# Evaluating the Efficacy of Subepithelial Connective Tissue Graft and Plasma-rich Fibrin using a Modified Tunnel Technique with V-Reverse Sutures for Gingival Recession: A Research Protocol

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## ABSTRACT

**Introduction:** Gingival Recession (GR) is the exposure of the root surface due to apical migration of the gingival tissue margin below the Cementoenamel Junction (CEJ). GR defects have been treated with a range of surgical techniques. Among the various treatments available for promoting root coverage, autogenous Subepithelial Connective Tissue Graft (SCTG)-based techniques are among the most effective and predictable.

**Need of the Study:** Suturing the graft in the flap results in mobile and unstable anchorage. Thus, the V-reverse sutures technique has been introduced to stabilise the graft favours angiogenesis and repair. Despite the promising outcomes of these techniques, comparative data on the effectiveness of using V-reverse sutures in multiple recession defects are limited. The present study is required to evaluate the clinical efficacy and patient-centered outcomes of this novel suturing technique using SCTG and PRF, which may enhance treatment predictability and healing outcomes.

**Aim:** The purpose of the present study is to compare the effectiveness of SCTG and PRF using the modified tunnel technique in combination with the V-reverse sutures technique for the treatment of multiple GRs defects in the anterior maxilla and mandible.

**Materials and Methods:** A single-blinded randomised controlled trial will be performed from April 2025 to October 2025 at the Department of Periodontology, Sharad Pawar Dental College, Datta Meghe Institute of Higher Education and Research (DMIHER), Sawangi (Meghe), Wardha, Maharashtra, India. A total of 20 systemically healthy patients aged 18 to 60 years with multiple GRs on the labial or buccal surfaces of the teeth will be included and examined over six months. SCTG will be placed in Group A and PRF will be placed in Group B. A total of 10 patients will be randomly allocated to each group. Clinical parameters {recession depth, periodontal probing depth, width of keratinised gingiva, gingival thickness and Gingival Biotype (BG)} will be assessed at baseline and after six months. Each patient will be questioned at the last control visit about satisfaction level with the colour, contour of gums and shape of gums; dentinal hypersensitivity; root coverage; pain and discomforts during surgery; cost-effectiveness; and postoperative discomfort. An independent t-test will be used for comparative evaluation of the effectiveness of the two groups at a 5% level of significance (p=0.05).

## INTRODUCTION

The GR is the exposure of the root surface due to apical migration of the gingival tissue margin below the CEJ. It is a common condition that affects a significant portion of the population [1]. Such mucogingival deformities can lead to aesthetic compromise, increased rates of radicular caries, dentinal hypersensitivity and may negatively impact peri-implant health [2]. Patients today are increasingly conscious of their appearance and considerable attention has been focused on denuded roots that are exposed when smiling, appearing unaesthetic [3]. Thus, periodontal surgical procedures aim to improve gingival plaque-induced GRs or mucogingival defects [4]. Over the past three decades, various surgical techniques have treated GR defects. These include laterally positioned flap, free gingival graft, Coronally Advanced Flap (CAF), SCTG and guided tissue regeneration using membranes, Acellular Dermal Matrix (ADM), platelet-rich plasma (PRP) and Platelet-Rich Fibrin (PRF) in combination with CAF [5]. Studies have demonstrated that among the variety of treatments available for promoting root coverage, autogenous Connective Tissue Graft (CTG)-based techniques are the most effective and predictable [6]. Different types of pedicle flaps, with or without CTGs or replacement biomaterials, may be employed to treat single GRs [7]. A systematic review indicated that the CAF covering a CTG is regarded as the gold standard for achieving Complete Root Coverage (CRC) and Keratinised Tissue (KT) gain at a single GR, with no loss of interdental attachment [8]. Although CRC can be successfully achieved in a single GR, practitioners often face challenges in attaining consistent coverage of several adjacent GRs. In such cases, wound healing tends to be more complicated due to factors such as the larger avascular surface, poorer blood supply, differences in Recession Depth (RD) and tooth positioning [9]. Various surgical techniques and materials have been proposed to achieve coverage of multiple GRs. However, uncertainty remains regarding which technique may reliably result in CRC. A primary drawback of advanced flap procedures is the requirement for vertical releasing incisions on the buccal side, which can impair the blood supply to the grafted tissue and negatively impact the aesthetic outcome. To avoid marginal incisions, supraperiosteal envelope techniques have been demonstrated for treating multiple adjacent areas of recession without detaching the papillae, thereby creating a mucosal tunnel [10]. Following this, the SCTG is passed through the tunnel, positioned coronally, stabilised at the recipient site and sutured in place. Necrosis of the exposed sections of the CTG is an issue that limits the predictability of this original procedure, as the size of the graft remaining across the root surface after surgery determines the extent of root coverage. Among the plethora of techniques, the tunnelling technique benefits

