



# The Pinhole Surgical Technique: A Clinical Perspective and Treatment Considerations From a Periodontist

Tina M. Beck, DDS, MS

**ABSTRACT** Multiple treatment options exist when considering therapeutic approaches for the management of gingival recession. The patented Pinhole Surgical Technique is one of the most recent of such procedures and one of the most poorly understood. The following commentary is intended to help guide clinicians in the decision-making process when considering root-coverage strategies.

## AUTHOR

**Tina M. Beck, DDS, MS**, is a diplomat of the American Board of Periodontology and a solo practitioner in San Diego. Her professional career has been dedicated to leadership in organized dentistry and patient care. She is published in the *Journal of the American Academy of Periodontology*.  
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Numerous therapeutic solutions have been proposed for the treatment of gingival recession.<sup>1</sup> One of the most recent root-coverage techniques, the Pinhole Surgical Technique (PST), has rapidly gained popularity over the last few years but is poorly understood by many clinicians. Even more confusing is the fact that there are numerous options available for gingival recession treatment, each with its own benefits and limitations. As a periodontist well trained in a vast array of techniques, incorporating PST into my practice four years ago was a bit of a treatment-planning challenge. Like many periodontists, my preferred technique had been subepithelial connective tissue grafting because of its ability to predictably cover exposed root surfaces,

change the gingival phenotype and increase the band of attached keratinized gingiva.<sup>2-5</sup> I was initially hesitant to offer PST as a viable treatment option because of the lack of long-term studies, specifically on its efficacy and stability. However, through trial and error and more than 100 cases completed with a minimum of one-year follow-up, I have established some guidelines that I use in my decision-making process when considering treatment options for recession defects. The purpose of this discussion is to elucidate how PST is performed, review its benefits and limitations and share my personal decision-making process in order to assist other clinicians in determining when this procedure would be a viable treatment option as well as answer some of the most commonly asked questions regarding this novel technique.

The most alluring aspect of this procedure for the general public, and some clinicians, is that PST does not require the use of autogenous or allogenic graft material (tissue harvested from a different site from the same patient or from a cadaver, respectively). Instead, the patient's existing gingiva is simply moved coronally to cover the exposed root surface. This is achieved using a 16-gauge sterile hypodermic needle to penetrate the alveolar mucosa and pierce the periosteum apical to the recessed area creating a "pinhole" through which instruments can be inserted. In cases with multiple adjacent sites, multiple pinholes may be required. Specifically designed instruments are inserted through the pinhole to elevate a full-thickness flap without severing the interproximal papillae to move the tissue to the desired coronal position. In my mind, I thought of the PST elevation technique to be an alternative method for achieving a full-thickness flap while keeping the papillae intact, similar to popular tunneling and modified tunneling procedures<sup>6,7</sup> or the vestibular incision subperiosteal tunnel access (VISTA) technique,<sup>8</sup> which many surgeons utilize to prepare a site for graft placement.

A critical factor for the success of most root-coverage procedures is the elimination of tension on the gingival margin of the newly positioned tissue.<sup>9</sup> With PST, wound stabilization is achieved with the use of a malleable, noncross-linked bioresorbable porcine collagen membrane (Bio-Gide, Geistlich, Princeton, N.J.) that is carefully inserted through the pinhole and tucked under the gingival tissues, over the root surfaces, supporting the flap in the desired coronal position, without the need for suturing, dressings or tissue adhesive. Wound stabilization is thus achieved by distending the flap with the collagen membrane, resulting in adequate



FIGURE 1A.

FIGURES 1. Maxillary central incisors with Class I Miller recession (1A). One year after PST (1B).



FIGURE 1B.



FIGURE 2A.



FIGURE 2B.



FIGURE 2C.



FIGURE 2D.

FIGURES 2. 2A and 2B show pretreatment of Class II Miller recession defects with thin biotype and no attached gingiva on teeth Nos. 21, 23, 28. 2C and 2D are one year after PST and demonstrate complete root coverage.

tissue support to secure the marginal gingiva in the new position. The use of such a membrane is not new in the periodontal literature and has a long history of being safe and effective both in the treatment of gingival recession<sup>10</sup> as well as periodontal regeneration.<sup>11</sup>

