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## ORIGINAL RESEARCH

## MARI'S NOVEL BI-ANCHORAGE SUTURE TECHNIQUE FOR ROOT COVERAGE AND GRAFT STABILIZATION

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## ABSTRACT

This paper demonstrates a novel suturing approach that achieves favorable and atraumatic soft tissue displacement in periodontal plastic surgery. Gingival recession, characterized by the apical displacement of the gingival margin, poses functional and aesthetic challenges, including root exposure, hypersensitivity, and diminished periodontal health. Successful treatment requires predictable root coverage, increased keratinized tissue width, and graft stabilization. Conventional techniques such as coronally advanced flaps and connective tissue grafts often face challenges related to graft stability and adaptation. To address these limitations, a novel bi-anchorage suture technique has been introduced, designed to enhance graft stabilization, minimize tension, and promote optimal healing outcomes. In periodontal plastic surgery, tunnelling flap techniques have developed as a scientific innovation with the focus on enhancing the vascular supply at the surgical site. A number of suturing techniques for flap stability have been reported in along with a variety of newer flap designs for recession coverage. The technique relies on a combination of tissue supported sling suture (TSS) and subpapillary sling suture (SSS)/ tooth supported sling suture. The present authors described the modification of subpapillary sling suture with crisscross pattern and they have found that the proposed suturing protocol achieves successful integration of graft, maximum root coverage, excellent esthetic results, and limited postoperative morbidity. This suturing technique is described in detail with schematic illustrations and clinical cases, and its advantages and potential limitations are discussed.

**Keywords:** periodontal plastic surgery, tissue supported sling suture, subpapillary sling suture, gingival recession.

## INTRODUCTION

In periodontal and mucogingival surgeries, achieving stable and predictable root coverage is essential for both functional and aesthetic outcomes<sup>1</sup>. This satisfactory outcome depends on the proper selection of suturing technique with the skill of suturing which enables the flap to be positioned precisely and promotes healing. Primary intention healing, which produces smooth, well-vascularized, tension-free,

and precisely shaped wound edges upon healing, depends on achieving primary closure after surgery<sup>[2]</sup>. Stable clot production is the first step towards improved wound healing. Growth factors present in the clot recruit the inflammatory cells (neutrophils, monocytes, and macrophages) to phagocytose the injured tissue and bacteria.<sup>3,4,5</sup>

This process helps to facilitate the granulation process

and leads to the formation of mature tissue without scarring. Suturing plays a significant effect on the molecular processes of inflammation, tissue repair and remodeling by stabilizing the wound while minimizing tension. The ideal healing process depends on biological processes such as fibroblast proliferation, angiogenesis, and extracellular matrix remodeling <sup>5</sup>, all of which are facilitated by sutures.

Earl C. Robinson developed the sling suture technique in 1956 <sup>6</sup>, which is one of the several suturing methods used during periodontal surgical treatments. Its ability to stabilize tissues while preserving precise positioning gives it an evident advantage over other suturing techniques. This method was eventually adopted for a variety of procedures, including guided tissue regeneration (GTR), soft tissue grafting, and implantology, and it became an essential component in periodontal surgeries. 1) Reduced tension and accurate flap approximation produce a stable blood clot that acts as a scaffold for cell migration and proliferation during primary healing, 2) permits selective flap tensioning without excessive compression, allowing sufficient blood flow to the flap or graft and improving tissue regeneration, revascularization, and cell nutrition.

Sling sutures have been used around teeth to favorably adapt and coronally position mucogingival flaps namely, continuous and interrupted sling suture (tooth supported sling suture) rely on tooth morphology for anchorage and to maintain coronal position flap (CPF) stability. A particular suturing approach, subpapillary continuous sling suture <sup>[7]</sup> has the following benefits: 1) the subpapillary placement prevents the flap's vascular supply from being compressed; 2) it keeps the architecture of the interdental soft tissues intact, which is crucial for maintaining both functional and aesthetic results and promoting better healing.

A modification of the sling suture technique used in implant and periodontal procedures is the tissue-supported sling suture <sup>[8]</sup>. This method uses the soft tissues themselves as the main support structure for flap stabilization, in contrast to the tooth-supported sling suture, which is secured around a tooth or implant. The benefits of this technique, 1) It is appropriate for soft tissue grafting in regions missing neighboring teeth, stabilizing flaps in ridge augmentation, and guided bone regeneration (GBR).

