Subpapillary Continuous Sling Suturing Method for Soft Tissue Grafting with the Tunneling Technique

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This paper describes a new suturing method, the subpapillary continuous sling suture, for use with soft tissue grafts in tunnel procedures to treat gingival recession. This method combines the graft suture and the sutures used to advance the pouch margins over the graft into a single continuous sling suture. It is indicated particularly for sites with shallow recessions and those treated for augmentation rather than root coverage because of a lack of graft access for standard suture placement. The single-suture method may also be used for sites with moderate to severe recession. The advantages of this method include elimination of the need to place additional sutures for coronal advancement of the pouch, resulting in reduced suturing time and reduced opportunity to inadvertently cut the continuous suture with the needle when suturing the pouch. (Int J Periodontics Restorative Dent 2010;30:479–485.)

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Site preparation for root coverage grafting has evolved from the original surgical dissection of an open vascular bed, used for placement of an exposed graft overlying the recipient bed, to the current coronally advanced flap and tunnel methods used for submerged grafts. Open site preparation was designed for free gingival grafts.1 Later, recipient site techniques, developed for subepithelial connective tissue grafts, included a pouch technique and coronally advanced flaps for partial coverage of the graft.2,3 The pouch technique was limited to single-tooth recession sites and used a tissue adhesive rather than sutures.3 More recently, tunnel procedures have been described for coverage of connective tissue grafts.4–6

Along with the advancement of soft tissue grafting methods, a variety of suturing techniques have been described. The original free gingival graft was sutured with simple interrupted sutures at the mesial and distal coronal borders of the graft and no sutures at the graft's apical or lateral margins.7 More detailed suturing techniques were described for free grafts used for root coverage with the intent...
of stabilizing the graft at all margins and ensuring close adaptation of the graft to the vascular bed and tooth root.6,9

The original suturing method for the subepithelial connective tissue graft described securing the coronal margins of the graft to the recipient bed first, and then coronally advancing the flap separately with a continuous sling suture to cover as much of the graft as possible.2 In a combination double-pedicle flap and tunneling technique, the overlying flaps were also sutured independently from the graft to prevent flap movement from interfering with graft stability.6 In the supraperiosteal envelope technique, the graft and overlying tissue were sutured together, but no attempt was made to advance the pouch over the graft.4

With the introduction of acellular dermal matrix (AlloDerm, LifeCell) for root coverage grafting, site design and suturing techniques changed to accommodate the different requirements for successful outcomes with allografts. It was found that flap retraction resulting in loss of the exposed portion of the graft was a more common sequella with allografts than with autografts. This finding led to use of a coronally advanced tunnel technique.10 A useful suture method for allografts in tunnel sites, the subgingival double-back continuous sling suture, was first described by Allen in a procedural manual,11 and later in a book chapter with Cummings.12 In this method, the graft is first sutured within the tunnel using a subgingival continuous sling suture without penetrating any tissue other than the graft.

The graft suture is initiated from the lingual side resulting in lingual positioning of the knot to avoid its situating between the graft and the overlying pouch. The suture is passed under the papilla to ensure adaptation of the graft to the tooth and recipient bed and to avoid compression of the interdental tissue. The papilla is elevated from the interdental crest with a 7/8 Younger-Good curette (Hu-Friedy) during site preparation to facilitate this process.11,12 After the graft is sutured, the pouch margins are advanced to cover the graft completely and are secured with interrupted sling sutures, with the knots on the facial aspect.10–12

The purpose of this report is to describe a modification of the subgingival double-back continuous sling suture and discuss the indications, advantages, and disadvantages of the modified method.

Suture method

The modified suture method combines the continuous sling suture for securing the graft with the interrupted sling sutures for coronally advancing the pouch margins into one continuous sling suture, the subpapillary continuous sling suture. In this method, the pouch margins and graft are sutured together and advanced coronally with one continuous sling suture.

After the allograft is placed into the tunnel and positioned over the roots to be treated, the graft margin is aligned level with the pouch margin. Beginning at the posterior-most tooth and using a 6-0 polypropylene suture with a C-17 needle (Hu-Friedy) and a microsurgical Castroviejo Needle Holder (Hu-Friedy), the needle is placed through the pouch margin and allograft at a point 3 mm apical to the pouch margin at the distal root line angle (Fig 1a). A microsurgical Allen Elevator (Hu-Friedy) is used at the pouch margin to maintain coincidence of the pouch and graft margins. The needle is recaptured and passed through the distal embrasure space, captured lingually with microsurgical Dressing Forceps (Hu-Friedy), and passed through the mesial embrasure back to the facial side (Fig 1b).

Next, the needle is passed under the papilla from the mesial aspect of the initial tooth to the distal aspect of the adjacent tooth (Fig 1c). The pouch margin and graft are penetrated with the needle at the distal root line angle of the second tooth 3 mm apical to the pouch margin, once again using the microsurgical elevator to maintain the position of the graft at the pouch margin (Fig 1d). The needle is passed back through the embrasure (Fig 1e), around the tooth lingually, and then through the mesial embrasure back to the facial side. The needle is then passed under the papilla facially from the distal to mesial aspect and the process continues until the last tooth to be treated is reached.