The elimination of the need for sutures is another unique aspect of this procedure. In order to allow tension-free coronal repositioning of the gingival margin without using sutures, it is necessary to also elevate and coronally advance the gingival tissues of several adjacent teeth, both mesially and distally to the treatment area. This requirement is of clinical significance for some patients who want to minimize the area of treatment for faster recovery. For example, it would not be uncommon to require release from first molar to first molar to treat a single, deep recession defect of a mandibular incisor. The more severe the recession defect, the

more lateral extension and flap release will be required to allow tension-free coronal advancement of the gingival margin at the site of recession. For this reason, many of my patients prefer a technique that allows for a smaller surgical area, like a subepithelial connective tissue graft with a double papilla flap technique.<sup>12</sup>

Postsurgically, the pinhole is left to heal by primary intention without suturing and is often healed within 48 hours. Patients are instructed to bathe the surgical area with 0.12% chlorhexidine gluconate oral rinse and avoid brushing or flossing the area for six to 12 weeks. Although patients experience very little pain following the procedure, there can be a considerable amount of swelling that subsides after about seven days. The collagen membrane is slowly resorbed over the next three to four months, as the newly coronally advanced gingiva settles and re-establishes periodontal

attachment to the previously exposed root surface. Histological studies are currently lacking to determine the exact biology of the healing process, either connective tissue attachment, long junctional epithelium or perhaps even some bone regeneration. Clinically, probing depths usually range from 1–3 mm when measured six months after surgery.

Like all surgical techniques, there are limitations to the success of PST that must be considered when determining treatment options. Most important, the patient must be healthy enough to be considered a surgical candidate, similar to all the other treatment modalities. Heavy smoking, uncontrolled or poorly controlled diabetes and certain medications are just some of the factors that can compromise the healing process and increase the risk of complications,<sup>1</sup> which may outweigh the benefit of treating the condition at all. As with other root-coverage therapies, patients should be free of active periodontal disease or severe gingival inflammation prior to performing PST and should demonstrate compliance with periodontal recall appointments and home care instructions. Also similar to other surgical therapies, occlusal discrepancies and nocturnal bruxism or clenching should be appropriately identified and managed.

There are many anatomical factors to account for when considering treatment options, including but not limited to location of defect, severity of defect, presence or absence of bone loss, number of teeth involved, amount of attached keratinized gingiva and gingival phenotype. Miller's classification of gingival recession<sup>13</sup> is the most widely used method for categorization of the different types and severities of recession defects and is useful to establish general guidelines for clinicians when predicting the success of various gingival recession

treatments. Miller explained that class I and II recession defects can expect 100 percent root coverage, class III defects can expect only partial root coverage and class IV defects are highly unpredictable and little to no root coverage can be expected due to the presence of horizontal bone loss and loss of interdental papillae. These same guidelines should apply to PST as well. Additional limitations include the inability to treat recession defects located on palatal surfaces, difficulty in physically accessing mandibular lingual areas using the PST

Patients should be free of active periodontal disease or severe gingival inflammation prior to performing PST.

protocol and instruments and anatomical considerations involving the sublingual spaces and related structures that may present significant risk in an apical-style approach for mandibular lingual surfaces.

When considering soft tissue biotype and attached keratinized gingiva, autogenous grafting is the most documented procedure demonstrating predictable and stable increases in tissue volume, i.e., altering the soft tissue biotype and amount of attached keratinized gingiva.<sup>2-5</sup> However, analogous to alternative treatment modalities including allogenic soft tissue grafting and guided tissue regeneration, anecdotal evidence suggests that PST is capable of increasing tissue volume and attached keratinized gingiva,<sup>14</sup> but currently there is limited evidence to

support these claims. When discussing treatment options with my patients, they are fully informed of this fact and it is left to them to make an educated decision. They usually choose subepithelial grafting in cases where there is only a single tooth with little to no attached keratinized gingiva. Initially, I only offered PST to patients who have ample attached gingiva and thick phenotypes (**FIGURE 1**). However, after my experience with the procedure and witnessing first-hand some of the dramatic results it can produce, I began to offer it for more complex cases (**FIGURE 2**). In cases where there are several teeth in a single arch with recession and minimal attached gingiva, patients often want to try PST over the multiple rounds of surgery required for connective tissue grafting of an entire arch. **FIGURE 2** demonstrates that good root coverage and some gain in attached gingiva is possible with PST and I consider it an acceptable treatment option despite the lack of documented stability, as long as patients are made aware of this fact. Additionally, I evaluate the gingival phenotype of the recession site and explain that PST might not alter it significantly, increasing the risk of recurrence. Due to the lack of evidence regarding the long-term stability of PST in cases with very thin biotypes and minimal or no attached gingiva, I ensure that these patients understand that additional procedures may be required if the desired results are not achieved, although I have yet to see such recurrence. This word of caution is based on existing studies involving coronally positioned flaps that suggest a minimum tissue thickness of 0.8–1mm for predictable and stable root coverage.<sup>15-17</sup> Notwithstanding these limitations, there are some unique and significant advantages to PST for both the patient and clinician.

