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Palatal island flap

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This chapter reviews the anatomy, indications, and technique for utilizing the palatal island flap in head and neck reconstruction. The unique anatomical features of this flap will be highlighted, in addition to practical tips in harvesting and insetting this flap. Potential pitfalls and complications will also be discussed. Strategies for use of this flap in specific subsites, and in combination with other reconstructive techniques, will be addressed. The palatal island flap remains a reliable and useful tool in the armamentarium of the reconstructive head and neck surgeon, to address challenging defects of the oral cavity and oropharynx.

Introduction

Palatal defects present unique and complex challenges relative to other oral cavity sites. Failure to achieve adequate oronasal separation and velopharyngeal competence drastically impacts a patient's quality of life. Although prosthetic obturation can accomplish these goals for many patients, sufficient retention of an obturator can be problematic for some, depending on the status of their dentition and the remaining oral cavity tissues. Cost can also be an insurmountable barrier, as these expensive devices are often not covered by medical insurance. Retromolar trigone and tonsillar fossa defects—even quite limited ones—can also present a reconstructive challenge due to the risk of trismus, a difficult complication to reverse. The palatal island flap provides a useful reconstructive option to address these issues. A variety of local, regional, and free tissue options exist for the reconstruction of defects within these oral cavity and oropharyngeal subsites. Gullane and Arena defined the desirable characteristics of such a reconstruction: composed of nonkeratinizing squamous epithelium, thin, pliable, sensate, mucus-secreting, with abundant vascularity.[1] The palatal island flap is a unique option that possesses all of these ideal features. This flap was initially described by Veau in 1922, and in the United States, by Millard in 1962.[2,3] Interestingly, its early application was in cleft palate repair. Another 15 years passed before publication of its use in ablative defects in 1977.[1] Over 4 decades later, it remains an important tool in the armamentarium of the reconstructive surgeon, as a stand-alone reconstruction, or in combination with other flaps. Functional rehabilitation of speech, mastication, management of secretions, and deglutition can all be optimized by judicious use of this flap in carefully selected patients.

Anatomy

The palatal island flap is distinctive relative to many other local reconstructive options, as it is composed of mucoperiosteum and its mucosa is keratinized. The hard palate mucosa is firmly attached to the periosteum, which in turn adheres to the palatal bone via fibrous tissue pegs called Sharpey fibers. Other distinguishing features of this flap are the path of the vascular pedicle through a bony

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canal, and its location in a nondependent position, so that gravity does not pose limiting forces on the reconstruction. The greater palatine foramen is situated laterally on the hard palate just opposite the second molar. This foramen is located at the lateral aspect of the bony palate transverse suture line, which separates the maxillary shelf from the palatine shelf. The greater palatine artery—a branch of the internal maxillary artery via the descending palatine artery—travels through the greater palatine foramen, along with the greater palatine vein and nerve. The nerve is a branch of the maxillary division of the trigeminal nerve, allowing this flap to be sensate. From the foramen, the greater palatine artery runs anteriorly along the lateral aspect of the hard palate, and anastomoses with the nasopalatine branch of the sphenopalatine artery anteriorly. As it courses anteriorly along the palate, it also gives off multiple anastomotic connections to the contralateral greater palatine artery, which has been termed a "trilaminar macronet," since the anastomoses involve the mucosa, submucosa, and periosteum.[4] This anastomotic network additionally involves branches of the superior alveolar artery, the nasal branch of the sphenopalatine artery, and branches of the superior labial artery. Various authors describe harvesting 75% to nearly 100% of the hard palate mucosa due to this rich anastomotic network. The greater palatine vein drains into the pterygoid or pharyngeal plexus of veins.[5] Although the venous anatomy of this flap fulfills the definition of an island flap (composed of epithelium and soft tissue with a pedicle consisting only of the supplying artery and vein), a wide base to the flap does improve venous drainage. Limits of the flap surface area are margins of 5-10 mm medial to the teeth and 1.5 cm anterior to the hard-soft palate junction. Posteriorly, a palatal aponeurosis attaches to the posterior margin of the hard palate, and accepts attachments from the tensor veli palatini and levator veli palatine muscles. The flap can be rotated as much as 180° to reach the ipsilateral retromolar trigone, tonsillar fossa, or lateral pharyngeal wall. The hook of the hamulus can be removed to improve the arc of rotation; decompressing the posterior wall of the greater palatine foramen can allow further freedom of movement of the pedicle. An advantage of the palatal island flap is that the secondary defect heals by secondary intention without any long-term morbidity for the patient. Because it heals by granulating in over bone, no consequential soft tissue contracture can occur.

