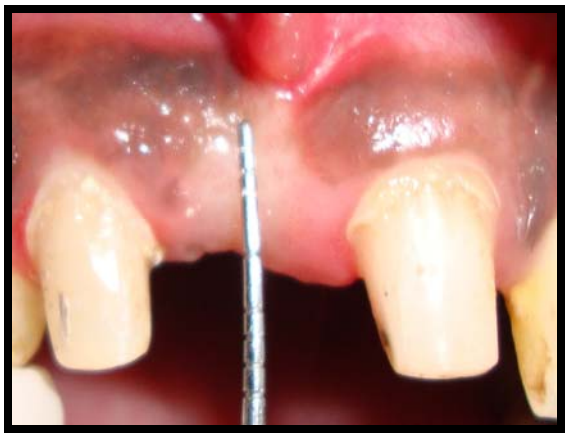
Past Medical History:

Edentulous Site:

Preliminary Examination:

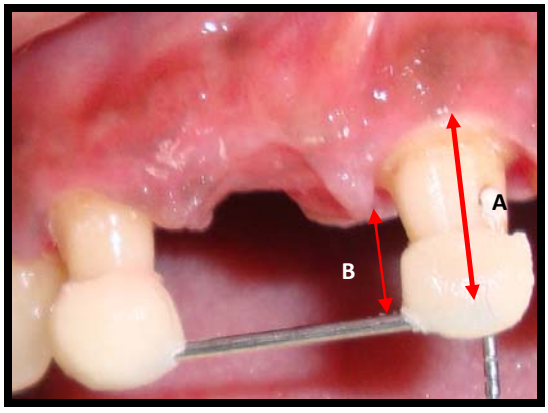
MEAN WIDTH OF THE KERATINIZED GINGIVA AT DIFFERENT TIME INTERVALS.

S. No.	Baseline (mm)	1 Months (mm)	3Months (mm)
1			
2			
3			
4			
5			
6			
7			
8			
9			



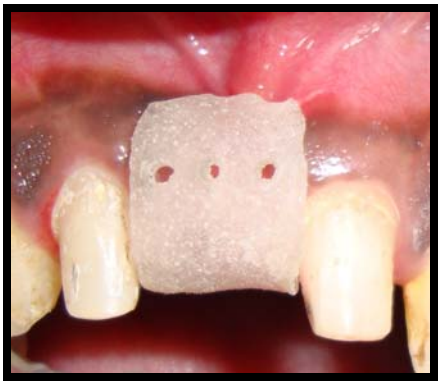
PAPILLARY HEIGHT MEASUREMENT AT DIFFERENT TIME INTREVALS

S.no	Baseline (mm)	1month(mm)	3 months(mm)
1			
2			
3			
4			
5			
6			
7			
8			
9			



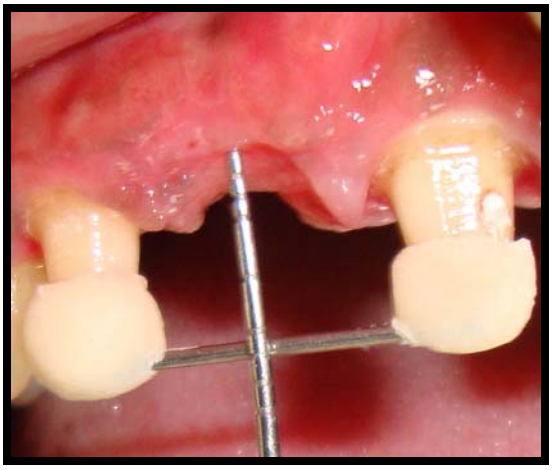
CHANGES IN HORIZONTAL DIMENSION AT DIFFERENT TIME INTERVALS

S.No.	Baseline(mm)			1 Months(mm)			3Months (mm)		
	Mesial	Mid buccal	Distal	Mesial	Mid buccal	Distal	Mesial	Mid buccal	Distal
1.									
2.									
3.									
4.									
5.									
6.									
7									
8									
9									

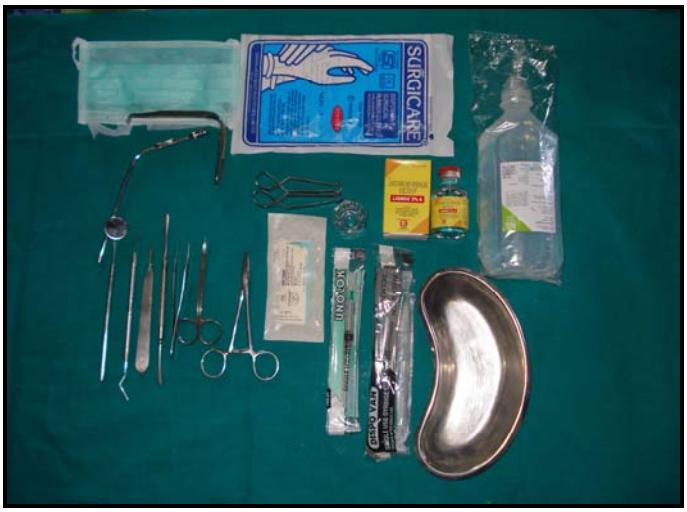


CHANGES IN THE VERTICAL DIMENSION RESPONSE AT DIFFERENT TIME INTREVALS

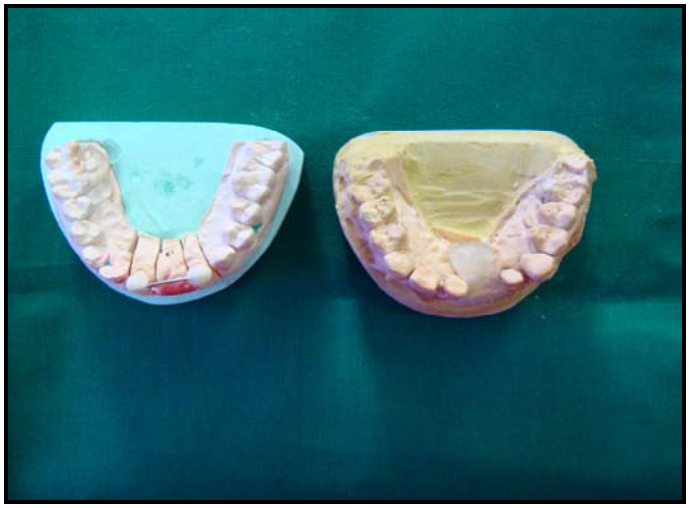
S.no	Baseline(mm)	1month(mm)	3 months(mm)
1			
2			
3			
4			
5			
6			
7			
8			
9			



Photographs



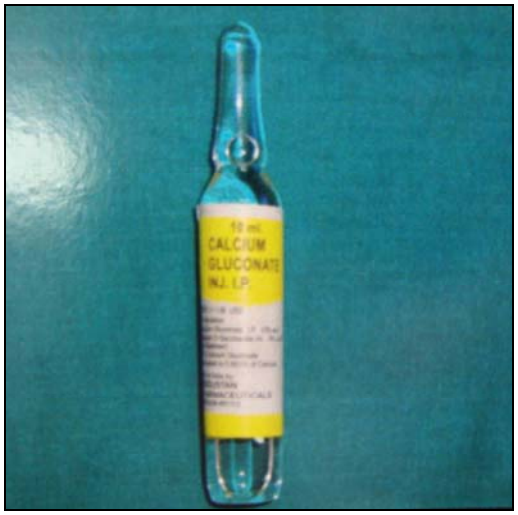
SURGICAL INSTRUMENTS



MODIFIED CUSTOMIZED ACRYLIC STENT

ABSORBABLE COLLAGEN SPONGE

(COLLACOTE™)

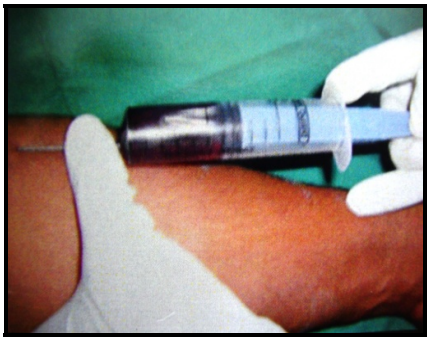


1O% OF CALCIUM GLUCONATE

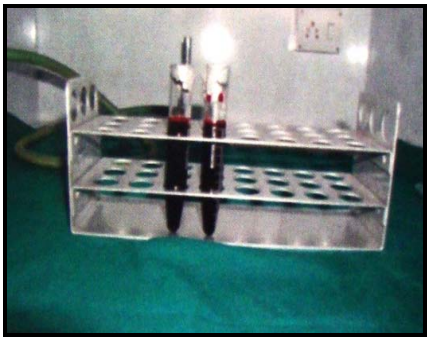
HEMOCOAGULASE (BOTROPASE)

