Pedicled Lingual Flap to Provide Keratinized Tissue Regeneration Over Dental Implants: A Description of the Technique and a Case Report

Alan S. Herford, DDS, MD[1]
Rahul Tandon, DMD[1]
Luca Pivetti, DDS[1]
Marco Cicciù, DDS, PhD, MSc[2]*

The aim of this study is to report the efficacy of a lingual pedicle flap for soft tissue pre-prosthetic surgery in implant rehabilitation. While it has been demonstrated that keratinized gingiva is an important factor for implant success, there remains a dearth of case reports concerning the use of a lingual pedicle flap to achieve this desired outcome in such a large reconstructive effort. For this case report, the patient underwent an anterior mandibular resection of an ameloblastoma and subsequent reconstruction, resulting in soft tissue loss. To satisfy the patient's desires, both functionally and esthetically, a bilateral rotated pedicled lingual flap was performed to augment keratinized tissue on the anterior mandibular ridge. An additional vestibuloplasty with two collagen matrices was also performed, and an acrylic splint was then applied to achieve better stabilization. The primary outcome was to evaluate the efficacy of this technique, which, until now, was used only for exposed root coverage. The site demonstrated excellent healing over time, even resulting in an excess of healthy and pink soft tissue, which later had to be corrected with a small gingivectomy. Although the patient reported slight discomfort for a few days after surgery, she was nonetheless pleased both with her ability to function and her appearance. The results of this study show that the bilateral rotated pedicled lingual flap is a viable technique for the correction of soft tissue defects in implant dentistry, providing a good amount of keratinized gingiva.

Key Words: lingual, flap, soft tissue

Introduction

The literature is replete with case reports and manuscripts concerning the rehabilitation of patients who have undergone mandibular reconstruction following resection due to pathology.[1–3] While the main goal of the clinician is to ensure adequate function for the patient, aesthetics should also play a paramount role. The rehabilitation process can involve a variety of prosthetic devices, and implants have become the primary choice for many clinicians. Many studies have focused on bone grafting and future implant placement,[4–6] but reports have been less attentive to soft tissue defects that potentially can (and do) occur.

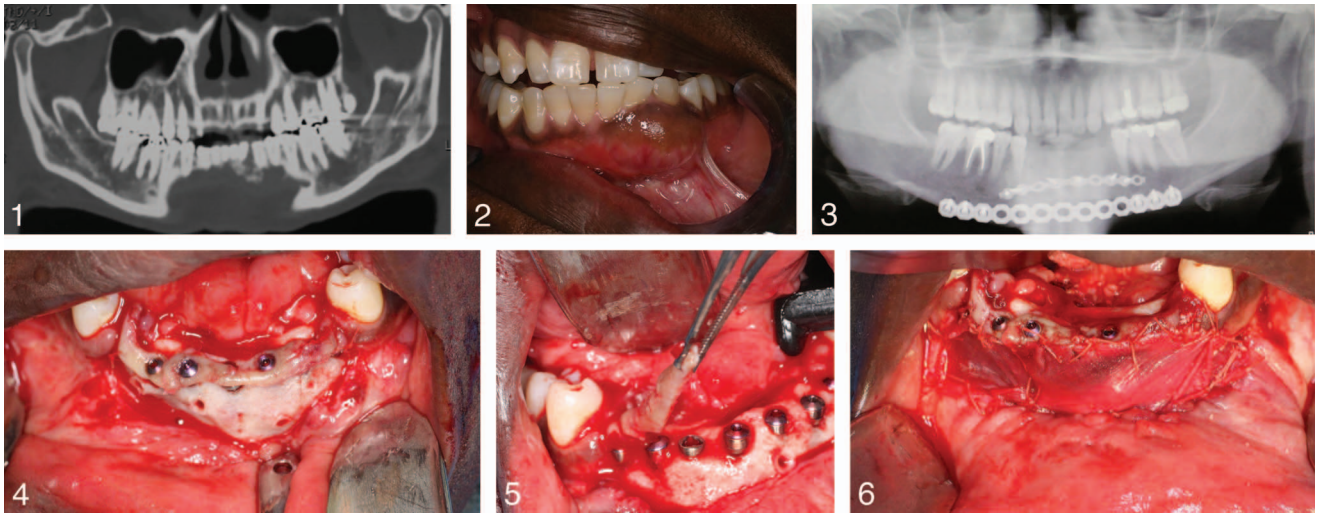
One of the most important factors determining the success of implants is the quality of keratinized gingiva,[7] which can be compromised for a variety of pathological and traumatic reasons. In addition to poor keratinized tissue, scar formation and decreased vestibular depth can pose significant obstacles to the clinician treating the patient.[8] Ridge extension is a surgical modality to compensate for insufficient vestibular depth, provided there is sufficient bone.[7,9] In the past, patients were successfully treated with either a mucosal advancement vestibuloplasty (MAVP) or a secondary epithelization vestibuloplasty (SEVP).[10] While these techniques to correct soft tissue vestibular defects were considered groundbreaking for their time, they also exhibited many drawbacks, such as the tendency to relapse and limitations due to the amount of freely mobile mucosa.[10,11]