2) It minimizes the stress on teeth or implants by not relying on anchoring, which reduces the possibility of injury or overloading; 3) It effectively stabilizes flaps or grafts, minimizing movement and ensuring appropriate healing. Though it aids in better anchorage and stabilization of flap, it needs an additional mechanical support or anchorage for covering high-tension areas,

that is when flap has to coronally position over larger defects like guided bone regeneration.

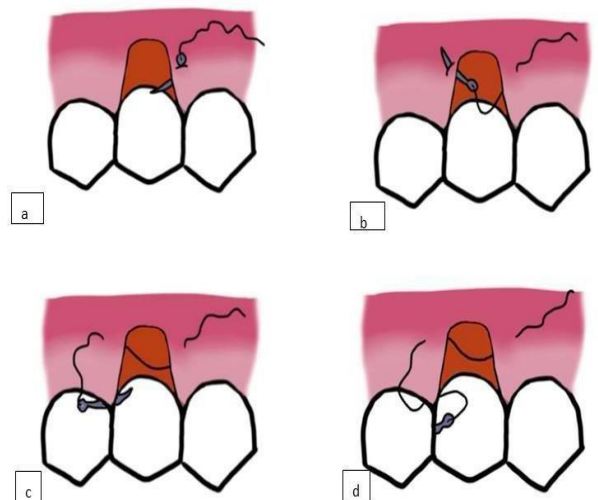
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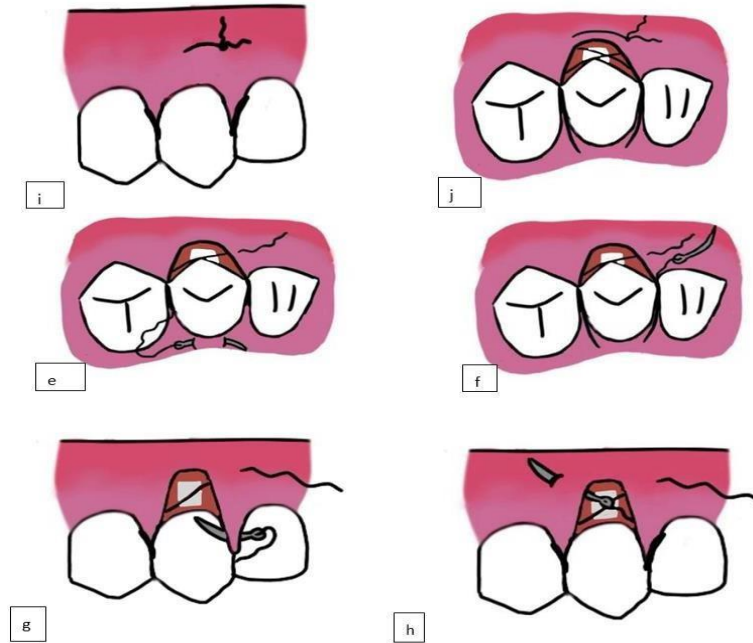
In the concept of additional anchorage, this paper highlights the novel suturing technique in name of bi-anchorage subpapillary technique by the combination of tissue supported sling suture (TSS) and subpapillary sling suture (SSS).

**Surgical Technique:**

**1. For graft stabilization along with root coverage in tunneled flap.**

- Initial bite is taken from the base of the mesial papilla (fig 1b) and needle exits through the sulcular surface (outer-inner)
- The needle is passed sub papilla of distal (fig 1c), thereby engages the graft with one strand along with papilla thereby prevent the collapse of tissue during healing.
- The needle escapes through interdental contact point (fig 1d) and engages the palatal surface by taking horizontal bite (fig 1e) from distal to mesial and the needle is passed through the contact point (fig 1f) to engage the buccal mesial surface.
- The needle passes sub papilla of mesial (fig 1g) and engages the papilla.
- The needle enters the distal papilla of sulcular region and exits in the base of the distal papilla(inner-outer) (fig 1h) thereby graft will be stabilized by two strands and the knot should be placed at the starting point of the bite taken. (fig 1i).