Compared to conventional autogenous soft tissue grafting, patients anecdotally report reduced postoperative pain with the elimination of a secondary harvest site.<sup>1</sup> This fact may also improve case acceptance for PST due to the perceived pain associated with autogenous grafting and other alternative techniques. Patient-centered investigations are needed to substantiate these notions. An additional advantage of PST over autogenous grafting procedures is the ability to treat an unlimited number of sites at one time because the clinician is not limited by the ability to harvest an adequate amount of tissue to cover the desired area. In contrast to most other procedures commonly performed for the reversal of gingival recession, PST also does not require sutures, reducing the time required to perform the procedure and eliminating the overhead cost of suture and related surgical instruments. Moreover, the usage of a noncross-linked bioresorbable collagen membrane with PST may encourage bone regeneration similar to that noted in the literature regarding guided tissue regeneration for the treatment of gingival recession,<sup>18-21</sup> however, histological evidence is needed to support this theory.

PST is not taught in universities and clinicians must attend a specific privately taught course to learn how to perform the procedure, causing many untrained clinicians to be unclear about its limitations. Some of the limitations of PST are not exclusive to this one particular procedure because it is due to the biologic nature of the periodontal attachment apparatus itself. It is well accepted in the periodontal community that connective tissue attachment will only form on cementum and not restorative surfaces or enamel.<sup>22,23</sup> Therefore, there is currently no procedure that will predictably coronally advance



**FIGURE 3A.**

**FIGURES 3.** Grade IV Miller recession due to horizontal bone loss (**3A**). One year after PST and showing 100 percent coverage on two of six sites and 50-70 percent coverage on four of six sites (**3B**). Note the black triangle between the central incisors remains after treatment.



**FIGURE 3B.**

the gingival margin and connective tissue attachment beyond the cemento-enamel junction onto enamel or over restorative surfaces. This limitation applies to PST as well. However, PST can be used to cover noncarious cervical lesions as well as previously restored or decayed root surfaces, similar to other methods for treating gingival recession. Although common in practice, the removal of a restoration to eliminate recurrent decay or improve gingival aesthetics, in combination with a root-coverage procedure, is a relatively recent concept in the literature.<sup>24-28</sup>

Another misconception regarding root-coverage procedures in general is related to the ability to predictably attain significant root coverage in the presence of horizontal bone loss. This type of recession often results in cosmetic compromise due to the lack of interproximal papillae, commonly referred to as “black triangles.” Analogous to other procedures,<sup>13</sup> PST does not predictably fill these spaces (**FIGURE 3**). A final question many unfamiliar with the technique have is in relation to the mental nerve. Due to the apicocoronal approach required with PST, special consideration must be taken to avoid damage to the mental nerve, a concern that is addressed with a simple modification to the technique taught during the training.

An increased understanding of the importance of treating gingival recession and the establishment of an adequate zone of attached keratinized gingiva in preventing clinical attachment loss,

together with a shift to patient-centered outcomes, has driven the development of alternative therapies with improved patient acceptance and less overall patient morbidity (pain, swelling and bleeding) compared to autogenous grafting. Additionally, the inherent limitation in the availability of donor tissue when performing autogenous grafting has compelled clinicians to explore other methods. As a result, clinicians are now faced with a plethora of treatment modalities for achieving root coverage. Systematic reviews and consensus statements produced as a result of the recent American Academy of Periodontology regeneration workshop concluded that viable alternative treatment modalities are currently available that are capable of achieving root coverage and providing keratinized tissue augmentation without the need for palatal donor tissue.<sup>29</sup> To date, the only peer-reviewed published clinical research to date that is specific to PST is a retrospective study of 100 sites treated with PST that found an average of 86.9 percent defect coverage and an average residual recession of only 0.4 mm.<sup>8</sup> Average follow-up period was 18 months, comparable to other long-term studies evaluating the stability of root-coverage procedures.<sup>1,4,6</sup> Research is currently in progress to further examine the efficacy, predictability, limitations and long-term stability of PST. In conclusion, many treatment modalities are available for the purpose of root coverage, and PST is yet another treatment option for clinicians to consider. ■

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#### DISCLOSURE

John Chao, DDS, holds patents for PST instruments and trademarks for the Pinhole Surgical Technique.

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THE AUTHOR, Tina M. Beck, DDS, MS, can be reached at [tmbeckdds@me.com](mailto:tmbeckdds@me.com).