from blood supply from both the overlying flap and the underlying periosteal bed, without compromising vascularity due to dissection of the papillae [11].

It has therefore been suggested to coronally advance the pouch and tunnel as a modification of this technique. This modification involves creating a mucoperiosteal-mucosal tunnel through sulcular incisions that include the papillary tissue [12]. Surgical modifications employing sharpened microsurgical instruments and modified suturing techniques have also been described [13]. Previous authors recommended suturing the graft in the flap, which resulted in mobile and unstable anchorage, unable to promote coronal traction of the graft due to the lateral stabilisation [14]. A new strategy for graft stabilisation in the bed, through an innovative suture technique that favours angiogenesis and repair, has been introduced [15]. Due to its excellent predictability, biocompatibility and ability to increase Gingival Thickness (GT) and KT, SCTG is recognised as the gold standard graft for root coverage [5], while PRF releases growth factors that promote tissue healing, angiogenesis and regeneration [16].

### Aim

1. To evaluate the effectiveness of SCTG using the modified tunnel technique in combination with the V-reverse sutures technique concerning GR during six months.

2. To evaluate the effectiveness of PRF using the modified tunnel technique in combination with the V-reverse sutures technique concerning GR during six months.

3. To compare the effectiveness of SCTG and PRF using the modified tunnel technique with the V-reverse sutures technique concerning GR during six months.

### Hypothesis

**Null hypothesis:** There will be no significant difference in the clinical outcomes of GR treatment when using SCTG and PRF with a modified tunnel technique and V-reverse sutures.

**Alternative hypothesis:** There will be a significant difference in the clinical outcomes of GR treatment between SCTG and PRF when used with a modified tunnel technique and V-reverse sutures.

## REVIEW OF LITERATURE

The SCTG is considered best option for treating GR due to its predictability and long-term success. PRF, a second-generation platelet concentrate, enhances soft tissue healing through the release of growth factors. The Modified Tunnel Technique, a minimally invasive approach, preserves vascularity and papillary integrity, promoting better healing. When combined with SCTG and/or PRF, it has shown promising results in root coverage and KT gain [17]. The use of V-reverse sutures improves graft stability and minimises trauma. However, limited studies have explored the combined efficacy of these techniques, which this protocol aims to evaluate systematically.

A randomised clinical trial evaluated the effectiveness of a modified tunnel technique with CTG, with and without Enamel Matrix Derivative (EMD), for treating multiple Miller Class III GRs. After 12 months, both groups showed similar results, with mean root coverage of around 82–83% in the test and control groups and CRC achieved in 38% of cases and concluded that the modified tunnel/CTG technique is effective and predictable [4]. A case report presented the V-reverse sutures technique to stabilise the SCTG and the tunnel flap to assess the efficacy and predictability of the root coverage procedure, applied in three clinical scenarios: root coverage procedures, papilla augmentation and immediate implant placement. They concluded that this technique provides a practical and efficient approach for stabilising grafts and flaps in periodontal and peri-implant plastic surgeries [18]. A systematic review and meta-analysis reported that the tunnel technique is an effective procedure in treating localised and multiple GR defects and

advocated that the tunnel technique could be used as a valuable alternative to conventional root coverage methods, particularly in aesthetically demanding cases. The comparison of SCTG and PRF employing a modified tunnel method with V-reverse sutures, which aims to improve stability, aesthetics and root coverage in multiple recession defects, is supported by these findings [19]. Given SCTG's proven predictability and capacity to enhance gingival architecture, alongside PRF's regenerative potential, the present study aims to evaluate and compare their clinical effectiveness in the treatment of GRs using modified tunnel technique with V-reverse sutures in anterior maxilla and mandible.