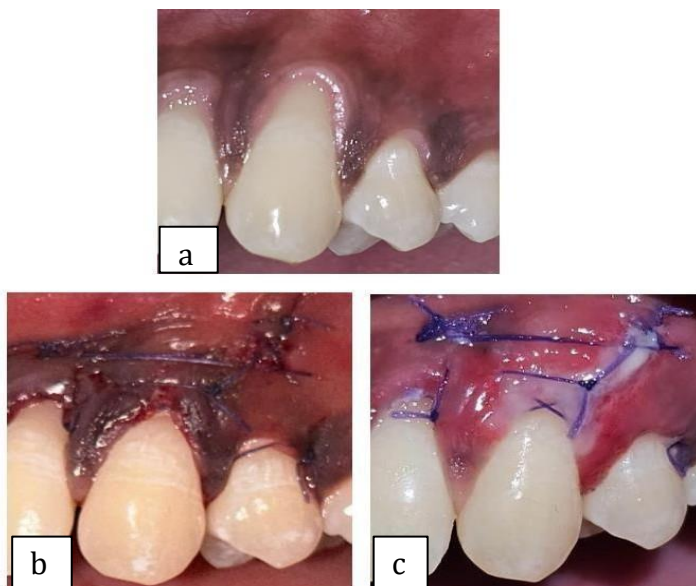


**Figura 1.** Graft stabilization along with root coverage in tunneled flap.

- a) recession of about 2mm,
- b) Initial bite is taken from the base of the mesial papilla,
- c) the needle passes sub papilla of distal,
- d) the needle escapes through interdigital contact point,
- e) engages the palatal surface by taking horizontal bite,
- f) needle is passed through the contact point to engage the buccal mesial surface,
- g) the needle passes sub papilla of mesial and engages the papilla,
- h) needle enters the distal papilla of sulcular region and exits in the base of the distal papilla(inner-outer),
- i) approximated coronally by suture,
- j) occlusal view shows the stabilization of membrane and flap in 8 shape pattern.

**CASE EXAMPLE:**

**CASE NO:1** (Fig 2a, 2b, 2c)



**Figure 2 - a) pre-op shows recession depth of 3mm in relation to 13, b) immediate post-op, c) post- op after a week shows gain in keratinized tissue width along with root coverage.**

**ADVANTAGES:**

- Achieving bi-anchorage (tooth supported & tissue supported) results in precise adaptation of the graft or flap to the root surface, promoting intimate contact and better healing.
- Minimizes tension and trauma to the tissue.
- Eliminates the need for a separate suture for coronal advancement and graft stabilization, which shortens the suturing time.
- Effectively stabilize the graft, ensuring minimal movement during the healing process, this stability is crucial for ensuring proper integration of the graft with the underlying tissues.
- Suitable for connective tissue grafts, coronally advanced flaps, or the placement of biomaterials.
- It results in increase keratinized tissue width and coronal advancement of the flap.
- The same technique can be used for graft stabilization along with root coverage in mucoperiosteal flap/split thickness flap.

**LIMITATIONS:**

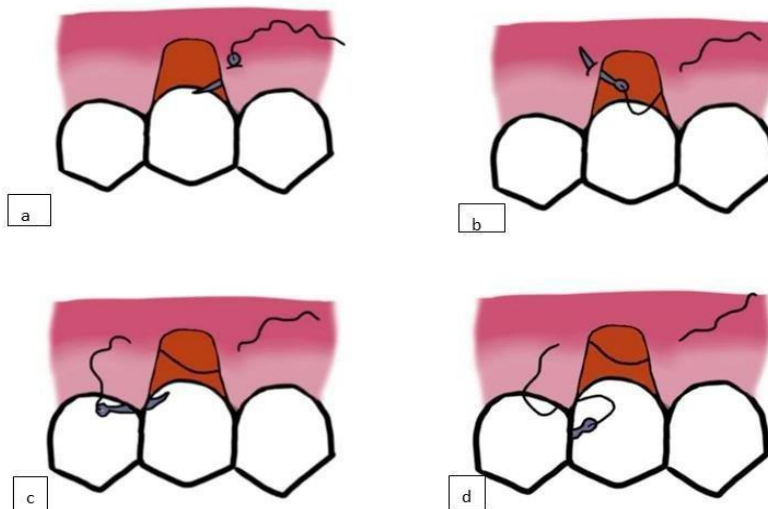
There may be less chance of hindrance to creeping attachment due to crisscross pattern of suture which is placed buccal surface sub gingivally.