The purpose of this report is to demonstrate one method of addressing the problem of inadequate soft tissue. In this case report, we present the use of a bilateral lingual pedicled flap technique, which has been primarily utilized for root coverage on the anterior mandibular lingual surfaces.[12]

Case Description

The patient is a 38-year-old female with a history of ameloblastoma resection of the anterior mandible who then underwent mandibular reconstruction with an anterior iliac crest bone graft. The anterior teeth and attached mucosa were removed, and the lower lip was undermined extensively to gain closure of the defect. Secondary reconstruction with an iliac crest bone graft was performed. The patient subsequently

[1] Department of Oral & Maxillofacial Surgery, Loma Linda University, Loma Linda, Calif.
[2] Department of Human Pathology, Dental School, Messina University, Via Consolare Valeria 98100, Messina, Italy.
* *Corresponding author*, e-mail: acromarco@yahoo.it
DOI: 10.1563/AAID-JOI-D-12-00218



Figures 1–6. Figure 1. Ortopanoramic X ray shows the tumor extension. **Figure 2.** Clinical view of the tumor swelling extension. **Figure 3.** Ortopanoramic X ray after tumor resection and titanium plate positioning. **Figure 4.** Time of dental implant positioning; a lack of keratinized tissue is evident in the buccal perimplant area. **Figure 5.** Lingual flap elevated and directed to covering the dental implant positioned. **Figure 6.** Lingual flap repositioned on the dental implants healing screws.

experienced a loss of both the vestibule and keratinized tissue in the anterior mandibular region. Bilateral lingual flaps were elevated, with care being used to maintain the pedicle anteriorly. The flaps were rotated anteriorly and secured into place with the implants healing screws (Figures 1 through 4).

Operative procedure

General anesthesia was administered in standard fashion; a #15 blade was then used to make an alveolar crest incision in the mandibular region from teeth #21–27. A full-thickness mucoperiosteal flap was then raised just superior to the inferior border of the mandible, which then allowed for the removal of the previously placed titanium plates. The implant stent, sterilized prior to surgery, was placed in the mandibular region, and using the Nobel BioCare system (Nobel BioCare, Kloten, Switzerland), a pilot drill was used to mark the areas of the implants at teeth #21–27. This was sequentially drilled to fit 3.5 mm × 13 mm dental implants and then using a slow-speed handpiece, the implants were placed in teeth #21–27. The torque used was between 35–45 Nm for all seven implants placed. A #15 blade was used to create a sulcular incision in the lingual area on the right side, and a full-thickness mucoperiosteal flap was raised. The same procedure was done on the contralateral side. The bilateral flaps were approximately 0.5 cm × 3 cm in dimension on the right side and 0.5 cm × 2 cm on the left side; each was rotated from their respective sides to the middle of the mandible. Holes were made in the local rotation of the flap, and cover screws were placed, piercing through the local rotational flap into the dental implants.