## MATERIALS AND METHODS

A single-blinded randomised controlled trial will be conducted in the Department of Periodontology, Sharad Pawar Dental College, Datta Meghe Institute of Higher Education and Research, Sawangi (Meghe), Wardha, Maharashtra, India, from April 2025 to October 2025. Participants will be randomly allocated to either the SCTG group or the PRF group using a coin-flip method of randomisation. The study population will consist of 20 systemically healthy patients aged 18 to 60 years with multiple GRs on the labial or buccal surfaces of the teeth. The study has been approved by the Institutional Ethics Committee, DMIHER (DU), with IEC number: DMIHER(DU)/IEC/2024/294 and has been registered with the Clinical Trial Registry of India (CTRI): CTRI/2024/11/077169 using the following inclusion and exclusion criteria:

**Inclusion criteria:**

- Systemically healthy patients with multiple (≥2 teeth) Miller Class I or Class II GR defects on labial/buccal surfaces of the teeth;
- GRs ≥2 mm in depth;
- Radiographically adequate interdental bone;
- Adequate Width of Keratinised Gingiva (WKG).

**Exclusion criteria:**

- Patients who are smokers and consume tobacco products;
- Patients having poor oral hygiene after initial periodontal therapy and presenting plaque score ≥1;
- History of previously done periodontal surgical treatment in the selected quadrant for the study within the last six months;
- Presence of severely decayed teeth;
- Teeth with mobility;
- Pregnant females or lactating mothers;
- Teeth presenting with dental cervical abrasion at CEJ level, or teeth with crowns or restorations.

**Sample size calculation:** The sample size will be calculated based on the reference study [20] and is determined using the following formula:

$$n \geq \frac{2\,(Z_{1-\alpha/2} + Z_{1-\beta})^2}{(\delta\mathrm{Diff}/\sigma\mathrm{Diff})^2} + \frac{Z_{1-\alpha/2}{}^2}{2}$$

α=0.01

β=0.01

mean reduction in GR (δDiff)=1.91

Standard deviation of difference (σDiff)=0.66 [20]

Total sample size=10 per group, i.e., 20

### Study Procedure

A total of 20 subjects who will meet the inclusion criteria will be randomly allotted to Group A or Group B, with 10 patients in each group. SCTG will be placed in Group A and PRF will be placed in

Group B. After obtaining informed consent from the patients, clinical measurements of treatment will be assessed at baseline and after six months. Patients will undergo initial therapy, including oral hygiene instructions, scaling, root planing and polishing with dental rubber cups and low-abrasive paste. If necessary, occlusal adjustments will be performed via selective grinding. To minimise brushing trauma in teeth with GRs, the modified Stillman brushing technique will be recommended. Plaque control will be reinforced to achieve a plaque score of ≤1, with a re-evaluation after six weeks to assess plaque control and tissue response.

Prior to surgery, contact points of affected teeth will be temporarily splinted using flowable light-cure resin to maintain the coronal position of the gingival margin. Under local anaesthesia, exposed root surfaces will be gently debrided using a curette. Sulcular incisions will be made and extended to adjacent teeth and the buccal mucosa will be undermined subperiosteally, ensuring no perforation, to allow full-thickness mucoperiosteal flap elevation for coronal displacement of the mucosa [21].

After preparing the tunnel, a sterile template or aluminum foil will help measure the recipient site. SCTG will be harvested from the palate using the trap-door technique between the maxillary canine and first molar. A periosteal elevator will expose and extract the connective tissue, which will be trimmed to a thickness of 1.0–1.5 mm, irrigated with saline and secured at the donor site using interrupted or modified horizontal mattress sutures for primary wound closure with 3-0/4-0 Mersilk sutures. The graft will then be inserted apically within the tunnel and laterally retracted with sutures [22].

