The Connective Tissue Graft
With Labial Vestibular Extension
Peter O. Cabrera, DDS

Because of its predictability and simplicity, the connective tissue graft has become the method of choice in most root coverage procedures. However, in cases with prominent frenum involvement and limited vestibular depth, this procedure can be difficult, if not impossible, to accomplish. Building upon a modification of the labial vestibular extension, described by Kazanjian in 1935, a technique is presented, whereby vestibular extension is accomplished in the same one-stage surgical procedure with a connective tissue graft. The learning objective of this article is to introduce this modification of the surgical technique to a larger segment of the clinical profession.

The connective tissue graft (CTG) has become one of the most predictable clinical procedures for root coverage and mucogingival reconstruction in properly selected cases. Ample blood supply from the underlying connective tissue and the overlying flap are the key features in the predictability of this technique. The ability to close the palatal flap by primary intention, as opposed to the exposed connective tissue left on the palate with the free gingival graft, provides increased patient comfort and acceptance. In addition, the excellent tissue blend that can be obtained provides the patient with

Dr. Cabrera is a Clinical Assistant Professor, Division of Advanced General Dentistry, Northwestern University Dental School, and an Affiliate, Department of Surgery, The Children’s Memorial Hospital, Chicago, Illinois. He maintains a private practice limited to Periodontics and Dental Implants in Chicago, Illinois.

Figure 1. Representation of Kazanjian’s vestibuloplasty - 1935. Original vestibule.

Figure 2. Initial incision.
superior aesthetic results. The most
limiting clinical situations in the
use of this procedure, however, are
cases with prominent frenum
involvement and limited vestibular
depth. These conditions are often
encountered on the facial aspect of
the mandibular anterior segment.
Tissue mobility is restricted, mak-
ing coronal or lateral flap position-
ing difficult, if not impossible. In
order to provide an adequate zone
of attached gingiva plus root cover-
age, the periodontist is forced to
employ either a large free gingival
graft or a two-stage procedure,
consisting of a free gingival graft
followed by a coronally positioned
flap. Although both of these
techniques have been shown to be
effective, both approaches have
the disadvantages inherent in free

grafting. The palatal wound must
heal by secondary intention, and
the procedure is somewhat less pre-
dictable because early healing is
dependent upon unilateral plasmat-
ic circulation rather than bilaminar
vascular support. The two-stage
procedure carries the obvious addi-
tional disadvantage of two surgical
procedures. Finally, in areas of aes-
thetic demand, the clinician may
find it challenging to reproduce an
acceptable color blend with the
adjacent tissue.

The ability to provide aesthetic
root coverage with adequate
attached tissue and eliminate aberr-
ant frenum pull, while providing
adequate vestibular depth in one
procedure, is a significant improve-
ment over the two-stage procedure
or the thick free gingival graft. The
purpose of this paper is to describe
the combined use of a connective

Figure 3. Final vestibular depth.

Prominent frenum involvement
and limited vestibular
depth...limit the regular
connective tissue graft.

Figure 4. Labial vestibular extension. Original vestibular depth.

Figure 5. Initial incision completed.
tissue graft with a labial vestibular extension technique in a one-stage procedure.

CLINICAL DESCRIPTION

The Connective Tissue Graft
The clinical technique of the connective tissue graft has been described in detail in the literature. In summary, a partial thickness flap is reflected away from the teeth to be grafted. The roots are thoroughly planed to reduce prominence and provide a smooth, clean surface. The donor tissue is procured via a partial thickness flap in the palate which can be sutured by primary intention after removal of the graft. The connective tissue graft is then sutured over the root and, in turn, is partially covered with the flap originally reflected. There have been numerous reports of substantial root coverage with excellent aesthetic results using this approach. The best results are obtained on teeth where there is minimal or no interproximal loss of attachment (Miller’s Classification 1 and 2).