Indications

The available surface area and arc of rotation of the flap make it amenable to many defects of the oral cavity and oropharynx. Other advantages include its sensate nature, rich blood supply, and "like tissue" to many common defects encountered by the head and neck surgeon. Appropriate oral cavity defects include hard palate, retromolar trigone, buccal mucosa, and posterior floor of mouth. Suitable oropharyngeal defects include tonsillar fossa, lateral oropharyngeal wall, and soft palate. As previously noted, most of the hard palate mucosa can be harvested on a single pedicle, providing approximately 16 cm^2 of surface area. Oroantral fistulas in the region of the third molar may be difficult to reach with the palatal island flap, in which case a random palatal flap may be used instead.[6] An advantage of the palatal island flap for closure of oroantral fistulas is that the defect can be repaired with a single layer, without requiring nasal lining flap. The sturdy mucoperiosteal tissue of the palatal island flap acts like a composite flap. Publications in recent years focus increasingly on the use of the palatal island flap in combination with other flaps to reconstruct complex defects. Karle et al reported the use of lateral pharyngeal wall flaps in combination with the palatal island flap to reconstruct total soft palate defects.[7] Karle describes bilateral myomucosal flaps incorporating the superior pharyngeal constrictors, in order to create a dynamic component to the soft palate reconstruction that will close the velopharynx. The palatal island flap is then rotated down over the lateral pharyngeal flaps to recreate the anterior mucosal surface. Ducic and Herford described the combination of the palatal island flap with microvascular free tissue transfer for extensive oromandibular defects.[8] Free flaps utilized in their series of 28 patients included radial forearm, fibula, and rectus abdominus. In most of their cases, the palatal island flap was used to reconstruct the soft palate and the medial retromolar trigone component of a larger defect, that is, areas that require thinner tissue. The free flap was typically used to reconstruct the tongue, floor of mouth, and lateral retromolar trigone—regions that require bulkier soft tissue replacement. The authors postulate that utilizing different flaps for different anatomical subsites of large defects improves functional outcomes, specifically mastication, swallowing, and velopharyngeal competence. The palatal island flap may also be used for secondary reconstruction, again often in combination with other flaps. Dings et al report a series of secondary hard and soft palate reconstruction using the palatal island flap in combination with small local flaps, such as nasal lining turn-in flaps, posterior pharyngeal wall flaps, and the buccal-vestibular flap.[9] They report excellent outcomes, but it is important to note that none of the patients in their series had received radiation therapy.

Contraindications

Use of this flap is not recommended in the setting of prior ligation of the external carotid or internal maxillary artery. Previous palatal surgery that may have interrupted the greater palatine arteries likewise contraindicates the use of this flap. This flap should also be avoided in patients who have undergone prior radiation to the palate. The palatal island flap is not advocated for use in children under 5 years of age; dissecting periosteum off the immature maxilla restricts midface growth and leads to malocclusion. Finally, this reconstruction will not adequately

Figure 1 Central soft palate fistula in a 63-year-old female patient after resection of a soft palate squamous cell carcinoma and superiorly-based pharyngeal flap reconstruction, which subsequently dehisced. The Dingman retractor provides excellent exposure of the defect and the surface area available for the palatal island flap.

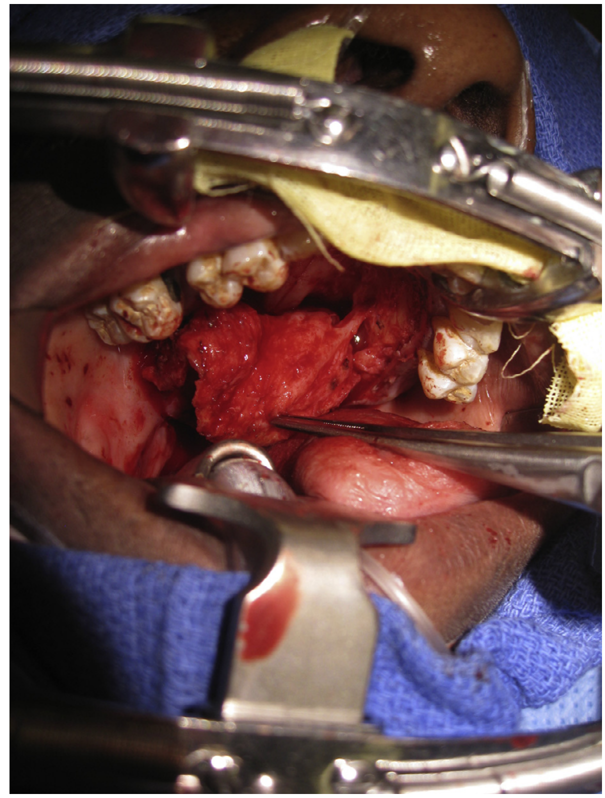

Figure 2 The flap has been elevated and the vascular pedicle has been isolated and preserved.

seal oral cavity or oropharyngeal defects that communicate with the neck.[10]