PREPARATION OF PRP

A)Drawing of venous blood

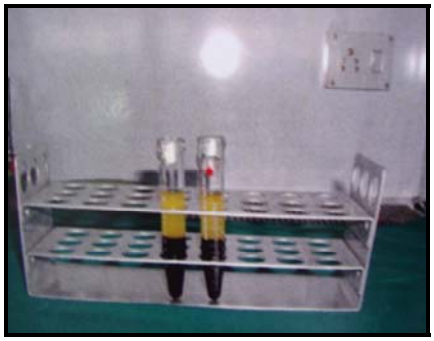


b)blood with 10% trisodium citrate



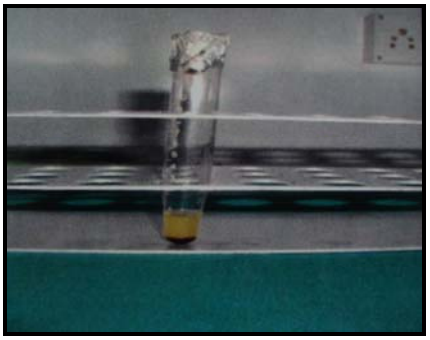
C)centrifugation of Blood

d)centrifugated blood with plasma at the Top & RBC at the bottom



E)**PPP AT THE TOP, PRP IN THE MIDDLE & RBC AT THE BOTTOM**

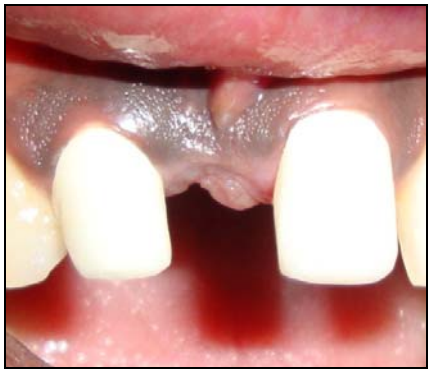
f)PLATELET RICH PLASMA



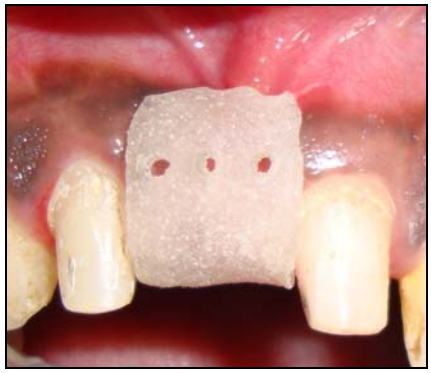
GROUP A – COLLACOTE™ WITH PRP

CASE #1

PRE OPERATIVE

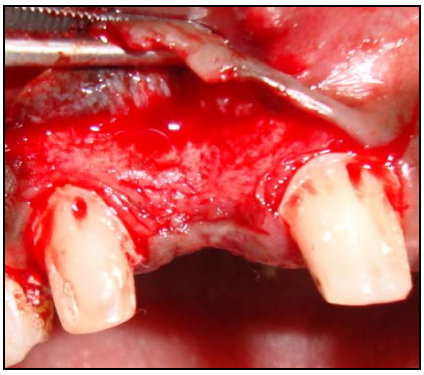


MEASUREMENT OF HORIZONTAL DIMENSION OF THE RIDGE

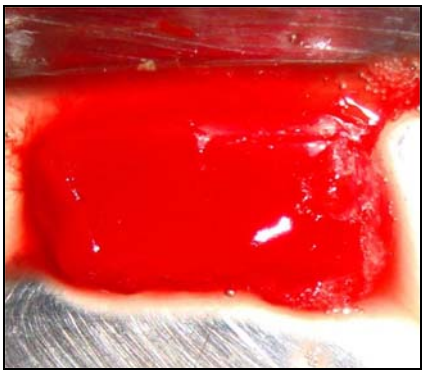


SURGICAL PROCEDURE

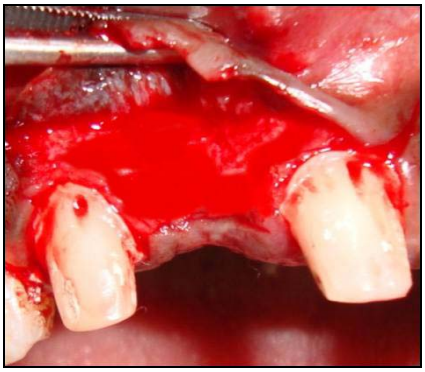
SPLIT THICKNESS FLAP ELEVATED



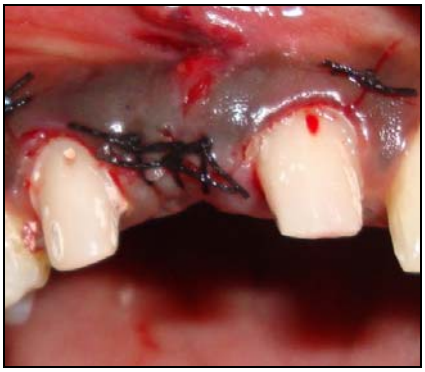
COLLACOTE™ IMPREGNATED WITH PRP



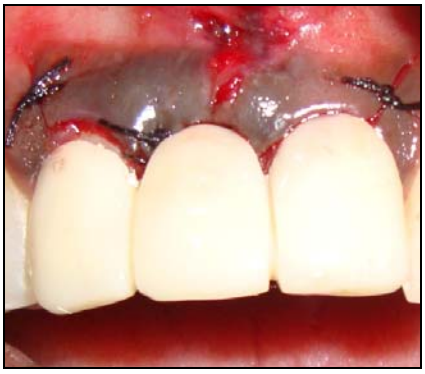
COLLACOTE™ WITH PRP IN THE DEFECT SITE



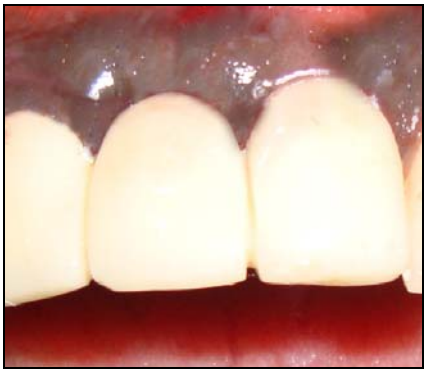
SUTURES PLACED



PROVISIONAL RESTORATION GIVEN

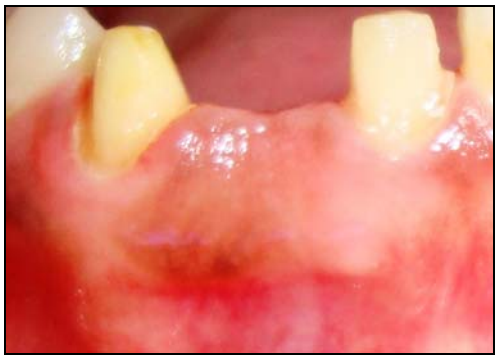


POST OPERATIVE- 3 MONTHS

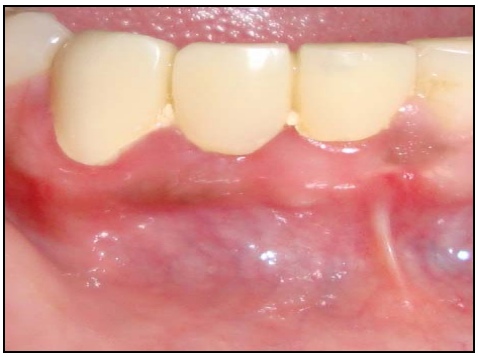


CASE #2

PRE OPERATIVE VIEW

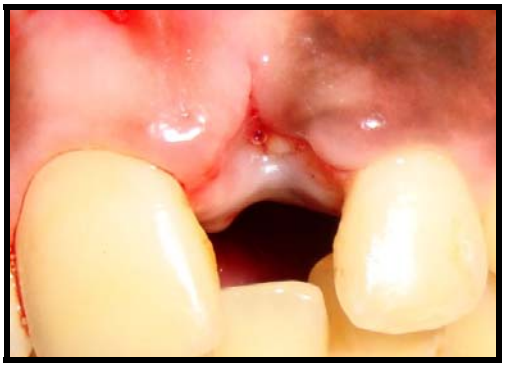


POST OPERATIVE -3MONTHS PERIOD

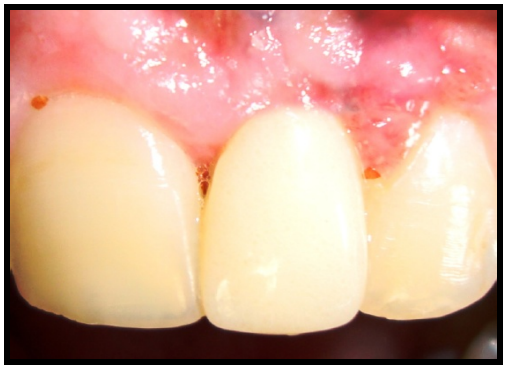


CASE #3

PRE OPERATIVE VIEW



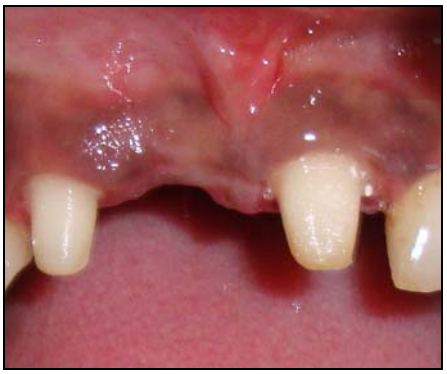
POST OPERATIVE -3MONTHS PERIOD



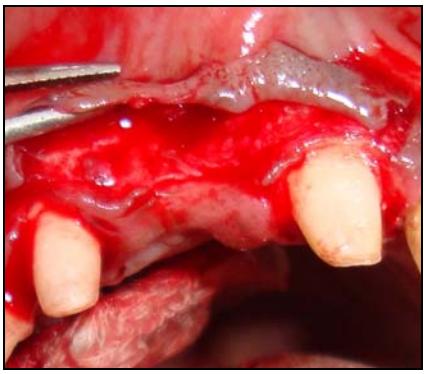
GROUP B – CONNECTIVE TISSUE GRAFT

CASE #1

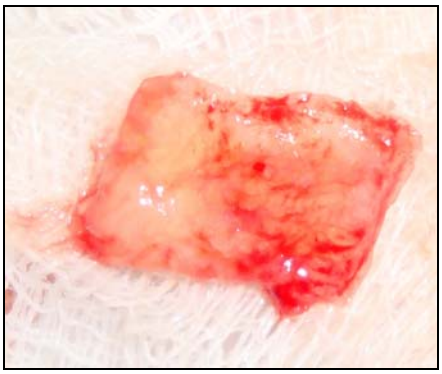
PREOPERATIVE VIEW



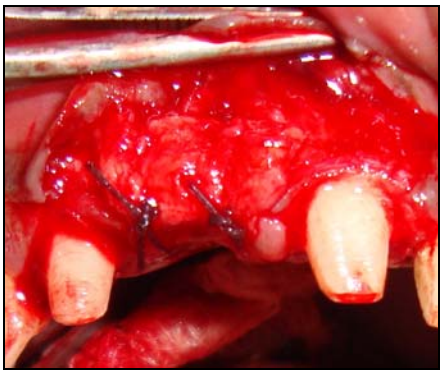
SPLIT THICKNESS FLAP ELEVATED



