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RESEARCH ARTICLE

COMPARATIVE EVALUATION OF SUBEPITEIAL CONNECTIVE TISSUE GRAFT AND LATERAL PEDICLE FLAP PROCEDURES FOR ROOT COVERAGE: A CLINICAL STUDY

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ABSTRACT

Aim: The aims of the study are to compare two graft procedures for the amount of root coverage. **Material and Method:** Thirty patients with Miller's class I or II gingival recession were treated with either lateral pedicle flap or subcutaneous connective tissue graft. The percentage of root coverage and the esthetic appearance of the flap post operatively were checked after 1 & 6 months. **Result:** Statistical analysis of the data (students t-test) shows that the difference in root coverage between the two methods is not significant ($p>0.05$). For esthetics, though the relation is statistically non-significant, patient treated with SCTG showed better esthetics than patients treated with LPG. **Conclusion:** The post-treatment assessment showed complete root coverage and an excellent aesthetic outcome of lateral pedicle graft and sub-epithelial connective tissue graft root coverage procedures of an isolated gingival recession.

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INTRODUCTION

Gingival recession is the apical migration of marginal gingiva beyond the cemento-enamel junction, consequently exposing the root surface to the oral environment (Langer and Langer, 1985). More than 50% of the population has one or more sites of gingival recession ≥1 mm (Kassab and Cohen, 2003). Most common site of gingival recession is buccal surface of the tooth as a result of vigorous tooth brushing. However, there are several other factors that may also account for this unpleasant and unaesthetic effect like plaque induced gingival inflammation, lack of attached gingiva, malpositioned tooth, shallow vestibule or local iatrogenic factors (Martins *et al*., 2011). Gingival recession frequently leads to pain, hypersensitivity, esthetic problem, retention of plaque hence inflamed gingiva, root caries, abrasion and fear of tooth loss. The coverage of denuded roots represents one of the challenges of periodontal treatment as clinician is not only required to treat disease and improve function but also cope with ever demanding esthetics of patients (Daing and Singh, 2015). Gingival recession can be managed by surgical or non-surgical approaches. Nonsurgical approaches include - restorations, crowns, veneers and gingival masks whereas surgical management includes various techniques of increasing the width of keratinized tissue such as frenectomy in case of high frenal attachment & root coverage procedures.

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In periodontal surgery, the choice of procedure is based on the four cardinal principles of any surgery: success, reproducibility, lack of morbidity and economy (Bouchard *et al*., 2000- 2001). A number of surgical procedures have been proposed to treat gingival recession. These can be divided into three main groups: pedicle soft tissue grafts, free soft tissue grafts and regenerative techniques (Del Pizzo *et al*., 2002). In pedicle grafts, there are rotation flaps – laterally/ horizontally repositioned flaps, double papilla flaps and oblique rotational flaps and the advanced flaps include coronally advanced flaps and semilunar flaps whereas soft tissue grafts include - connective tissue & free gingival grafts (Miller, 1993; Prato *et al*., 1995; Dym and Tagliareni, 2012; De Sanctis and Clementini, 2014). In the present study, two graft procedures were studied and compared for the amount of root coverage and the cosmetic integration of the operated zone within the mouth. Lateral pedicle graft (LPG), is a technique where graft is elevated from donor site which remains attached at its base for nourishment and is transferred to adjacent site in isolated denuded root. This technique was selected because of the advantages such as – single surgical area, preservation of blood supply of flap, the postoperative color being in harmony with surrounding tissue. The sub epithelial connective tissue graft is one of the most versatile and predictable periodontal plastic surgical procedures. It consists of bilaminar reconstruction of the gingiva using both free and pedicle connective tissue layers to preserve graft viability over denuded root surfaces (Nelson, 1987; Harris, 1992). Improved root coverage is seen because of the dual supply of blood.

MATERIALS AND METHODS

Thirty patients with gingival recession were selected from the out patient department of Periodontics Govt. Dental College and Hospital Srinagar. The patients (15 each) were randomly selected for either surgery. The inclusion criteria were: adjacent tooth with good periodontal condition with adequate keratinized gingival and no interproximal bone loss, systemically healthy, non-smoker and Miller's class I or II type defect. Thorough scaling and root planning was done. On assessing the positive compliance from the patient they were educated, and consent was taken before performing surgical root coverage procedure. The depths of the defects have been measured before surgery and at a follow-up examination after 6 months. Results in terms of mid-surface root coverage have been expressed in millimeters and as the percentage of original defect that has been covered. Also, percentage defects with complete coverage have often been reported. To evaluate aesthetic results, (Bouchard *et al*., 1994) impressions and photographs of the recessions were made preoperatively and 6 months later. The photographs and the impressions were examined and compared by two independent examiners who were blind to the given treatment. The evaluation of the aesthetic results was scored using a three-step scale: good, moderate or poor.