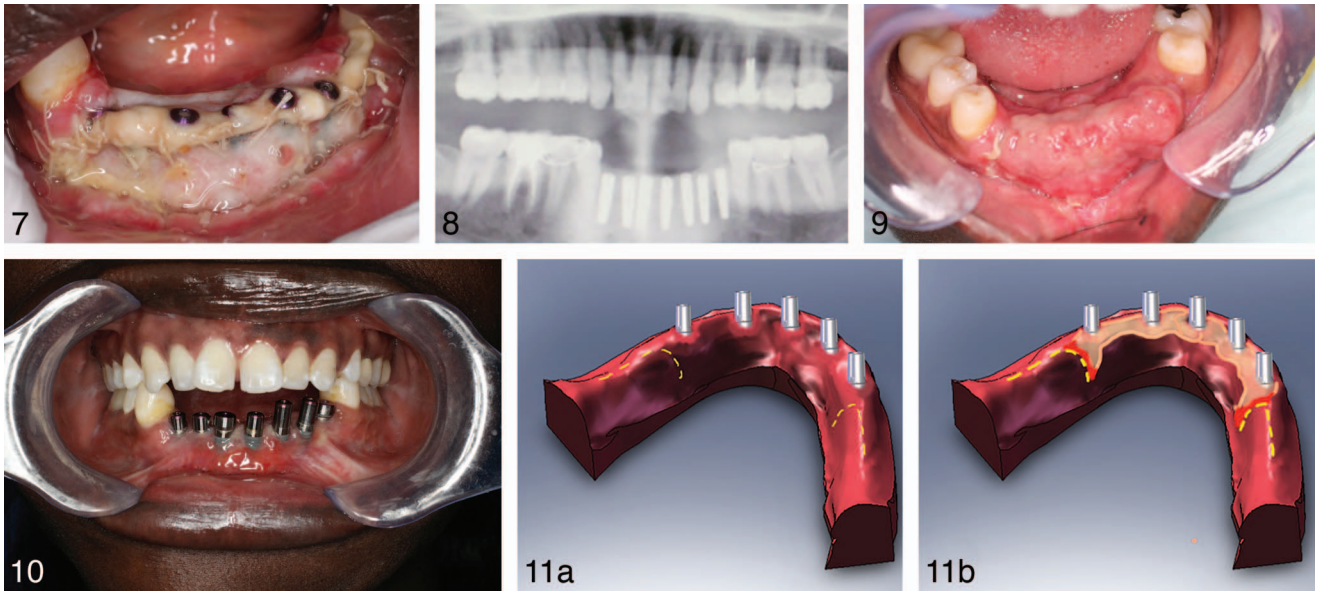
The cover screws were placed over the dental implants and demonstrated good fixation of the rotational lingual flaps in the middle of the mandibular region. Two collagen sponge matrices, measuring 30 mm × 40 mm each, were cut to fit the defect of the vestibule of the anterior mandibular region. Using 4-0 Vicryl sutures, the rotational lingual flaps were fixated on the superior portion with the collagen matrix, which was then sutured to the inferior portion of the mandible where the defect was also present. The acrylic splint was then adapted and cut to fit the defect area of the anterior mandible to create the vestibule. After adapting and cutting the acrylic splint, appropriate vestibular depth was achieved in the lower anterior region. Two 24-gauge wires, one on each side, were circumdentally adapted to fix and place the acrylic splint.

Recovery

The patient reported pain for a few days after surgery. Approximately 4 months later, clinical findings revealed that the site was healed and tissue appeared pink and healthy with excessive gingiva. After 8–9 months, healing screws were removed and 3 mm healing abutments were placed, and a minor gingivectomy was performed to correct the gingival excess (Figures 5 through 11).

Discussion

This patient presented with a severely inadequate soft tissue vestibule in the anterior lingual mandibular region. From an aesthetic point of view, this defect may not garner much attention; however, when the patient opened her mouth to eat or speak, the defect became both an aesthetic and functional impairment. Some studies have concluded that soft tissue reconstruction can have a greater impact on postoperative oral function than the bone restoration.[5,7,12] Past investigators have utilized the free anterolateral thigh (ALT) musculocutaneous flap, in which the muscular component provides an adequate amount of vascularized tissue reducing infection. However, the ALT flap provides for a bulky reconstruction and reducing asymmetry of the reconstructed mandible.[13–15] While this method has proven to be successful, patient recovery and discomfort postoperatively can prove to be a rather arduous task due to the extent of the donor site surgery.



Figures 7–11. Figure 7. Collagen matrix connected to the lingual flap. **Figure 8.** One week healing of the soft tissue. **Figure 9.** Four weeks healing; a healthy amount of keratinized soft tissue is presented around dental implants. **Figure 10.** Four weeks ortopanoramica rx control. **Figure 11**. A sample draw of the designed flaps technique. (a) The mucoperiosteal flaps design. (b) The pedicled flaps positioned.

In the oral cavity, rotation or advancement flaps of buccal/labial mucosa has been a well-established therapy for oronasal or oroantral defects.[15,16] These flaps illustrate the concept that careful planning of the length and width of the flap is essential to its success. A mucoperiosteal flap is often used to treat numerous soft tissue defects[14,16,17] and owes much of its success to its vast blood supply found within the periodontal ligaments, connective tissue above the periosteum, and from the bone.[5] Flaps are commonly used in the intraoral region for closing a variety of defects,[18,19] from oronasal communications to covering denuded roots. As varied as their functions can be, flaps can also be designed in a vast amount of ways. No matter what the purpose of the flap, when raising a full thickness flap, the donor site must be able to heal by primary intention, which can only be accomplished by not severing and traumatizing the original tissue site.

This case report highlights how the pedicled lingual flap can be considered a predictable and valuable treatment procedure for soft tissue reconstruction in oral surgery. The illustrated technique provides sufficiently high and thick keratinized tissue available from the adjacent donor sites. An excellent color match is still maintained after the procedure and the presence of its own blood supply after the transfer from donor site provides for a high long-term clinical success rate. However, it does have limitations in cases of insufficient thickness of adjacent lingual soft tissue.