After the needle is passed around the lingual aspect of the final tooth and back through the mesial embrasure to the facial side, the pouch margin and graft are penetrated at the mesial root line angle 3 mm apical to the pouch margin (Fig 1f). The needle is passed back through the mesial embrasure to the lingual side, around the tooth, and through the distal...
embrasure to the facial side. After passing under the papilla (Fig 1g), the needle penetrates the pouch margin at the distal root line angle of the next tooth, passes through the mesial embrasure, around the lingual side of the tooth, and back to the facial side through the distal embrasure. The process continues by passing under the papillae to engage the mesial root line angles of all treated teeth. After returning to the distofacial aspect of the posterior-most tooth (starting point), the suture is tied (Fig 1h). The surgical site is then inspected.

**Fig 1** Subpapillary continuous sling suturing method.

(Fig 1a) The needle penetrates the pouch margin and allograft at a point 3 mm apical to the pouch margin at the distal root line angle.

(Fig 1b) After passing through the distal embrasure and around the palatal aspect of the molar, the needle is passed back to the facial aspect through the mesial embrasure.

(Fig 1c) The needle is passed under the papilla from the molar toward the second premolar.

(Fig 1d) The pouch margin and graft are penetrated with the needle at the distal root line angle of the second premolar 3 mm from the pouch margin. A microsurgical elevator is used to hold the graft at the pouch margin.

(Fig 1e) The needle is passed through the embrasure to the palatal side.

(Fig 1f) After the needle is passed around the lingual aspect of the final tooth and back through the mesial embrasure to the facial side, the mesial graft margin is submersed, and the pouch margin and graft are penetrated at the mesial root line angle 3 mm from the pouch margin.

(Fig 1g) After passing through the mesial embrasure, around the palatal aspect of the canine, and back to the facial aspect through the distal embrasure, the needle is passed under the papilla.

(Fig 1h) After returning to the distofacial aspect of the starting tooth, the suture is tied.
for adaptation and stability. An additional interrupted suture may be necessary on occasion for enhancement of adaptation or stabilization (Fig 2).

The suture may be removed easily after swelling has subsided. Based on clinical observation, it is recommended to retain the suture for 2 to 3 months to allow time for graft integration and marginal stability.

**Discussion**

As with the subgingival double-back continuous sling suture, the subpapillary continuous sling suture engages the margins at the distal aspect of each treated tooth when moving from a posterior starting point and engages the mesial margins when doubling back from the final to the initial tooth, crossing underneath the papillae in both directions.

This method for engaging both the pouch margins and the graft with a single suture is indicated particularly for sites with shallow recessions and sites treated for augmentation rather than root coverage (Fig 3). In such sites, it is more difficult to access the graft for subgingival suture placement. The single suture method may also be used for sites with significant root exposure, but it is imperative to maintain the graft and pouch margins at the same level (Fig 4). This is most easily accomplished by positioning the graft apically in the pouch to align with the pouch margin rather than aligning the graft at the level of the cementoenamel junction and moving the pouch coronally.

Advantages of the single-suture method include elimination of the need to place additional sutures for coronal advancement of the pouch. This in turn results in reduced suturing time and reduced opportunity to inadvertently cut the graft suture with the needle when suturing the pouch. The single-suture method reduces the number of knots that can be irritating to the patient, and the only knot is on the facial surface, providing easy access at removal.

The monofilament polypropylene suture is hydrophobic, does not attract or wick bacteria into the tissue, and does not leave marginal clefts on the surface. During healing, as the tissue swells, the suture sinks below the surface and the tissue heals over the suture. The result is less visible sutures during healing and little evidence of sutures having been present after their removal.

The disadvantages of the single-suture method are the possibility of improper alignment of the graft and the possibility of muscle movement of the pouch causing movement of the graft. When suturing the graft separately from the pouch, the graft can be visualized for precise alignment; when suturing the pouch separately from the graft, the muscle pull on the pouch will not be translated to the graft. Thus, the single-suture method may be contraindicated in sites where excessive muscle displacement is anticipated. Although suturing the overlying tissue and graft together was not recommended previously to avoid the possibility of graft displacement, this problem has not been observed in over 2 years of experience with this
Fig 2a  Moderate recession at the maxillary canines and shallow recession at the central incisors in a patient with congenitally missing lateral incisors. The patient presented with a history of an unsuccessful palatal connective tissue graft on the labial aspect of the right canine. This site now has mesial and distal clefting and scarring from vertical releasing incisions associated with a coronally advanced flap over the palatal graft.

Fig 2b  AlloDerm was placed in a tunnel at the labial side of the four anterior teeth and secured with a single subpapillary continuous sling suture that simultaneously advanced the pouch coronally to cover the graft. An additional sling suture stabilized the margin at the buccal aspect of the right premolar where the tunnel had been extended to allow passive advancement of the pouch at the canine site.

Fig 2c  At 2 weeks postsurgery, there is minimal swelling and the suture is seen just beneath the surface.

Fig 2d  At 4 weeks postsurgery, tissue tone and color are good and the submerged suture is causing no tissue reaction.

Fig 2e  The suture is removed 3 months postsurgery leaving no signs of irritation.

Fig 2f  At 12 months after allograft surgery, complete root coverage is seen along with an esthetic outcome in terms of tissue color and form, with the exception of the clefting and thick tissue from the previous palatal grafting surgery.
method. This lack of displacement influence from the overlying tissue may be due in part to the creation of a passive, tension-free tunnel.

**Conclusion**

The subpapillary continuous sling suture is a simplified method for suturing an allograft within a tunnel and advancing the pouch margins with a single suture. This method requires less time to complete and only one knot, it is more comfortable for the patient, and the sutures are less visible during the healing period. Disadvantages of this method include the possibility of improper graft alignment and the possibility of graft displacement from muscle pull on the pouch.

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**Disclosure**

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**References**