Technique

Raising this flap is relatively straightforward. Oral intubation and use of a Dingman retractor provides good exposure for raising and insetting this flap (Figure 1). Relaxing the retractor for 1 minute at 20-minute intervals throughout the procedure can mitigate tongue edema and neuropraxia of the lingual nerve. The flap is designed slightly larger than the defect in both width and length to account for the loss of length with rotation, and to ensure a tension-free closure. Vasoconstrictive agents may be used, but are not necessary, before making mucosal incisions. Full thickness incisions are made along the edges of the flap down to the bony palate. The author prefers a protected needle tip Bovie to make the initial incision. Attempting to control mucosal oozing with bipolar cautery after making incisions with a scalpel can be challenging, due to the flap thickness and relative inelasticity of the cut edges before the flap is mobilized; moreover, this can interfere with adequate visualization of both the ipsilateral and contralateral vascular bundles. The flap may also be harvested in a random (rotation-advancement) pattern, in which case it should not cross the midline and the length to width ratio should not exceed 2.4-1.[6] A wide base should be maintained when designing a random rotation-advancement style flap.[11] After making the full thickness incisions, the mucoperiosteal flap is dissected off the bony hard palate, starting on the side contralateral to the intended vascular pedicle, and working in an anterior to posterior fashion. The Sharpey fibers are quite adherent, but slow steady undermining with a periosteal elevator will complete the flap raising in a short period of time. The contralateral vascular pedicle must be ligated to adequately liberate the flap. The descending palatine artery in the incisive foramen may also require ligation. The author recommends use of a suture ligature, since retraction of the proximal end of the vessels into the bony canal can become difficult to control.

As flap elevation approaches the intended vascular pedicle of the flap within the greater palatine foramen, dissection slows to carefully identify and preserve the pedicle, bluntly dissecting soft tissue attachments away from it [Figures 2 and 3]. Further elevation of the flap base proceeds beyond the foramen, periodically assessing the flap's ability to rotate into the defect and need for further undermining. Judicious back cuts can be utilized to facilitate rotation of the flap. Widening the greater palatine foramen with a bone rongeur can increase length and arc of rotation. Removing the hook of the hamulus can provide an additional 1 cm in flap length. If the border of the flap is not immediately adjacent to the defect, it may

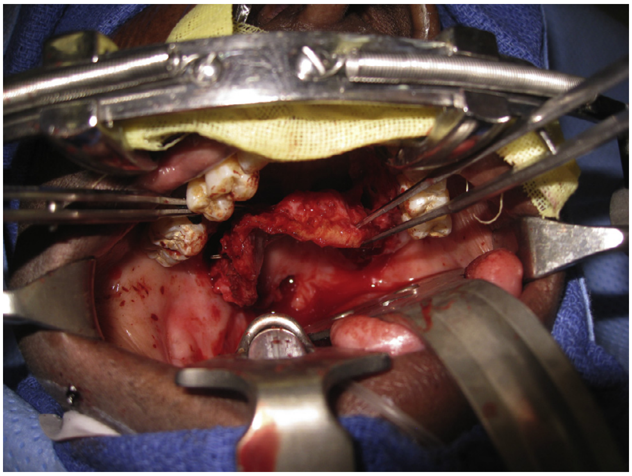

Figure 3 The cut edge of the flap demonstrates robust thickness and vascularity.

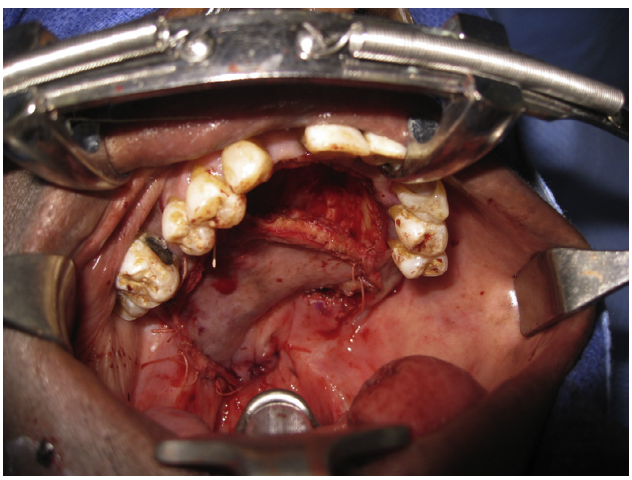

Figure 4 The flap has been rotated into place and is being inset with prefers 3-0 polyglycolic acid suture. Note the secondary defect with exposed palatal bone.