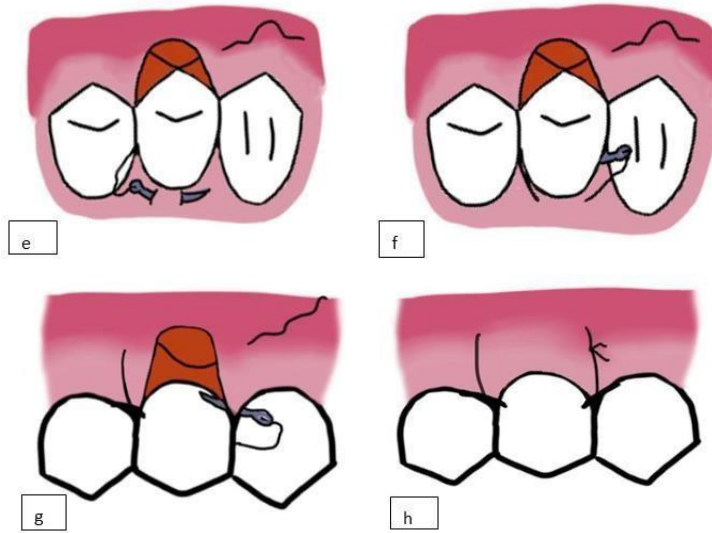
**PRECAUTIONS:**

- The sutures should be placed sub gingivally but not too deep, ensuring the graft or flap remains well-adapted to the tooth surface.
- While suturing the tension should be minimal to avoid tissue compression or ischemia. Thus, surgical site is free of tension to promote proper healing and vascularization, results in root coverage. (fig 2c).

**2. For root coverage in tunneled flap without graft stabilization.**

- Initial bite is taken from the outer buccal surface of base of the mesial papilla and needle exits through the inner sulcular region of tooth (fig 3a)
- Needle passes through the inner sulcular region of distal papilla to the outer buccal surface (fig 3b). The needle passes beneath the distal papilla (fig 3c) towards distal direction thereby engages the papilla and prevent the collapse of tissue during healing.
- The needle is passed around through contact point (fig 3d) and engages the palatal surface by taking horizontal bite (fig 3e) from distal to mesial direction and the needle is passed through the contact point of mesial surface (fig 3f)
- The needle passes beneath the mesial papilla (fig 3g) towards the mesial direction and engages the papilla.
- Both ends of the suture securely tied together, which to be placed most coronally to achieve maximum root coverage (fig 3h).





**Figure 3.** Root coverage in tunneled flap without graft stabilization.

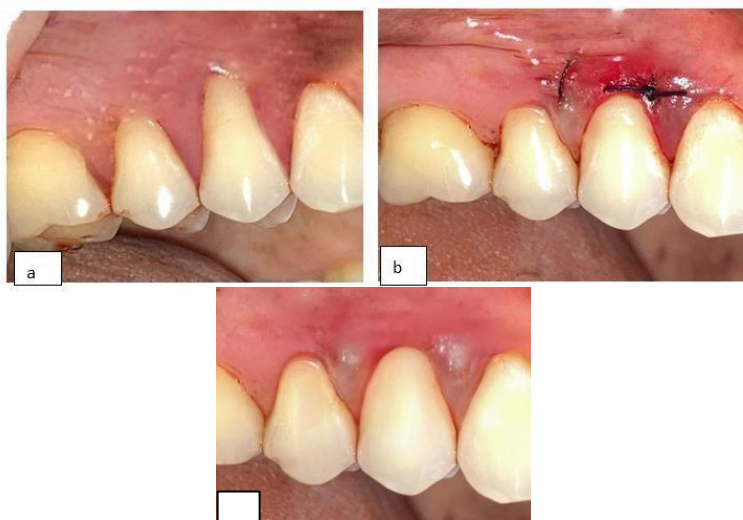
- a) Initial bite is taken from the outer buccal surface of base of the mesial papilla,
- b) Needle passes through the inner sulcular region of distal papilla to the outer buccal surface,
- c) the needle passes beneath the distal papilla,
- d) the needle escapes through interdental contact point,
- e) engages the palatal surface by taking horizontal bite,
- f) needle is passed through the contact point to engage the buccal mesial surface,
- g) the needle passes beneath the mesial papilla,
- h) flap is approximated coronally by suture.