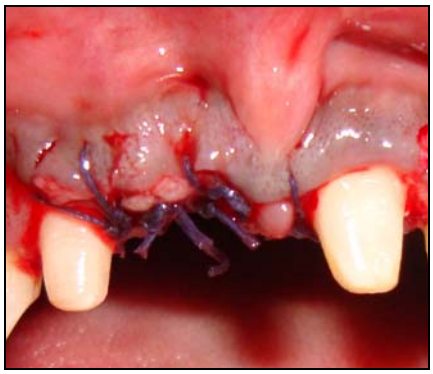
CONNECTIVE TISSE GRAFT HARVESTED



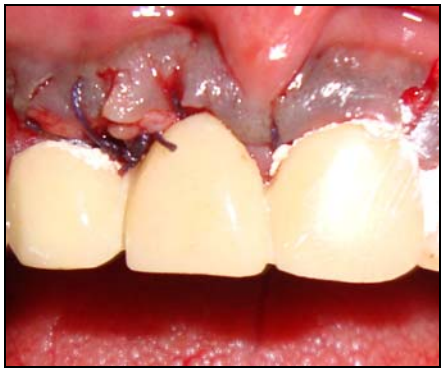
STABILIZATION OF CTG



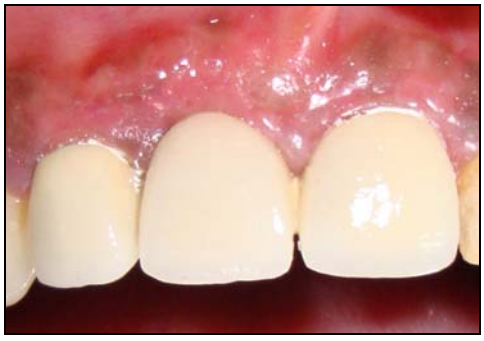
SUTURES PLACED



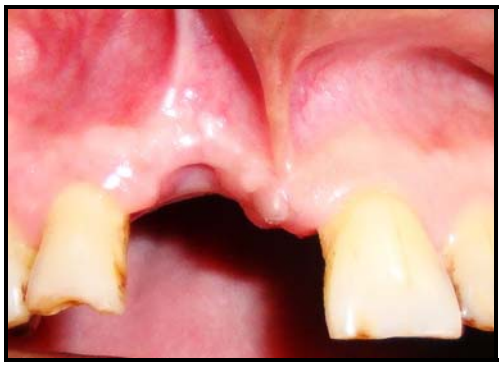
PROVISIONAL RESTORATION GIVEN

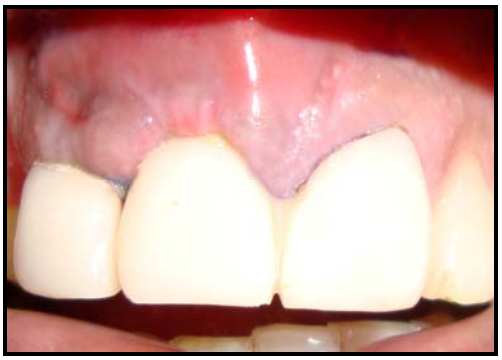


POST OPERATIVE – 3 MONTH

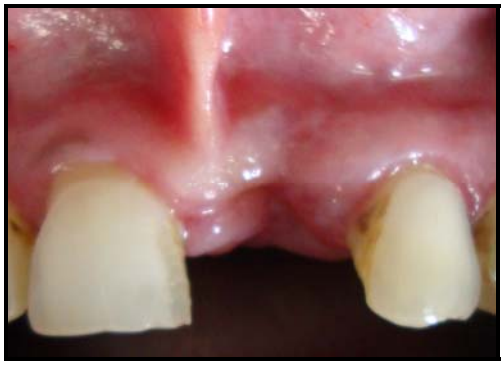


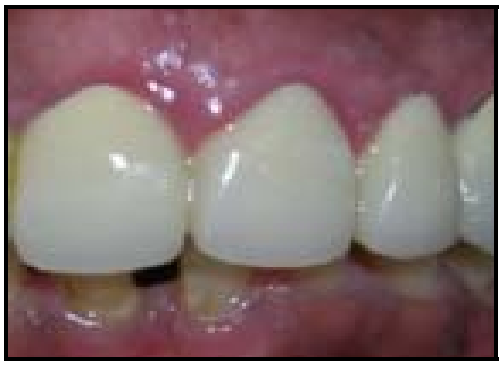
CASE#2





CASE #3





Results

Clinical parameters

Width of keratinized tissue for Group A(Collacote™&PRP):

At baseline the mean value of width of keratinized tissue was 3.67±0.50, at 1months interval 3.66 ±0.50 ,and at 3months time interval it was 3.67±0.50. When the baseline value was compared to 3 months time interval and subjected to the statistical analysis it was not statistically significant with a value of P value> 0.05(Table-5)

Width of keratinized tissue for Group B (CTG):

At baseline the mean value of width of keratinized tissue was, 3.18±0.73 at 1months interval 3.17 ±0.73 ,and at 3months time interval it was 3.18±0.73. When the baseline value was compared to 3 months time interval and subjected to the statistical analysis it was not statistically significant with a value of P value> 0.05. (Table-5)

Inter group comparison of the changes in the mean value of the keratinized gingiva between the groups at 3 months time intervals had a P-value >0.05 which was not statistically significant.(TABLE – 5)

Papillary height (mesial) dimensions for Group A(Collacote™&PRP):