be tunneled under intervening mucosa, but this risks compression of the vascular pedicle. The flap may also be rotated over intervening mucosa, which necessitates pedicle division at least 3 weeks after flap elevation. Insetting the flap may be accomplished with similar suture material and technique to other oral cavity reconstructions. The author prefers 3-0 or 4-0 polyglycolic acid suture in a vertical or horizontal mattress fashion [Figure 4]. Suture may be passed through holes drilled in the hard palate to facilitate approximation of the flap to the defect. It is critical during flap inset to avoid undue tension on the closure, since the course of the vascular pedicle is significantly limited by the bony canal it traverses. For soft palate reconstruction, Ducic and Herford recommend to "push back" the palatal flap so that it is positioned more posteriorly than the patient's native palate, in order to prevent velopharyngeal insufficiency from this adynamic flap.[8] The secondary defect consisting of exposed hard palate bone may be managed in a number of ways. It may be left exposed, which contributes to postoperative pain but which most patients find manageable. Iodoform gauze may be secured over the exposed bone using either sutures or a tissue sealant. Oxidized cellulose polymer or petroleum-impregnated gauze may also be used to cover the donor site. Finally, a prefabricated stent may placed over the defect, although one must be wary of compressing the vascular pedicle and/or flap mucosa. Regardless of which method is chosen to address the secondary defect, meticulous oral hygiene will speed healing and therefore decrease pain. Patients should be prescribed chlorhexidine mouth wash and instructed to strictly abstain from smoking in the postoperative period. Iodoform gauze often develops bacterial colonization despite use of chlorhexidine mouth wash. Stringent dietary restrictions are not necessary, although use of chlorhexidine mouthwash after meals should be emphasized to the patient. Typically patients will initiate a clear liquid diet on the first postoperative day and then advance to a soft diet. The exposed palatal bone will mucosalize typically in 3-5 weeks, but may be delayed by several weeks in smokers.

Complications

There are few complications reported with this reliable and straightforward flap. Partial or total necrosis of the flap is the most common complication. Multiple authors cite low flap failure rates, with appropriate patient selection and operative technique.[8-10] Gullane and Arena reported 1 flap necrosis in their series of 30 patients.[3] Risk of flap failure increases when utilizing a random rotation-advancement design. Lee et al reported a 25% failure rate, which is mitigated by respecting the 2.4:1 length/width ratio.[6] Moore et al noted 2 out of their 10 patient cohort who had persistent small oronasal fistulae; both of these patients had defects which extended to the skull base through the infratemporal fossa.[12] Other potential complications associated with this flap include hemorrhage from inadequate control of the contralateral greater palatine artery or descending palatine artery.

Conclusion

In summary, the palatal island flap remains a unique and reliable technique for reconstruction of some of the most common and functionally important defects encountered by the head and neck surgeon. Attention to patient selection, as well as careful flap design and operative technique, will yield a dependable and straightforward procedure for use alone, or in concert with other flaps, for oral cavity and oropharyngeal defects.

Conflict of interest

None.

Disclosure statement

The author reports no proprietary or commercial interest in any product mentioned or concept discussed in this article.

References

1. Gullane P, Arena S: Palatal island flap for reconstruction of oral defects. Arch Otolaryngol Head Neck Surg 103:598, 1977.
2. Veau V: Division Palatine: Anatomie—chirurgie Phonetíque. Chirurgien De l'Hopital Des Enfants 8:568, 1931.
3. Millard DR: Wide and/or short cleft palate. Plast Reconstr Surg 29:40, 1962.
4. Seckel NG: The palatal island flap on retrospection. Plast Reconstr Surg 96:1262–1268, 1995.
5. Urken ML, Biller HF. Palatal island. In: Urken ML, Cheney ML, Sullivan MJ, Biller HF, editors. Atlas of Regional and Free Flaps for Head and Neck Reconstruction. New York: Raven Press. p. p. 109–115.
6. Lee JJ, Kok SH, Chang HH, et al: Repair of oroantral communications in the third molar region by random palatal flap. Int J Oral Maxillofac Surg 31:677–680, 2002.
7. Karle WE, Anand SM, Clain JB, et al: Total soft palate reconstruction using the palatal island and lateral pharyngeal wall flaps. Laryngoscope 123:929–933, 2013.
8. Ducic Y, Herford AS: The use of palatal island flaps as an adjunct to to microvascular free tissue transfer for reconstruction of complex oromandibular defects. Laryngoscope 111:1666–1669, 2001.
9. Dings JP, Mizbah K, Berg SJ, et al: Secondary closure of small- to medium-size palatal defects after ablative surgery: Reappraisal of reconstructive techniques. J Oral Maxillofac Surg 72:2066–2076, 2014.
10. Genden EM, Lee BB, Urken ML: The palatal island flap for reconstruction of palatal and retromolar trigone defects revisited. Arch Otolaryngol Head Neck Surg 127:837–841, 2001.
11. Jamali JA: Palatal Flap. Oral Maxillofac Surg Clin N Am 26:305–311, 2014.
12. Moore BA, Magdy E, Netterville JL, et al Laryngoscope 113:946–951, 2003.