Vestibular Extension
In 1935, Kazanjian described a labial vestibular extension procedure to help in the prosthetic restoration of resorbed mandibular edentulous ridges. Kazanjian described his procedure (Figures 1 through 3) as follows:

With the lower lip hyperextended, a partial thickness flap through the buccal mucosa is initiated midway between the crest of the alveolar ridge and the lower lip. The flap is carried to the ridge, dissecting soft tissue and muscle attachments in the process. The labial edge of the mucosa is then undermined,
stretched, and sutured to the depth of the vestibule. This results in a ridge with increased vestibular depth without frenum pull that can accommodate a denture.

Several modifications of this procedure have been presented over the years. In 1965, Howe\textsuperscript{14} and, in 1978, Kethley and Gamble\textsuperscript{15} presented a variation of the original procedure by elevating the periosteum and suturing it to the edge of the alveolar mucosa rather than suturing the edge of the mucosa at the depth of the vestibule. This procedure has come to be known as the “lip-switch” procedure. Although these approaches have the disadvantage of placing some of the denture surface on alveolar mucosa, the results of vestibular extension and elimination of aberrant frenum pull have proved to be substantial and long lasting;

Kethley\textsuperscript{11} reported a 20% relapse. This approach to vestibular extension was described in 1991 by Thies and Sager\textsuperscript{16} in conjunction with implant placement and in 1985 by Jensen\textsuperscript{17} in combination with hydroxylapatite ridge augmentation.

In periodontics, Edlan and Mejchar\textsuperscript{18} described a technique in 1963 for vestibular extension in periodontal flap management. In their report, the authors described the condition of a shallow vestibule with prominent frenum pull as primary or secondary, the former being developmental and contributing to recession at an early age, and the latter resulting from periodontitis-related recession which eventually results in a shallow vestibule and increasing pull on the remaining marginal gingiva. Interestingly, the clinical description of this procedure is remarkably similar to the

The combination procedure is not necessarily new...it is a combination of two established and predictable procedures.

Figure 9. Labial vestibular extension completed: labial margin of mucosal tissue sutured to depth of the vestibule. Frenum pull eliminated.

Figure 10. Partial thickness flap has been reflected prior to root preparation and insertion of the connective tissue graft.

Figure 11. CTG in place with coronal position of reflected flap. Zone of exposed connective tissue demonstrates flap flexibility.
Figure 12. Final healing 2 months postoperatively.

Figure 13. Case 2. Preoperative view showing recession, minimal zone of attached gingiva and limited vestibular depth.

Figure 14. Initial superficial vestibular incision.

lip-switch procedure, described later by Howe in the British literature in 1965, and by Kethley and Gamble in 1978. The approach of Edlen and Majchar was utilized by Marggraf in combination with a coronally positioned flap for root coverage. Marggraf presented the two-year results in 1985. At the two-year evaluation, 50% of the recessions were completely covered. He concluded that by utilizing this method, it is possible to cover denuded root surfaces without increasing the width of the keratinized gingiva. The 5 to 8-year results were reported by Romanos, Bernimoulin, and Marggraf in 1993. In the latter study, they reported root coverage of 75% or more on 58% of the teeth and total coverage in 14% of the teeth. Their results showed that this approach, which they called the double

The donor tissue is procured via a partial thickness flap in the palate which can be sutured by primary intention.

lateral bridging flap and incorporated a labial vestibuloplasty, is a predictable and effective procedure with a good long-term prognosis.

Combination Procedure: Connective Tissue Graft Plus Vestibular Extension
In order to facilitate tissue manipulation during root coverage, the vestibular extension is accomplished first. The lip is stretched and everted in an outward and downward direction to fully identify vestibular depth and frenum involvement. A superficial crescent-shaped incision is initiated at the depth of the vestibule, approximately 1 to 2 teeth to the mesial or distal of the teeth to be grafted (Figure 4). This incision is carried towards the lip onto the mucosal surface approximately 2 mm beyond the origin of the frenum and 1 to 2 teeth to the opposite side. The exact length of this
incision depends on the degree of frenum involvement and the depth of the existing vestibule. With continued tension on the lip and the surgical blade parallel to the long axis of the teeth, the incision is carried apically to the desired vestibular depth (Figure 5). Care should be taken not to perforate the vestibular depth of the flap, as this may compromise the vascular supply. The mucosal edge adjacent to the lip is undermined and sutured to the periosteum at the new vestibular depth.