At baseline the mean value of papillary height in the mesial aspect was 1.61±0.55, at 1months interval was 1.94±0.39 ,and at 3months time interval it was 1.72±0.51. When the baseline value was compared to 3 months time interval and subjected to the statistical analysis it was not statistically significant with a value of P value> 0.05 . (Table-6)

Papillary height(distal) dimensions for Group A(Collacote™&PRP):

At baseline the mean value of papillary height in the distal aspect was 1.50±0.43, at 1months interval was 1.778±0.44 ,and at 3months time interval it was 1.67±0.43. when the baseline value was compared to 3 months time interval and subjected to the statistical analysis it was not statistically significant with a value of P value> 0.05 . (Table-6)

Papillary height(mesial) dimensions for Group B(CTG)

At baseline the mean value of papillary height in the mesial aspect was 1.06±0.17, at 1months interval was 1.44±0.30,and at 3months time interval it was 1.39±0.22. when the baseline value was compared to 3 months time interval and subjected to the statistical analysis it was statistically significant with a value of P value<0.05(Table-6)

Papillary height(distal) dimensions for Group B(CTG)

At baseline the mean value of papillary height in the distal aspect was, 1.11±0.17 , at 1months interval was 1.38±0.33,and at 3months time interval it was 1.39±0.22. when the baseline value was compared to 3 months time interval and subjected to the statistical analysis it was statistically significant with a value of P value<0.05 (Table-6)

Inter group comparison of the changes in the mean papillary height change at mesial and the distal aspect between the groups at 3 months time intervals had a P-value >0.05 which was not statistically significant.(TABLE – 6)

Horizontal dimensions for Group A(Collacote™ &PRP):

At baseline the mean value of horizontal dimension was, 1.41±0.43 at 1months interval was 3.44±0.60 ,and at 3months time interval it was 2.28±0.29. when the baseline value was compared to 3 months time interval and subjected to the statistical analysis it was statistically significant with P value<0.01(Table-7)

The mean percentage of the horizontal tissue gain attained with that of the desired gain was 82% (TABLE – 9)

Horizontal dimensions for Group B (connective tissue graft):

At baseline the mean value of horizontal dimension was1.15±0.24 at 1months interval was as 2.92 ± 0.32,and at 3months time interval it was 2.26±0.52. when the baseline value was compared to 3 months time interval and subjected to the statistical analysis it was statistically significant with P value<0.01(Table-7)

The mean percentage of the horizontal tissue gain attained with that of the desired gain was 79%(TABLE – 10)

Inter group comparision of the changes in the mean horizontal dimension score between the groups at 3 months time intervals had a P-value >0.05 which was not statistically significant.(TABLE – 7)

Vertical defect response for Group A(Collacote™&PRP):

At baseline the vertical defect was measured as 5.11±1.45 at 1months interval was4.77±1.48 ,and at 3months time mean value of interval it was4.77±1.48. when the baseline value was

compared to 3 months time interval and subjected to the statistical analysis it was not statistically significant with P value>0.05(Table-8)

Vertical defect response for Group B(CTG):

At baseline the vertical defect was measured as 4.56±1.0.88, at 1months interval was 4.38±1.02,and at 3months time mean value of interval it was 4.46±0.88 . when the baseline value was compared to 3 months time interval and subjected to the statistical analysis it was not statistically significant with P value>0.05(Table-8)

Inter group comparison of the changes in the mean vertical dimension between the groups at 3 months time intervals had a P-value >0.05 which was not statistically significant.**(**TABLE –8)

Statistical analysis

Data were expressed as mean ± standard deviation o the parameters evaluated. Clinical parameters were recorded at the baseline, 1 month and 3 months post operatively. Comparison were made within the each group and between the groups at baseline, 1st month and the 3rd month using the non parametric **Mann Whitney U test.**

P <0.05 is considered as significance at 5%level of significance and the P value of <0.01 is considered as 1% level of significance.

Tables and Graphs

TABLE 1

MEAN VALUES OF WIDTH OF THE KERATINIZED GINGIVA AT DIFFERENT TIME INTERVALS- Group A (Collacote™ and PRP)

Sno	Baseline(mm)	1month(mm)	3months(mm)
1	4	4	4
2	4	4	4
3	4	4	4
4	3	3	3
5	3	3	3
6	4	4	4
7	4	4	4
8	3	3	3
9	**4**	**4**	**4**

MEAN VALUES WIDTH OF THE KERATINIZED GINGIVA AT DIFFERENT TIMINTERVALS- Group B (connective tissue graft)

sno	Baseline(mm)	1month(mm)	3month(mm)
1	3	3	3
2	4	4	4
3	3	3	3
4	4	4	4
5	4	4	4
6	3.3	3.3	3.3
7	3	3	3
8	2.3	2.3	2.3
9	2	2	2

TABLE 2

VALUES OF MEAN CHANGES IN THE PAPILLARY HEIGHT AT DIFFERENT TIME INTERVALS

IN GROUP A

S no	Baseline(mm)		1months(mm)		3months(mm)	
	mesial	Distal	Mesial	distal	mesial	distal
1	1.5	1	2	2	2	2
2	1	1.5	2	2	2	2
3	1.5	1	2	2	2	2
4	1	1	1.5	1.5	1	1
5	1	1	2	1	1	1
6	1.5	1	1.5	1.5	1.5	1.5
7	1.5	1	2	2	2	2
8	1	1	2	2.5	2	2
9	1	1	1.5	1.5	1.5	1.5

VALUES MEAN CHANGES IN THE PAPILLARY HEIGHT AT DIFFERENT TIME INTERVALS IN GROUP B

Sno	Baseline(mm)		1 months(mm)		3 months(mm)	
	mesial	Distal	Mesial	Distal	mesial	Distal
1	1	1	1.5	1.5	1.5	1.5
2	1	1	1.5	1.5	1.5	1.5
3	1	1	1	1	1	1
4	1	1	1.5	1.5	1.5	1.5
5	1	1	2	2	1.5	1.5
6	1.5	1	1.5	1	1.5	1.5
7	1	1	1.5	1.5	1.5	1.5
8	1	1	1.5	1.5	1.5	1.5
9	1	1	1	1	1	1

TABLE 3

MEAN CHANGES IN THE HORIZONTAL DIMENSIONS AT DIFFERENT TIME INTERVALS-Group A

Sno	**Desired gain**	**Actual gain**(mm)		
		Baseline	**1month**	**3months**
1	4	1.66	4.66	3.66
2	4	1	3.66	3.33
3	4	4	3.33	3
4	4	1.66	4	3.66
5	3	1	2.66	2
6	3	1	3	2.33
7	3	1.33	3.33	2.66
8	4	2	3.33	3
9	3	1	3	2.66

MEAN CHANGES IN HORIZONTAL DIMENSIONS AT DIFFERENT TIME INTERVALS-Group B

Sno	**Desired gain(mm)**	**Actual gain(mm)**		
		Baseline	1month	3months
1	3	1	3	2.67
2	3	1	2.66	2.33
3	3	1	3	2.33
4	3	1	3	2
5	3	1.33	3	2.33
6	3	1.66	3.33	2.66
7	2	1	2.66	1.66
8	2	1	2.33	1.33
9	3	1.33	3.33	3

TABLE 4

CHANGES IN THE VERTICAL DIMESION AT DIFFERENT TIME INTERVALS

-GROUP A

Sno	Baseline(mm)	1month(mm)	3months(mm)
1	5	4	4
2	7	6	6
3	4	4	4
4	3	3	3
5	4	3	3
6	7	7	7
7	6	6	6
8	6	6	6
9	4	4	4

CHANGES IN THE VERTICAL DIMESION AT DIFFERENT TIME INTERVALS

-GROUP B

Sno	Baseline(mm)	1month(mm)	3months(mm)
1	4	4	4
2	4	3.5	4
3	4	4	4
4	4	3.5	4
5	4	4	4
6	5	5	5
7	6	6	6
8	4	3.5	4
9	6	6	6

TABLE – 5

a)Mean width of the keratinized tissue at different time intervals in group A (Collacote™ and PRP)

	Baseline(mm)		1months(mm)		3months(mm)		P value
	Mean	SD	Mean	SD	Mean	SD	b-3m
WKT	3.67	0.50	3.66	0.50	3.67	0.50	1.00

P-value between baseline and 3months is >0.05 denotes not statistically significant at 5% level

b)Mean width of the keratinized tissue at different time intervals in group B (connective tissue graft)

	Baseline(mm)		1months(mm)		3months(mm)		P value
	Mean	SD	Mean	SD	Mean	SD	b-3m
WKT	3.18	0.73	3.17	0.73	3.18	0.73	1.00