Surgical Procedure

Sub Epithelial Connective Tissue Graft

Antisepsis was carried out through aqueous solution of 0.2% chlorhexidine digluconate. After local anesthesia with 2% lignocaine with adrenaline, scaling and root planing were executed on tooth to remove the contaminated and exposed cementum. Then, preparation of the receptor site was performed through horizontal incisions, towards enamel-cementum junction direction, at each papilla. Following, two vertical relaxing incisions and one intrasulcular incision were executed. Next, full-thickness flap was raised, up to the mucogingival junction and continued as a partial-thickness flap based on this junction. Later, the papilla's epithelium was coronally removed up to their apexes. After preparing the receptor site and measuring the size of graft required, we obtained the subepithelial connective tissue graft from the palate, through the technique of two parallel incisions: one perpendicular to the tooth axis and the other parallel to the bone surface, deepening up to the desired graft height. A partial thickness flap was raised and connective tissue was obtained. The donor site was sutured with 4-0 silk thread. The graft was adapted onto the donor site through sutures and a suspensory suture was performed (silk thread 4-0), aiming to position the flap coronally onto the graft to improve therefore the graft's stabilization and nutrition on the receptor site. Also, complementary sutures were executed.

Lateral Pedicle Graft

Local anesthesia (2% lignocaine with 1:80,000 adrenaline) was used to anaesthetize the surgical site. Recipient site was prepared by using 15 no. surgical blade, starting an internal bevel incision around denuded root to remove adjacent epithelium and connective tissue. The incision skirted mesial surface of tooth with external bevel incision to expose the connective tissue surrounding the denuded root surface. Donor site was prepared by extending sulcular incisions from the distal surface of tooth till mesial surface of adjuscent. Two vertical incisions were made, one at distal line angles of adjacent teeth. Vertical incisions were made continuous with horizontal incisions, and were extended apically to the mucosal tissue to permit adequate mobility of the flap. The flap was raised using a sharp dissection. A cut back releasing incision was made to ensure that the flap is free of tension is free enough to permit movement to the recipient site. Before placing pedicle flap on denuded root, a though root planning was done using curettes. This was followed by copious irrigation with saline. The pedicle flap was positioned 1 mm coronal to cemento-enamel junction of tooth and sutured by 4-0 silk sutures. The area was protected with Coe-Pack. At postoperative period, patient was oriented to use aqueous 0.12% chlorhexidine digluconate mouthrinse for 10 days, analgesics for pain and antibiotics for 3 days. Sutures were removed 7 days post-surgery. Oral hygiene instructions were reinforced, and patient was instructed to come for check-up at 30, 90 days and 6 months post-operatively.

RESULTS

Thirty gingival recession cases were treated. 15 with sub-epithelial connective tissue graft and fifteen with lateral pedicle graft. Out of eighteen patients belonging to Miller's Class I, 10 were treated with SCTG and 8 with LPG. Out of twelve patients belonging to Miller's Class II, 5 were treated with SCTG and 7 with LPG. In class I cases, the mean pre-operative recession was 2.5mm and the average width (measured at CEJ) was 4.05mm. In the Class II cases, the mean pre-operative recession was 4.25mm and the average width (measured at CEJ) was 4.55mm. For Pedicle grafts, the average % of coverage after 2 months was 61.9% and after 6 months was 61.9%. For SCTG grafts, the average % of coverage after 2 months was 67.9% and after 6 months was 76.55%. In 8 of the 15 patients subject to treatment with the SCTG method, there was a coverage of 100%, in two cases there was a coverage of 20% while the rest 5 cases showed a coverage of 75-80%. In the group of patients treated with laterally positioned pedicle flaps, 5 patients obtained coverage of 100%, 1 case was there a 25% increase while the rest 9 cases showed a coverage of 75-80%.

If the data are analyzed on the basis of presurgical classification, the percentage of coverage in class I cases is 82.9% with the SCTG method and 72.9% with pedicle flaps. With respect to the class II cases, an average root coverage of 66.73% was obtained with the SCTG method, whereas an average root coverage of 62.05% was obtained in pedicle flap group. The average increase of keratinized tissue at 6 months was 4.5mm in the pedicle flap group. In the SCTG group it was 2.95 mm. A statistical analysis of the data (students t-test) showed that the difference in root coverage between the two methods is not significant ($p>0.05$).