The flap will be advanced slightly coronal to the CEJ and secured using the V-reverse suturing technique. Sutures will pass beneath the contact point and engage both the graft and flap, ensuring intimate tissue contact and stability. Each tooth with a recession defect will receive one V-reverse suture and two knots between contact points, maintaining coronal displacement. The surgical site will be packed with a non eugenol periodontal dressing. PRF will be guided under the tunnel between adjacent recession defects and similarly secured using V-reverse sutures. Again, one V-reverse suture and two knots per tooth will ensure stabilisation and the entire area will be packed with a non eugenol periodontal dressing such as Coe-Pak [18].

Post-surgery, patients will be prescribed analgesics (ibuprofen 325 mg + paracetamol 400 mg, tid) and antibiotics (Amoxicillin 500 mg, tid) for five days. Brushing will be restricted in treated areas for three weeks and 0.2% chlorhexidine gluconate mouth rinse will be used twice daily for two weeks. After a week, the periodontal dressing will be removed and re-applied, if needed. Donor-site sutures will be removed after one week and recipient-site sutures after 15 days. Cotton pellets soaked in chlorhexidine will be used for another week before switching to a soft toothbrush with the Charter's brushing technique. Follow-ups at one week, one month, three months and six months post-surgery will monitor healing and reinforce oral hygiene.

### Clinical Outcomes

Re-evaluation of the patient's oral hygiene and gingival status will be done at baseline, one month, three months and six months post-surgery in all patients, using the Plaque Index and Papillary Bleeding Index. Clinical parameters will be measured for assessment of the results.

**Recession Depth (RD):** RD refers to the vertical measurement of GR, indicating how far the gingival tissue has receded from its original position at the CEJ. It is a key clinical parameter used to assess the severity of GR and is often measured in millimetres.

**Probing Pocket Depth (PPD):** PPD is measured from the gingival margin to the base of the pocket using a periodontal probe, typically recorded in millimetres.

**Relative Attachment Level (RAL):** Measures the position of the periodontal attachment relative to a fixed reference point, typically the CEJ. It helps assess periodontal health and tissue loss over time.

**Relative Gingival Margin Level (RGML):** Evaluates the position of the gingival margin relative to a reference point and is often used in studies assessing periodontal treatment outcomes.

**Width of Keratinised Gingiva (WKG):** Refers to the distance between the mucogingival junction and the free gingival margin. It plays a role in periodontal stability and influences treatment planning.

**Gingival Thickness (GT):** GT indicates the thickness of the gingival tissue, which can affect periodontal health and surgical outcomes. It is often classified into thin and thick phenotypes.

**Gingival Biotype (GB):** It will be evaluated by sulcus probing of the midfacial aspect; according to the visibility of the periodontal probe through the gingival tissue, it will be categorised as thin or thick (visible=thin; not visible=thick) [23,24].

These measurements will be recorded using a University of North Carolina 15 (UNC 15) periodontal probe (Hu-Friedy). To standardise clinical measurements, acrylic stents will be made on the patient's cast, which will cover the occlusal surfaces of the experimental tooth and will be used as a reference point. A periodontal probe will be placed onto the stent by placing it into the crevicular area at the angle required to reach the deepest part of the defect. On the stent, longitudinal grooves will be made, which will serve as guides for the periodontal probe.

The patient will have weekly follow-ups during the first month, followed by evaluations at 3 and 6 months to assess satisfaction based on clinical findings. Clinical variables—including gingival margin coverage, colour, contour and surface texture—will be monitored before and after surgery at 1 week, 1 month, 2 months, 3 months and 6 months.

Patient-centered outcomes will be assessed through a self-administered questionnaire at the final visit, focusing on their perception of gingival colour, contour and shape. Additionally, patients will provide feedback on their surgical experience, postsurgical recovery and any discomfort, including swelling, pain, dentinal hypersensitivity, or other postoperative issues.

## STATISTICAL ANALYSIS

Software for statistical analysis will be used to analyse the data {Statistical Package for Social Sciences (SPSS) version 27.2, Chicago, USA}. Mean and Standard Deviation (SD) data will be analysed by the standard statistical method. Student's paired t-test will be used to compare data from baseline to three and six months within each test and control group. Comparisons between the test and control groups at baseline, three months, and six months will be evaluated using Student's unpaired t-test. Between-group comparisons at baseline, 3 months and 6 months will be analysed using independent (unpaired) t-tests. A p-value of less than 0.05 will be considered statistically significant.

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