**CASE EXAMPLE:**

**CASE NO:2 (Fig 4a, 4b, 4c)**

**ADVANTAGES:**

- Attaining bi-anchorage results in increased suture integrity, wound stability and flap position.
- Achieves tension-free approximation of the flap margins, reducing the risk of dehiscence and necrosis.
- It helps in achieving uniform root coverage, enhancing the esthetic appearance.
- Facilitates suturing in cases where flap margins are thin or delicate, reducing the likelihood of tearing.
- It is a versatile technique can be used in a variety of cases, such as single or multiple recession defects.



**Figure 4.** a) pre-op shows recession depth of 2mm, b) immediate post-op, c) post-op after 2 weeks.

## DISCUSSION

Periodontal plastic surgery success is influenced by proper suturing by stabilizing the clot and promotes the healing which results in favorable outcome. Coronal advancement of the flap is a crucial component of periodontal plastic surgery aimed at addressing gingival recession and achieving root coverage. Over time, several conventional techniques have been developed to facilitate effective coronal positioning of the flap, interrupted sutures, vertical and horizontal mattress suture, sling sutures. Several studies have shown that the sling suture is more beneficial for patients over other techniques.<sup>9</sup>

The tissue-supported sling suture which was performed in this technique results in favorable outcome. Similarly, McGary et al. (2019) concluded in this study that tissue-supported sling suture provides favorable stability and achieved coronal advancement and root coverage<sup>[8]</sup> and he provided a significant contribution to the understanding of the tissue-supported sling suture technique, emphasizing its advantages over conventional suturing methods like vertical and horizontal mattress sutures. The complete root coverage can be expected only when the flaps were surgically placed 1 to 2mm coronal to cemento-enamel junction hence there will be contraction of soft tissue in healing phase<sup>10</sup>. According to Zuhr et al.<sup>11</sup> using double cross suture with composite stops at the interdental contact points provides over-coverage and achieves complete coverage, but there is a chance of micromovement and relapse of the flap may occur.

Edward et al. (2010)<sup>7</sup> introduced subpapillary continuous sling suture for tunneling and explained the advantages of the method include elimination of the need to place additional sutures for coronal advancement of the pouch, resulted in reduced suturing time over other suturing methods.

A 'V- Reverse' suture technique<sup>12</sup> (Gerardo José Chacón Ramírez in 2020) has used for stabilization of tunnel and connective tissue graft which results in complete root coverage after 6 months and he also pointed out the limitations of this approach may not be suitable at sites with a thin gingival phenotype or lack of keratinized mucosa since it may cause flap dehiscence.

Lakshmi Priya et al in 2021<sup>13</sup>, utilizes subpapillary continuous sling sutures and stabilized the tunnel with PRF which results in favorable outcomes with gain in keratinized tissue width.

Ronco et al in 2016 combined the benefits of suspended suture with vertical and horizontal anchored sutures used in millers' class 1 recession of anterior region, each involved tooth received modified vertical mattress suturing and horizontal suture to achieve the concept of coronal positioning of flap, which results in better esthetic and functional outcome<sup>10</sup>.

## CONCLUSION

This suturing technique has shown promising improvement in clinical outcomes such as increased keratinized tissue width, improved root coverage, and faster healing. Its ability to secure the graft from multiple anchorage points contributes to better stabilization, even in challenging clinical scenarios, such as thin gingival biotypes or areas with minimal tissue support. Further studies and clinical trials may be needed to validate its efficacy compared to traditional suturing techniques fully.

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## DECLARATIONS

No funding was received from any financially supporting body, and there was no associated grant number

### Consent for publication

Informed consent was obtained from every participant for documentation and examination.

### Competing interests

The authors declare no competing interests.

### Ethical approval

Ethical approval was granted by the Institutional Human Ethical Committee

### Informed patient consent

All patients' clinical records were obtained with informed consent.

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