P-value between baseline and 3months is >0.05 denotes not statistically significant at 5% level

c)Inter group difference in mean width of the keratinized tissue at different time intervals

	Baseline(mm)		1months(mm)		3months(mm)		P value	
	Mean	SD	Mean	SD	Mean	SD	B-b	3-3
Group A	3.67	0.50	3.66	0.50	3.67	0.50	0.148	0.148
Group B	3.18	0.73	3.17	0.73	3.18	0.73		

P-value between baseline and 3months is >0.05 denotes not statistically significant at 5% level

TABLE - 6

a)Mean papillary height at different time intervals in group A (Collacote™ and PRP)

Papillary height	Baseline(mm)		1months(mm)		3months(mm)		P value
	Mean	SD	Mean	SD	Mean	SD	b-3m
Mesial	1.61	0.55	1.944	.39	1.72	0.51	0.157
Distal	1.50	0.43	1.778	.44	1.67	0.43	0.083

P-value between baseline and ,3months is >0.05 denotes not statistically significant at 5% level

b)Mean papillary height at different time intervals in group B (connective tissue graft)

Papillary height	Baseline(mm)		1months(mm)		3months(mm)		P value
	Mean	SD	Mean	SD	Mean	SD	b-3m
Mesial	1.06	0.17	1.44	.30	1.39	0.22	0.014*
Distal	1.11	0.22	1.38	.33	1.39	0.22	0.025*

P-value between baseline and 3months in distal papillary height <0.05 denotes statistically significant at 5% level.

P-value between baseline and 3months in mesial papillary height <0.05 denotes statistically significant at 5% level.

TABLE -6

c)Inter group difference in mean papillary height at different time intervals

	Baseline(mm)		1months(mm)		3months(mm)		P value	
	Mean	SD	Mean	SD	Mean	SD	B-b	3-3
Group A								
Mesial	1.61	0.55	1.944	0.39	1.72	0.51	0.13	0.095
Distal	1.50	0.43	1.778	0.44	1.67	0.43		
Group B								
Mesial	1.06	0.17	1.44	0.30	1.39	0.22	0.19	0.093
Distal	1.11	0.22	1.38	0.33	1.39	0.22		

P-value between baseline and 3months is >0.05 denotes not statistically significant at 5% level

TABLE – 7

a)Mean horizontal dimensions at different time intervals in groupA(Collacote™ and PRP)

	Baseline(mm)		1months(mm)		3months(mm)		P value
	Mean	SD	Mean	SD	Mean	SD	b-3m
Horizontal dimensional change	1.41	0.43	3.444	.60	2.28	0.29	0.007**

P-value between baseline and 3months is < 0.01 which is statistically significant at 1% level

b)Mean horizontal dimensions at different time intervals in groupB(connective tissue graft)

	Baseline(mm)		1months(mm)		3months(mm)		P value
	Mean	SD	Mean	SD	Mean	SD	b-3m
Horizontal dimensional change	1.15	0.24	2.926	.32	2.26	0.52	0.007**

P-value between baseline and 3months is < 0.01 which is statistically significant at 1% level.

c)Inter group difference in mean horizontal dimensions at different time intervals

	Baseline(mm)		1months(mm)		3months(mm)		P value	
	Mean	SD	Mean	SD	Mean	SD	B-b	3-3
Group A	1.41	0.43	3.44	0.60	2.28	0.29	0.188	0.894
Group B	1.15	0.24	2.92	0.32	2.26	0.52		

P-value between baseline and,3 months is >0.05 denotes not statistically significant at 5% level

TABLE - 8

a)Vertical dimensional change at different time intervals in group A (Collacote™ and PRP)

	Baseline(mm)		1months(mm)		3months(mm)		P value
	Mean	SD	Mean	SD	Mean	SD	b-3m
Vertical dimensional change	5.11	1.45	4.77	1.48	4.78	1.48	0.083

P-value between baseline and 3months is >0.01 denotes not statistically significant at 1% level and 1% level.

b)Vertical defect response at different time intervals in group B (connective tissue graft)

	Baseline		1months		3months		P value
	Mean	SD	Mean	SD	Mean	SD	b-3m
Vertical dimensional change	4.56	0.88	4.38	1.02	4.56	0.88	1.00

P-value between baseline and 3months is >0.05 denotes not statistically significant at 5% level

c)Inter group difference in vertical dimensions at different time intervals

	Baseline(mm)		1months(mm)		3months(mm)		P value	
	Mean	SD	Mean	SD	Mean	SD	B-b	3-3
Group A	5.11	1.45	4.77	1.48	4.78	1.48		
Group B							0.393	0.886
	4.56	0.88	4.38	1.02	4.56	0.88		

P-value between baseline and 3months is >0.05 denotes not statistically significant at 5% level

TABLE -9

Mean % of gain attained in experimental group (desired gain -3 months)

Sno	Desired gain	baseline	1month	3months	% gain (D-3)
1	4	1.66	4.66	3.66	91.5
2	4	1	3.66	3.33	83.3
3	4	4	3.33	3	75.0
4	4	1.66	4.00	3.66	91.5
5	3	1	2.66	2	66.7
6	3	1	3.00	2.33	77.7
7	3	1.33	3.33	2.66	88.7
8	4	2	3.33	3	75.0
9	3	1	3.00	2.66	88.7

Mean % of actual gain in experimental group-82%

TABLE – 10

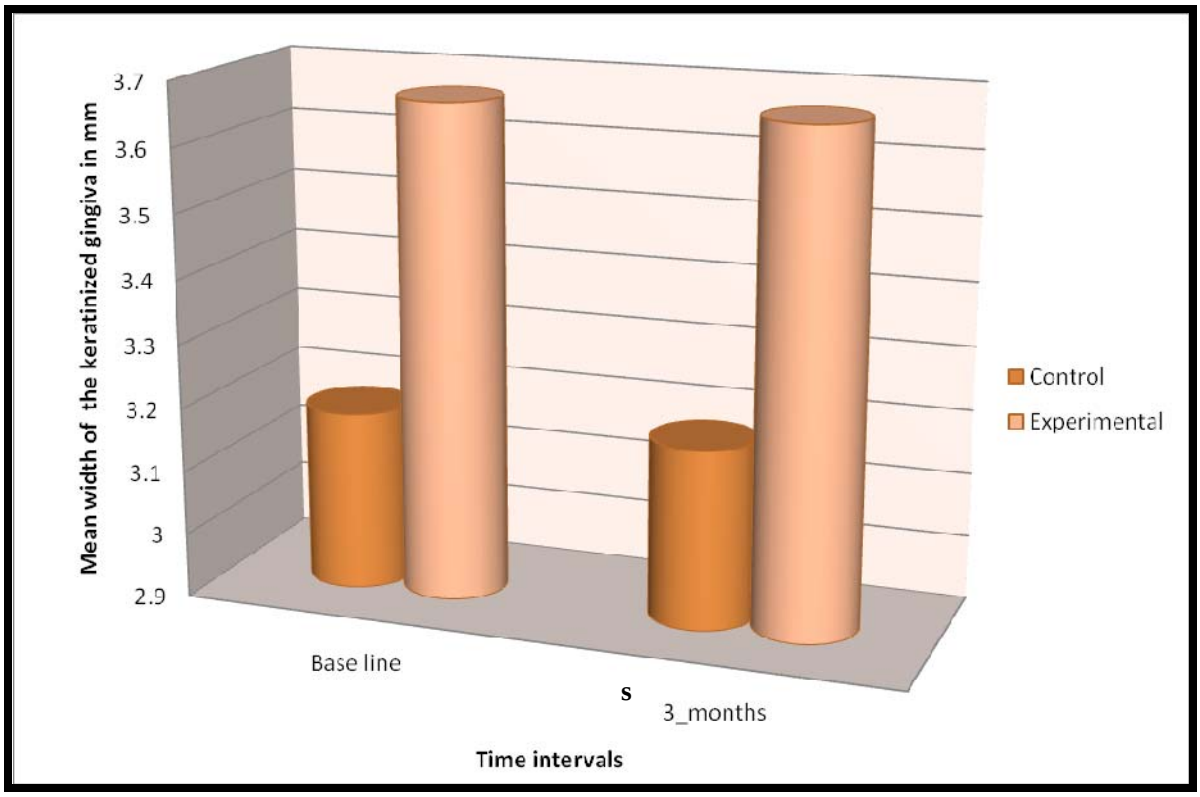
Mean % of gain attained in control group (desired gain -3 months)

