The Subepithelial Connective Tissue Graft Palatal Donor Site: Anatomic Considerations for Surgeons

Surgeons must become completely familiar with the anatomy of the palatal donor site to feel confident in providing the subepithelial connective tissue graft procedure. Variations in the size and shape of the hard palate affect the dimensions of donor tissue harvested, as well as the location of the greater palatine neurovascular bundle. This article classifies palatal vaults according to height as high, average, and shallow. Illustrations and cadaver dissection are utilized to demonstrate that surgeons can gain substantial donor tissue specimens without encountering the neurovascular bundle. Actions to be followed in the unlikely event that the neurovasculature is encountered are reviewed. (Int J Periodont Rest Dent 1996;16:131-137.)

The subepithelial connective tissue graft procedure has gained wide acceptance. This technique typically utilizes donor tissue retrieved from the hard palate. The purpose of this article is to describe the anatomy of the palatal donor site and to identify structures that could potentially create surgical complications.

The hard palate is composed of the palatal process of the maxillary bone and the horizontal process of the palatine bone. It is covered with masticatory mucosa. The soft tissue extending superiorly from the cementoenamel junction (CEJ) of the maxillary posterior teeth for approximately 2 to 4 mm is composed of dense lamina propria. The connective tissue continuing on to the midline of the palate contains loosely organized glandular and adipose tissue.

The height, length, and thickness of donor tissue that can be obtained varies with the differing anatomic dimensions

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of the palatal vault. The greatest height (inferior-superior dimension) can be found in the high (U-shaped) palatal vault. The greatest length (anterior-posterior dimension) can be found in a large palate. The thickest tissue can be found in the area from the mesial line angle of the palatal root of the first molar to the distal line angle of the canine (Figs 1 and 2). A thick alveolar process and/or exostosis is often encountered in the molar region, which limits the length and thickness of tissue that may be obtained. The clinician can easily determine the thickness of the donor tissue by needle soundings following the administration of local anesthesia.
Neurovascular considerations

The greater and lesser palatine nerves and blood vessels gain entrance into the palate by passing through the greater and lesser palatine foramina. The foramina locations vary, but generally can be identified apical to the third molar at the junction of the vertical and horizontal parts of the palatine bone. These nerves and vessels course anteriorly (Fig 3a) within a bony groove (Fig 3b). The neurovascular bundle may be located 7 to 17 mm from the cementoenamel junctions of the maxillary premolars and molars (Bowers GM, personal communication, 1995) (Figs 4a to 4d). Prior to making the initial incision to procure the donor tissue from the palate, the
surgeon should attempt to palpate the bony groove (Fig 5). The groove is easiest to palpate at its most posterior extent. This palpation allows the surgeon to determine the maximum apical (superior) placement of the incision that is possible before violating the neurovascular bundle. The surgeon may wish to indicate this groove with a line made by an indelible marker on the soft tissue surface of the hard palate (Fig 6a), which can be a useful reference when obtaining the donor tissue (Fig 6b).

When the palatal vault is shallow (flat), neurovascular structures will be located more proximally to the CEJ (see Fig 4d). When the palatal vault is high (U-shaped), the structures will be located at a greater distance from the CEJ (see Figs 3a, 3b, 4a, and 4b). The retrieval of donor tissue from the premolar region in the high and average palate (see Figs 4b and 4c) offers a greater margin of safety than retrieval from the shallow (flat) palatal vault (see Fig 4d) in reference to the neurovascular structures. The mean height of the palatal vault (the shortest distance between the midline of the hard and soft palates and the CEJs of the first molars) in an adult male is 14.90 mm, with a standard deviation of 2.93 mm. The mean height in an adult female is 12.70 mm, with a standard deviation of 2.45 mm. Caution must always be exercised not to violate the neurovascular bundle when obtaining the donor tissue, but extreme caution must be exercised when the palate is shallow.

The terminal branch of the greater palatine artery extends to the incisal foramen, where it passes superiorly up the incisal
canal onto the nasal septum into Kiesselbach's area. In this anterior palatal region, the artery drops inferiorly, decreasing the distance from the artery to the cementoenamel junctions of the anterior teeth. Therefore, the authors recommend limiting the anterior extent of the donor site surgery to the distal line angle of the canine tooth to avoid damage to the greater palatine nerve and artery (see Figs 3a and 3b), which could cause postsurgical bleeding and paresthesia or anesthesia. Instances of paresthesia and anesthesia have been encountered when the donor site has been extended anteriorly to the lateral incisor region and beyond.

If the surgeon encounters bleeding from the palatine vessels, the following actions can be taken in sequence:

1. Immediate direct application of pressure and the injection of a local anesthetic containing a vasoconstrictor into the region. Pressure should be constant for at least 5 minutes.
2. Placement of one or more sutures proximal to the bleeding site (ie, between the bleeding site and the foramen).
3. Elevation of a full-thickness flap—the vessel is reflected with the flap, visualized, and ligated.

**Donor site surgery in the cadaver**

To visualize the anatomic structures when obtaining donor tissue from the palate, the procedure was performed on cadavers following the methods previously described by Bruno. Incisions were made in the palates of cadavers, reproducing the palatal incisions needed to obtain donor tissue for clinical patients (Fig 7a). The tissue was then elevated and removed from the palatal donor site (Figs 7b and 7c). The donor tissue taken from the average or high palate typically measured approximately 5 to 8 mm in height (Fig 7d). When the donor tissue procedure was completed in the cadaver, the palatal tissue covering the donor site (overlying flap) was removed, and the donor tissue was replaced to demonstrate the distance between the superior edge of the donor tissue and the palatal neurovascular structures (Fig 8). In a high palatal vault this distance measured approximately 4 to 7 mm.
Surgical blade in place at the completion of an incision parallel to the long axis of the teeth. The length of the cutting edge of the blade can be measured and used as a depth gauge to avoid the neurovascular bundle (cadaver).

Donor tissue being elevated (cadaver).

The donor tissue after being removed from the palatal donor site (cadaver).

The donor tissue measures 7 mm in height (cadaver).
Conclusions

1. Knowledge of the anatomy of the soft tissues, hard palate, and neurovascular structures is mandatory to avoid surgical complications when obtaining the desired donor subepithelial connective tissue.

2. The thickest donor connective tissue can usually be harvested from the premolar region of the palate. If sufficient tissue cannot be obtained on one side, the contralateral side of the palate may be simultaneously utilized.

3. Greater tissue availability is found with a high palatal vault versus a low palatal vault. A thick alveolus or exostosis in the molar region may limit connective tissue availability in this region.

4. A sequential series of three actions must be taken if serious bleeding complications arise during the surgical procedure.

To the authors' knowledge, very few instances have occurred where anesthesia and paresthesia have been permanent, or where a serious hemorrhage has occurred in obtaining connective tissue from the palate. Nevertheless, caution must always be exercised not to violate the neurovascular bundle when obtaining the donor connective tissue, and extreme caution must be exercised when a shallow palatal vault is encountered.

References


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