For esthetics, the examiners were asked to evaluate 1) the Color and texture matching of the tissues i.e. Pre-existing keratinized tissues and gingival graft and 2) Soft tissue appearance i.e. Lack of hypertrophic scars or fibrosis. No scar tissue or fibrosis was reported in 29 cases. Only 1 case with miller's class II treated with lateral peddicle graft showed a little scarring. For color and texture matching, 12 out of 15 patients treated with SCTG showed good esthetic results while 3 were classified as moderate esthetic appearance.

These 3 cases belonged to Miller's class II. Out of 15 patients treated with LPG, only 10 showed esthetically good results, 4 were esthetically moderate while 1 showed poor results esthetically. Though the relation is statistically non-significant, patient treated with SCTG showed better esthetics than patients treated with LPG.

DISCUSSION

Gingival recession, the apical migration of gingival margin is a mucogingival defect of multifactorial origin. It can be defined as the exposure of root surface by an apical shift in the position of gingiva (Carranza *et al*., 1996). The various consequences are clinical crown lengthening esthetic problem, hypersensitivity, root caries, abrasion and fear of tooth loss (Zucchelli *et al*., 2003; Pabolu *et al*., 2013). The presence of gingival recessions at the anterior teeth may represent an esthetic problem. This disharmony may be apparent in the patient's smile or even at a functional level (phonics, chewing). Root coverage has become an important treatment modality because of increasing cosmetic and functional treatment. The treatment of buccal gingival recession for aesthetics or root sensitivity is a frequent demand in patients (Gupta and Pradhan, 2015). Several root coverage procedures have been tested to move the position of the gingival margin coronally including pedicle flaps, free soft tissue grafts, combination of pedicle flaps plus grafts or barrier membranes (Prato *et al*., 1995). The international literatures (Prato *et al*., 1995; Dym and Tagliareni, 2012; De Sanctis and Clementini 2014; Wennstrom and Zucchelli 1996). Have thoroughly documented that gingival recession can be successfully treated using several surgical procedures, irrespective of the utilized technique, provided the biologic conditions for accomplishing root coverage are satisfied: no loss of interdental soft and hard tissue height (Miller, 1993). Irrespective of the surgical approach, the ultimate goal of a root coverage procedure is the complete coverage of the recession defect and an optimal integration of the covering tissue with the adjacent soft tissue.

Success criteria should not only be based upon the amount of root coverage but also upon the cosmetic integration of the operated zone within the mouth **(**Bouchard *et al*., 2000; 2001**).** Success of root coverage procedures depends on several factors like elimination and control of etiology, interproximal bone level, and the choice of best coverage procedure based on the clinical situation (Greenwell *et al*., 2000). The selection of one surgical technique over another depends on several factors, some of which are related to the defect like the size of the recession defect, the presence or absence of keratinized tissue adjacent to the defect, the width and height of the interdental soft tissue, the depth of the vestibulum or the presence of frenuli while others are related to the patient (Zucchelli and De Sanctis, 2013). Despite various surgical treatment modalities available for isolated gingival recessions, Lateral Pedicle Graft was the only surgical procedure available that could predictably produce root coverage (Miller, 1993). It was first described by Grupe and Warren as a surgical procedure comprising the use of a full thickness pedicle flap moved horizontally to cover the denuded root. This can consequently lead to exposure of donor area bone tissue (Grupe and Warren, 1956). Staffileno recommended the use of partial thickness pedicle flap; consequently maintaining the donor area covered by Periosteum (Staffileno, 1964). A further modification was suggested by Parkinson *et al*. called as double – papilla technique (Parkinsom *et al*., 1971). Localized gingival recessions treated with the LPG have a greater probability of obtaining root coverage. (Garber and Salama, 2000; Ozturan *et al*., 2011; Zuhr *et al*., 2014; Pini-Prato *et al*., 2010) Also, the soft tissue utilized to cover root exposure is similar to that originally present at the buccal aspect of the tooth with the recession defect and thus the esthetic result is satisfactory and as various literature (Miller, 1993; Prato *et al*., 1995; Wennstrom and Zucchelli, 1996; Zuhr *et al*., 2014). Suggest that the use of LPG to cover the graft improves the root coverage predictability & esthetic result. Advantages of using lateral pedicle graft over the SCTG procedure is that it requires only a single surgical site, with no separate donor site and offers good color matching of the graft tissue in harmony with surrounding tissues. It is also less invasive procedure with easy oral hygiene maintenances. The disadvantage of using lateral pedicle graft is possible bone loss and gingival recession on the donor site. Its limitations that may contraindicate its use (Dym and Tagliareni, 2012) such as: An insufficient amount of gingival available for positioning, shallow vestibule, Secondary frenal attachment(s) at the donor site and Multiple adjacent recessions.