Sno	desired gain	baseline	1month	3months	% gain
1	3	1	3.00	2.67	89.0
2	3	1	2.66	2.33	77.7
3	3	1	3.00	2.33	77.7
4	3	1	3.00	2	66.7
5	3	1.33	3.00	2.33	77.7
6	3	1.66	3.33	2.66	88.7
7	2	1	2.66	1.66	83.0
8	2	1	2.33	1.33	66.5
9	3	1.33	3.33	2.77	89

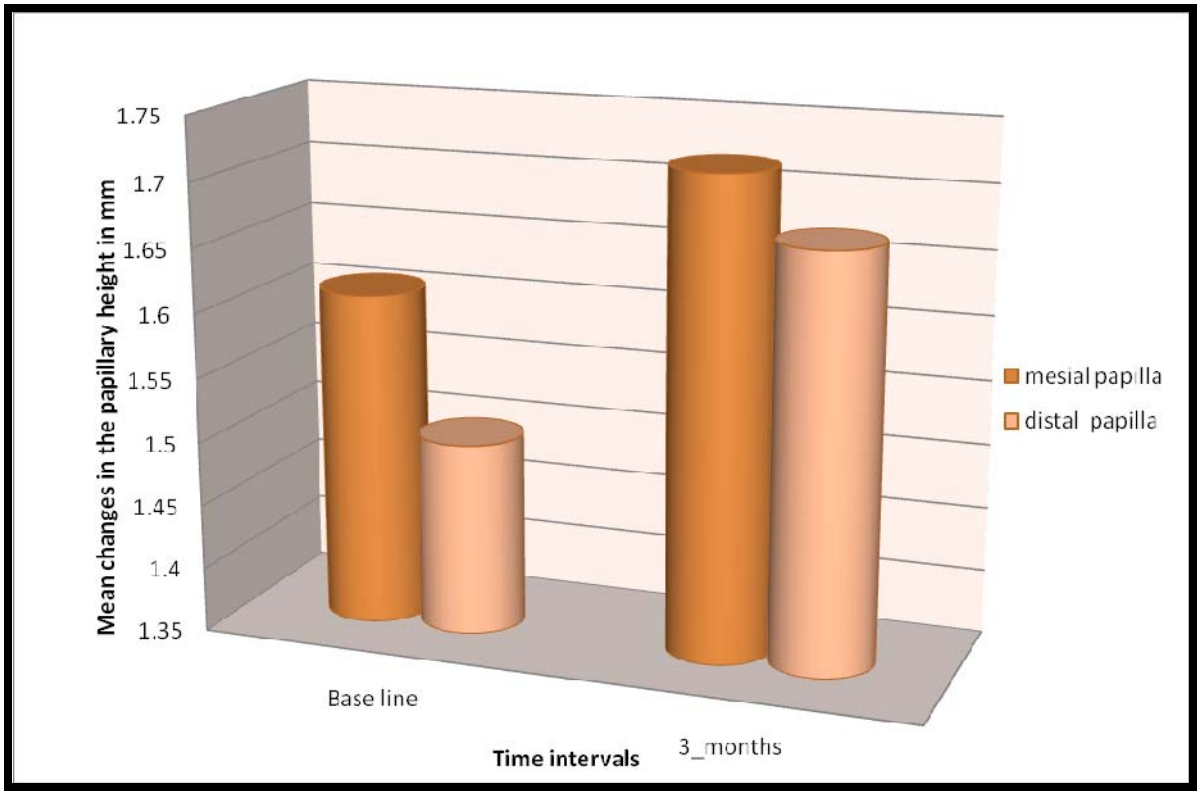
Mean % of the actual gain in control group -79%

COMPARISON OF THE MEAN WIDTH OF THE KERATINIZED GINGIVA AT

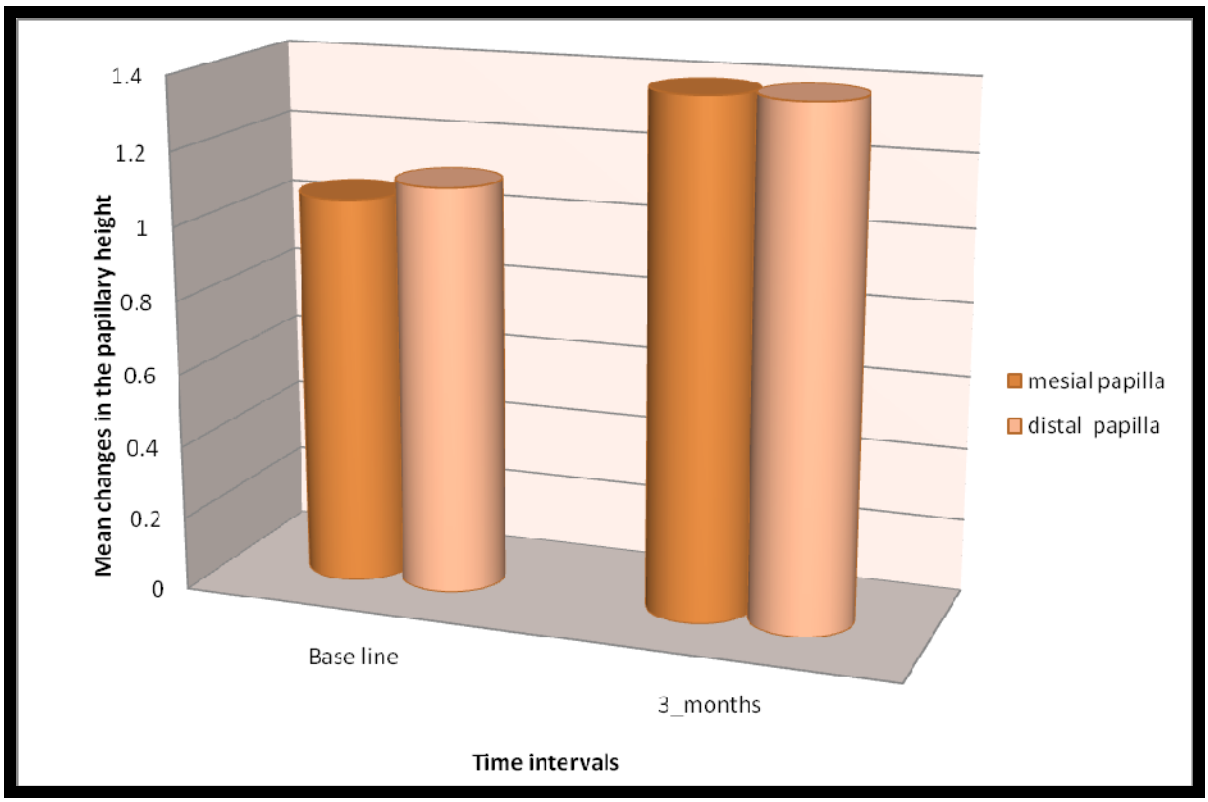
DIFFERENT TIME INTERVALS



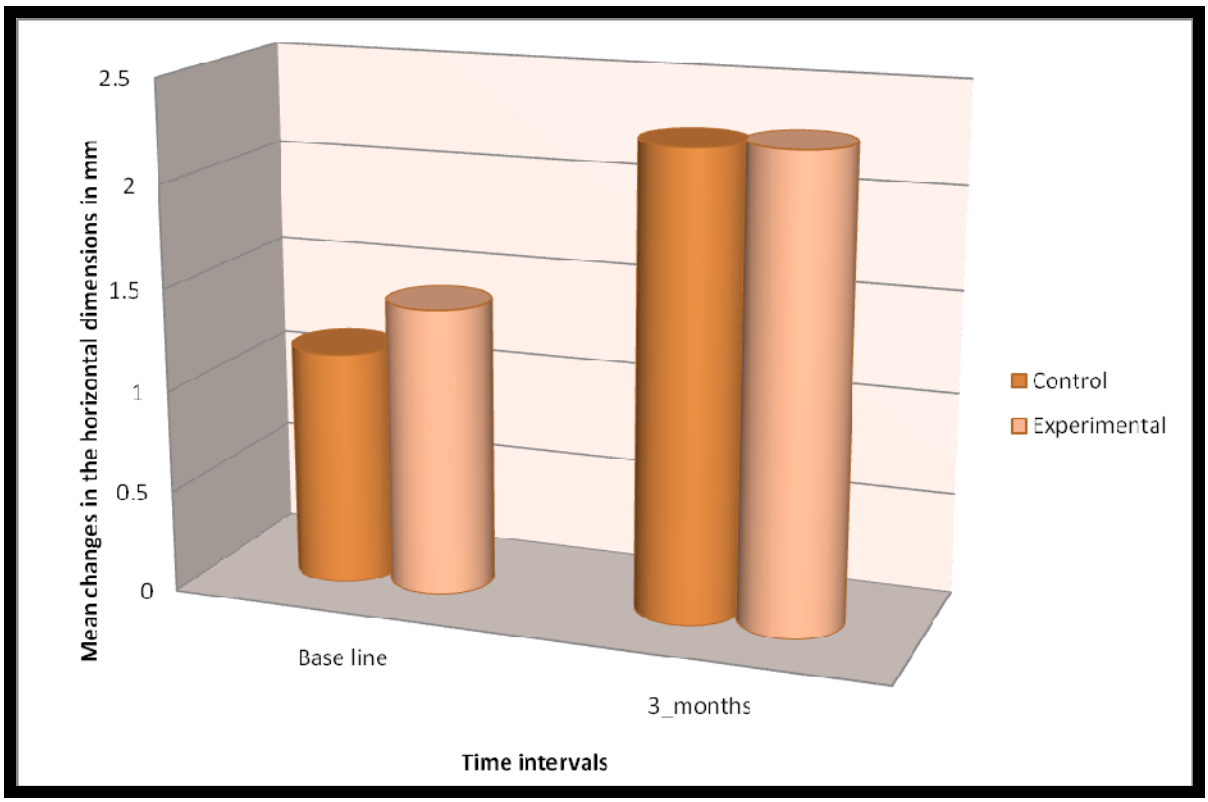
COMPARISON OF THE MEAN CHANGE PAPILLARY HEIGHT IN GROUP A AT DIFFERENT TIME INTERVALS