Once the desired vestibular depth has been established and all frenum attachments have been severed, the buccal tissue should be visibly relaxed against bone (Figure 6). The connective tissue graft is now performed as previously described. The key feature in this surgical manipulation is the loose submucous connective tissue and elastic fibers of the lip, vestibule, and alveolar mucosa. This provides excellent flexibility in the flap which can now be positioned coronally or laterally without significant impingement on the vestibular depth or the creation of frenum pull.

**DISCUSSION**

The success of the connective tissue graft in root coverage lies in the double blood supply from the undersurface and from the overlying flap. Because the palate is closed by primary intent, there is minimal postsurgical discomfort and increased patient acceptance. From an aesthetic perspective, the tissue blend is usually excellent. This makes the connective tissue graft the procedure of choice in...
The success of the connective tissue graft in root coverage lies in the double blood supply.
PRACTICAL PERIODONTICS & AESTHETIC DENTISTRY

The 10 multiple choice questions for this exercise are based on the article “The connective tissue graft with labial vestibular extension” by Peter O. Cabrera, DDS. This article is on Pages 57-63. Answers for this exercise will be published in the August, 1994, issue of PP&A.

1. The key feature in the predictability of the connective tissue graft is:
   a. The use of a partial thickness flap.
   b. The dual blood supply from the overlying flap and underlying connective tissue.
   c. Thorough root preparation.

2. Limiting clinical situations in the use of the connective tissue graft include:
   a. Prominent frenum
   b. Limited attached gingiva.
   c. Shallow vestibular depth.
   d. a and c.

3. In Kazanjian’s vestibuloplasty, described in 1935, the initial incision is started:
   a. Midway between the crest of the alveolar ridge and the lower lip.
   b. On the crest of the alveolar ridge.
   c. Only on attached gingiva.
   d. Without any tension on the lower lip.

4. The principal difference between Kazanjian’s extension and the lip-switch procedure is:
   a. Periosteal reflection in the lip-switch.
   b. The use of silk sutures with Kazanjian’s procedure.
   c. The use of releasing incisions with the lip-switch.

5. Aesthetic tissue blend is usually best achieved with a:
   a. Free gingival graft.
   b. Two-stage procedure.
   c. Connective tissue graft.

Self-Instruction Exercise No. 63
LEARNING OBJECTIVES:
The learning objective of this article is to introduce to the larger segment of the profession the modification of connective tissue graft for use in cases with prominent frenum involvement and limited vestibular depth. Upon completion of this exercise, the reader should be:

- Better acquainted with the principles of the modified procedure.
- Better prepared to use the technique in clinical practice.

6. The correct order described for the combination procedure is: 1) Partial thickness flap; 2) Insertion of connective tissue; 3) Labial vestibular extension.
   a. 1, 2, 3.
   b. 2, 1, 3.
   c. 3, 1, 2.
   b. 2, 3, 1.

7. Flexibility in the flap after labial vestibular extension is provided mainly by:
   a. Elastic fibers and loose submucous tissue.
   b. The largest possible incision.
   c. Keratinized epithelium.
   d. Periosteal retention.

8. In the combination procedure, the mucosal crescent-shaped incision is initiated at the depth of the vestibule:
   a. True
   b. False

9. The combination procedure described is:
   a. A totally new procedure.
   b. A combination of two established procedures.
   c. A single-step procedure.
   d. b and c.

10. After the initial vestibular extension, the labial edge of the mucosa is:
    a. Cauterized and packed.
    b. Undermined, stretched, and sutured to the depth of the vestibule.
    c. Left to granulate.
    d. Sutured to the connective tissue graft.