In 1985, Langer and Langer1 described a technique of subepithelial conjunctive tissue graft for root coverage in the treatment of recessions at single or multiple areas, attributing the procedure success to the double blood supply for the graft's nutrition, originating from the connective tissue of both the periosteum and flap. Additionally, this technique is less invasive at the palatal area, causing a minimum postoperative discomfort to patient and offering a great predictability of coverage. Consequently, this technique is the first choice in cases needing good aesthetical outcomes. The technique gains its clinical predictability by use of a bilaminar flap (Nelson 1987; Harris, 1992) design to ensure graft vascularity and a high degree of gingival cosmetics from the secondary intention healing of the connective tissue graft. Technique also exhibit disadvantages like Need of a greater amount of tissue than the required for covering the area due to the contraction suffered by the tissue, from the surgery to its functional incorporation within the receptor site (Edel, 1975) and difficulty of standardization of the graft thickness, which may result in esthetical alterations (Callan and Silverstein, 1998). Accordingly, these aspects must be observed during the surgical procedure.

Subepithelial connective tissue graft can be indicated for the treatment of single or multiple gingival recessions, correction of the papilla's volume or deformities of the edentulous gingival border, creation and/or increasing of the amount of the keratinized mucosa, (Bernimoulin *et al*., 1975) and perspective improvement of the root coverage associated with restorative procedures, abrasion, or dental caries (Nevins and Melloning, 1998). This procedure is the single most effective way to achieve predictable root coverage with a high degree of cosmetic enhancement (Chandra *et al*., 2015). Historically, the underlying gingival connective tissue has been shown to be a viable source of cells for repopulating the epithelium (Karring and colleagues, 1971) and a somewhat predictable source for increasing the zone of keratinized gingiva (Edel, 1974; Becker and Becker, 1986). The clinical and patient centered outcomes were excellent. Complete root coverage was obtained. No scars resulting in esthetically displeasing appearance were observed. Clinically, the grafted tissues seemed to be attached to the root surfaces.

The obtained clinical outcomes may be considered the gold standard procedure for covering Miller Class I and II gingival recessions (Chambrone *et al*., 2008). One of the advantages of SCTG over others procedures is that it produces a larger increase in the keratinized tissue compared with repositioned flaps (Harris, 2002; Cordioli *et al*., 2001). The presence of thick attached keratinized tissue may constitute a protective factor against marginal inflammation or trauma. Due to the high predictability of root coverage in Miller's Class I and Class II and dual blood supply for graft's nutrition, better maintenance of root coverage could be achieved. However, this technique presents less predictability for root coverage in Miller's Class III and IV recessions because of the difficulty of graft's adaptation and nutrition which may result in necrosis. In the present study, it was found that both the surgical procedures showed complete root coverage and good esthetic results. Connective tissue grafts may be best suited to avoid the collapse of the flap onto the root surface, and to provide better restoration of the soft tissue morphology. Laterally positioned flaps can be proposed to increase the gingival height for root coverage of isolated recessions when neighbouring gingiva is sufficient (Harris, 1998). The choice of the adequate technique and the long-term success of the procedure depend on the careful evaluation of the defect type, recession's etiology, operator's ability, presence of keratinized tissue, tissue width, predictability, single or multiple gingival recessions, healing, aesthetic result, and risk factors (Ottoni *et al*., 2006).

Conclusion

To conclude, post-treatment assessment showed complete root coverage and an excellent aesthetic outcome of lateral pedicle graft and sub-epithelial connective tissue graft root coverage procedures of an isolated gingival recession. Case selection is foremost important criteria for a successful treatment. It is important to provide optimum functional and aesthetic solution for the missing gingival tissue and simultaneously to preserve periodontal health. Marked esthetic and functional results can be obtained with lateral pedicle grafts for replacing lost tissue where a large amount of tissue is missing. The success of subepithelial connective tissue graft may be due to the high predictability of root coverage and the double blood supply for the graft's nutrition.

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