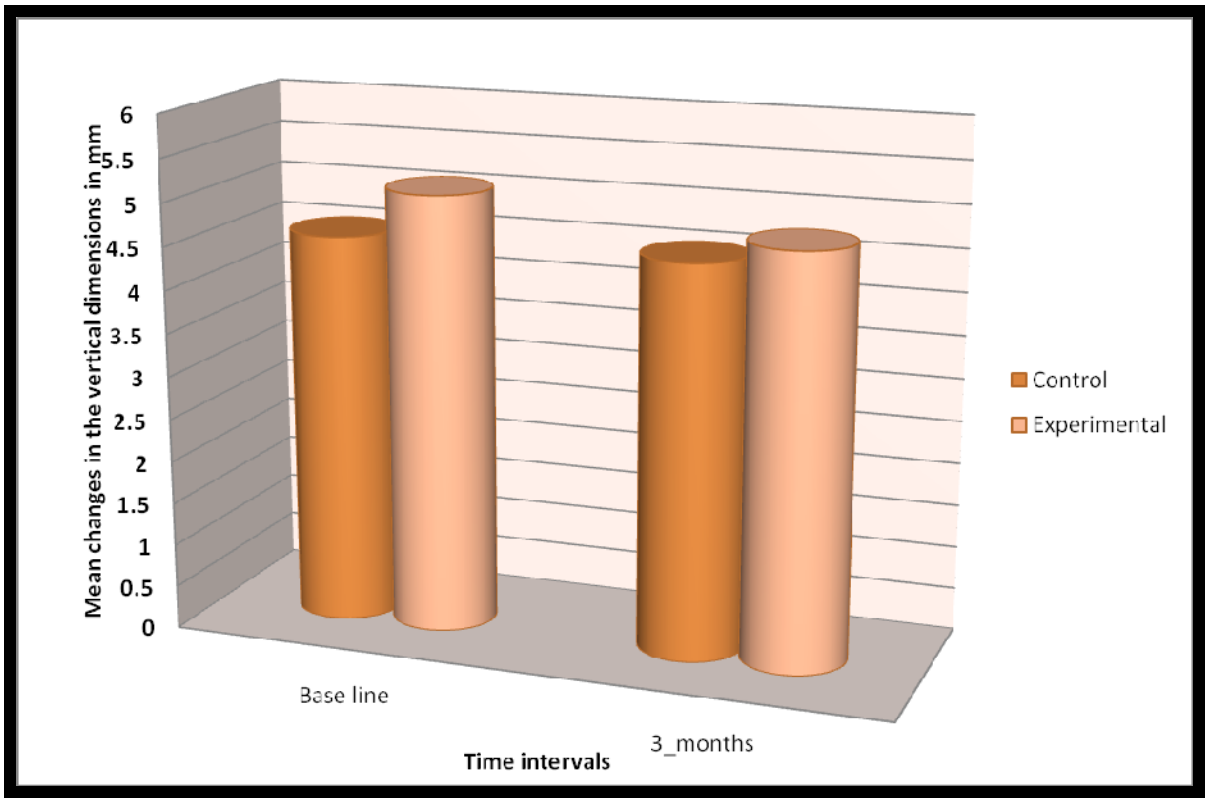
COMPARISON OF THE MEAN CHANGE IN PAPILLARY HEIGHT IN GROUP B AT DIFFERENT TIME INTERVAL



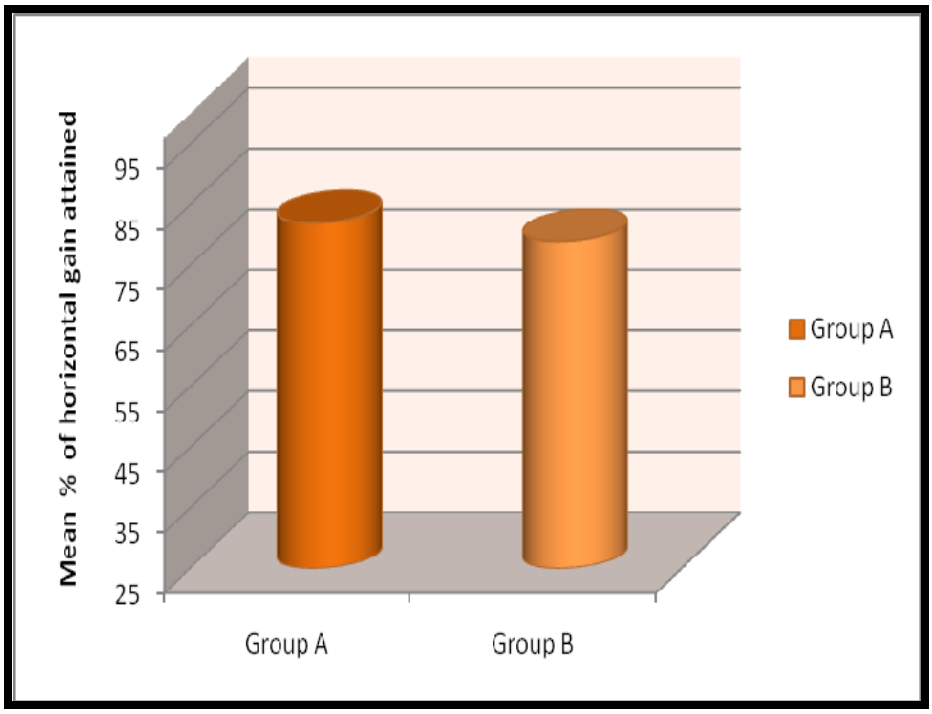
COMPARISON OF THE HORIZONTAL DIMENSIONAL CHANGES IN GROUP A AND GROUP B AT DIFFERENT TIME INTERVALS.



COMPARISON OF THE VERTICAL DIMENSIONAL CHANGES IN GROUP A AND GROUP B AT DIFFERENT TIME INTERVALS



COMPARISON OF MEAN PERCENTAGE OF THE GAIN ATTAINED IN GROUP A AND GROUP B



Discussion

Periodontal plastic surgery encompasses a wide range of treatment modality out of which includes, augmenting the soft tissue defects around the fixed prosthetic bridges or implants. Soft tissue ridge augmentation procedure is performed to improve the patient esthetics for fixed prosthetic replacement when unsightly deformed ridges exists[69]. Various modality of soft tissue augmentation procedures were presented in the periodontal literature using soft tissue graft[6, 14,42,69,72]. Of which the connective tissue graft has proven to be "gold standard" in achieving desire volumetric soft tissue gain [1, 77]

The palatal masticatory mucosa is widely used as a donor site in periodontal plastic surgery[100]. Phenotype of masticatory mucosa strongly depends on age, gender and the periodontal tissue phenotype[54]. Based on observations made by series of investigators, it has become evident that individuals with thin gingival phenotype were prone to the development of recession, and often present with thin palatal mucosa that might not be very suitable for obtaining connective tissue graft of proper dimension.

To overcome the shortcoming of not able to harvest the graft of uniform thickness (W×L×H) ,other soft tissue substitutes such as allogenic graft or natural polymer are used in periodontal plastic surgery. Collagen is one of the novel material used widely in mucogingival surgery with the biological mediators[93, 31].

The uniqueness of collagen as a biomaterial rests largely in its structural homogeneity and of low immunogenicity [93,50]. Collagen promotes the fibroblastic cellular mobility ,angiogenesis and inflammatory cells actively penetrates the porous scaffold that encourages the formation of the highly vascularized granulation bed[48,86,90]. The platelet-rich plasma (PRP) is an autologous product that concentrates a high number of platelets in a small volume of plasma [37,75,79] Its biocompatible and biodegradable properties and rich source of GFs that accelerates the wound healing at the surgical site. So this biological mediator has been widely used in periodontal surgical field.

In the present study, when the clinical parameters were assessed at the baseline value, both the groups did not differ statistically from each other. Therefore the post operative difference between and within the group is due to the clinical effect of the materials.

Similarly, in both the groups the desired gain for the individual site were established preoperatively with the prosthetic inter relationship. The actual gain for each tissue was tabulated and the mean changes in the desired gain were then expressed in terms of the percentage gain of each group.

In the present study the width of the keratinized tissue in the edentulous ridge is measured with the calibrated Williams periodontal probe from the standard anatomical reference point[26] and the mean width of the keratinized tissue at baseline was 3.67 ±0.50 ,at 3months time interval, the mean width of the keratinized tissue was 3.67 ±0.50. Similarly in group B the mean width of the keratinized tissue at the baseline was 3.18 ±0.73 and at 3 months time interval it was 3.18 ±0.73. When this value were subjected to the statistical analysis in both

the intra and the inter groups comparison ,there was no statistical significance at P value of >0.05.

This can be attributed to the fact that the augmentation procedure was done coronal to the mucogingival junction and no coronal advancement of the flap was made during the surgery. This is in accordance with the previous studies by Scharf et al[87], Batista et al [26]

The papillary height response in both the groups were measured with the modified customized acrylic stent[26]. In the present study, ovate pontic with minimal pressure over the augmented ridge were given as a provisional prosthesis to create a favorable, clinical anatomy of interdental papillae. In group A the mean value of papillary height of the mesial and the distal papilla at the base line was 1.61 ±0.55 and 1.50 ±0.43. At 3 months time interval, the mean value of papillary height was 1.72 ±0.51and 1.67 ±0.43. When the values are subjected to statistical analysis, the mean changes in the papillary height from baseline to 3 months it was not statistically significant >0.05. This can be due to the rapid resorption time of collagen sponge (10-14 days)[31].

Similarly, in group B the mean papillary height of the mesial and the distal papilla at the base line was 1.06 ±0.17 and 1.11 ±0.22. At 3 months time interval the value was 1.39 ±0.22 and 1.39 ±0.22.when the values were subjected to the statistical analysis,the mean changes in the papillary height was statistically significant with the P value of <0.05. The results of the group B could be attributed to the fact that initial stabilization of the graft is done at the defect site ,dual blood supply to the CTG, results in rapid acclamization and maturation of the graft to the host bed which was in accordance with the previous studies by Studer et al in1998[87] and Lai Y.L et al in 2007[49]. The inter group comparison between the

two groups from baseline to 3 months does not show any statistically significant difference with the p value of >0.05

The vertical defect was measured with the MCAS from the standardized reference point[26] on the stent to the crest of the edentulous ridge. The mean vertical dimension for group A at baseline was 5.11 ±1.45 and at 3 months time interval the mean changes in the vertical dimension was and 4.78 ±1.48 which was not statistically significant from baseline to 3 months with the P value of >0.05.

Similarly in group B mean vertical defect dimension at baseline was 4.58 ±0.88 and at 3 months time interval mean changes in vertical dimension was 4.58 ±0.88 respectively which was not statistically significant with the P value >0.05. Inter group comparison between both the groups from baseline to 3 months was also not statistically significant with the P value of >0.05. These results are in accordance with the previous study by Batista et al in 2001[26] in augmenting the soft tissue defects in Sieberts class I ridge. In the present study both the groups, group A and group B presented the sieberts class I ridge defect with minimum or no vertical soft tissue loss. From a prosthetic perspective all the sites in the present study required only the lateral augmentation to make the fixed prosthesis esthetically acceptable.

The horizontal dimensions of the ridge were measured with the MCAS that was constructed with the predetermined desired gain for each patients[26]. The mean horizontal dimension for group A at baseline was 1.41±0.43and at 3 month time interval the mean changes in the horizontal dimension was 2.28 ±0.29. When subjected to statistical analysis the values was statistically significant from baseline to 3 months with the p value of <0.01.the mean percentage of actual gain for group A (CollaCote^{TM} with PRP) was 82% of the desired gain.

Similarly the mean horizontal dimension for group B at baseline was 1.15 ±0.24 and at 3 months time interval the mean change in the horizontal dimension was 2.26 ±0.52. When subjected to statistical analysis from baseline to 3 months it was statistically significant with the P value<0.01, and the mean % of the actual gain was 79%.of the desired gain . This was in accordance to the previous studies done by Allen et al[1] , Studer S.P[83] and Batista[26] ,Spira[84] Inter group comparison between the two groups in the mean changes in horizontal dimensions from the baseline to 3 months was not statistically significant with the P value of >0.05.

In the present study both the groups showed acceptable, clinical improvement in terms of volumetric soft tissue gain. Reviewing the previous literature it has been accepted that CTG seems to be a good autogenous source of soft tissue augmentation[83, 29,6]. In the present study Collacote™ impregnated with the PRP responded clinically similar to that of connective tissue graft in augmenting the Sieberts class I soft tissue defects. Henceforth this material can be used as an alternative to CTG in clinical demanding situations where adequate dimension of the graft cannot be harvested because of the thin palatal mucosa.

Evaluating the individual percentage of the actual gain attained in both the groups at the end of 3 months in group A out of 9 patients, 2 patients attained the maximum of 91.5% of the desired gain and one patient achieved the minimum of 66.5%

Similarly in group B, out of 9, 2 patients attained maximum 89% and 2 patients achieved the minimum of 66.5% of the expected gain. Confounded to the results these patients exhibiting the minimum gain have shown phenotypically thin tissue in the edentulous site at baseline. This was supported by the previous studies by Wara-aswapati et al[100] and Muller et al[54] who correlated the gingival phenotype of the tissue to the thickness of the palatal mucosa and to the surgical outcome after the mucogingival treatment with regards to the age, gender and body weight of the patient. Inter group difference at the end of 3 months was not statistically significant.

In the present study both the treatment modalities proved to show successful therapeutic, clinical outcome in treating soft tissue defects of Seibert's Class I ridge. In accordance with the results of the present study it has been clear that patients with thin and vulnerable gingival tissue also present with thin palatal mucosa that might not be very suitable for obtaining connective tissue of proper dimension for plastic periodontal surgery. In such cases Collacote^{TM} with PRP can be viable alternative in treatment option of treating the soft tissue ridge defects. However long-term clinical studies and larger sample size are needed to validate the augmented result.

Summary& Conclusion

The present study compared and evaluated the soft tissue ridge augmentation with absorbable collagen sponge (Collacote^{TM}) impregnated with PRP and connective tissue autograft. The study population comprised of 18 patients with age ranging from 21-50 yrs. All the patients returned for scheduled maintenance visits. A total of 18 soft tissue ridge defects were treated and post operative healing in the grafted areas was satisfactory.

The following clinical parameters namely width of keratinized gingiva, papillary height, horizontal and the vertical defect measurements were assessed at baseline and 3 months.

Within the framework of this study, the following conclusions have been elucidated:-

1. Clinical measurements of the mean width of keratinized gingiva did not show any difference from the baseline to 3 months period of the study in both the groups.
2. Clinical measurements of the vertical defect response did not show any difference from the baseline to 3 months period of the study in both the groups.
3. Papillary height in group B showed significant increase in 3 months 1.39±0.22 when compared with the group A
4. Both ACS (Collacote^{TM}**)** with PRP and connective tissue graft can be used to augment the horizontal dimensions of the soft tissue defect in sieberts class I defects.

The results presented here clearly demonstrate that in patients where the connective tissue of proper thickness cannot be harvested for augmentation of Seibert's Class I ridge deficiency absorbable collagen sponge (Collacote^{TM}) impregnated with PRP yielded favorable clinical results. However, it is necessary to have a larger sample size and long term controlled

clinical trials to evaluate the true efficacy of this material in augmenting the soft tissue defects.

FUTURE OUTLOOK

Further developments in soft tissue augmentation should be related to simple handling of the material. Synthetic material could result in lower surgical risk when compared to autogenous soft tissue graft. New material developed should be of a matrix with cell in growth capacity which could influence the biologic principles providing space for tissue regeneration. The material should be less technique sensitive with predictable soft tissue augmentation.

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