The lingual pedicle flap has been previously utilized to cover denuded roots on lingual surfaces of mandibular incisors, mainly involving those areas associated with an "ill-fitting" removable partial denture.[20–22] A study done by Huang et al. demonstrated that a double laterally rotated bilateral flap provided good aesthetics and blood supply to treat 2 teeth with gingival recession.[23,24] While these studies have evaluated flap coverage for gingival recession, our case report focuses on a deficient soft tissue vestibule following an anterior mandibular resection due to an ameloblastoma, a condition deeply unfavorable to achieve good implant rehabilitation. The decision to use a full thickness flap as opposed to a partial thickness flap has been discussed previously.[12,21,25] While Huang et al. used a split thickness flap to cover 2 exposed roots, it was evident that our case required a larger amount of tissue, as the whole anterior mandibular region was involved, leading to the choice of a full thickness flap.

Several studies showed that acellular dermal matrix graft (alloderm) might be successfully used to treat gingival recession, as adequate root coverage may be predictably obtained. However, even if the advantage of using dermal matrix is related to the possibility of using a large quantity of graft (because of unlimited availability), the quality of keratinized gingiva around dental implants seems to be more predictable using pedicled vascularized flaps. Moreover, the presence of blood vessels is another condition for the integration of the soft tissue moved by a pedicled flap.[25–28]

Despite certain limitations, both full and partial thickness laterally rotated flaps can be a successful therapeutic method for treating soft tissue defects in the anterior mandible region,[21,25,28] In our case, we have shown that this is applicable in a situation involving treatment of a patient who has undergone anterior mandibular reconstruction following resection.

Abbreviations

MAVP: mucosal advancement vestibuloplasty
SEVP: secondary epithelization vestibuloplasty

References

1. Gerzenshtein J, Zhang F, Caplan J, Anand V, Lineaweaver W. Immediate mandibular reconstruction with microsurgical fibula flap transfer

following wide resection for ameloblastoma. *J Craniofac Surg*. 2006;17:178–182.

2. Guilio C, Bimbi G, Colombo S, et al. Autologous freeze-treated bone for mandibular reconstruction after malignant tumor resection: a study of 72 patients. *A J Otolaryngol*. 2009;30:383–389.

3. Urken ML. Composite free flaps in oromandibular reconstruction. Review of the literature. *Arch Otolaryngol Head Neck Surg*. 1991;117:724–732.

4. Chana JS, Chang YM, Wei FC, et al. Segmental mandibulectomy and immediate free fibula osteoseptocutaneous flap reconstruction with endosteal implants: an ideal treatment method for mandibular ameloblastoma. *Plast Reconstr Surg*. 2004;113:80–87.

5. Herford AS, Cooper TC, Maiorana C, Cicciù M. Vascularized connective tissue flap for bone graft coverage. *J Oral Implantol*. 2011;37: 279–285.

6. Chiapasco M. Implants for patients with maxillofacial defects and following irradiation. In: Lang NL, Karring T, Lindhe J, eds. *Proceedings 3rd European Workshop on Periodontology*: *Implant Dentistry*. Berlin: Quintessence Books, Quintessenz Verlag-GmbH; 1999:557–607.

7. Chiapasco M, Abati S, Ramundo G, Rossi A, Romeo E, Vogel G. Behavior of implants in bone grafts or free flaps after tumor resection. *Clin Oral Implants Res*. 2000;11:66–75.

8. Pogrel MA, Podlesh S, Anthony JP, Alexander J. A comparison of vascularized and nonvascularized bone grafts for reconstruction of mandibular continuity defects. *J Oral Maxillofac Surg*. 1997;55:1200–1206.

9. Kao SY, Yeung TC, Hung KF, Chou IC, Wu CH, Chang RC. Transpositioned flap vestibuloplasty combined with implant surgery in the severely resorbed atrophic edentulous ridge. *J Oral Implantol*. 2002;28:194–199.

10. Kao SY, Lui MT, Fong J, et al. A method using vestibule-sulcoplasty combining a split-thickness skin graft and a palatal keratinized mucosa graft for peri-implant tissue secondary to oral cancer surgery. *J Oral Implantol*. 2005;31:186–191.

11. Al-Mahdy Al-Belasy F. Mandibular anterior ridge extension: a modification of the Kazanjian vestibuloplasty technique. *J Oral Maxillofac Surg*. 1997:55:1057–1059.

12. Starshak TJ. Mandibular anterior ridge extension: a modification of the Kazanjian vestibuloplasty technique. *J Oral Maxillofac Surg*. 1997;55: 1060.

13. Bianchi B, Ferri A, Ferrari S, Copelli C, Boni P, Sesenna E. Reconstruction of anterior through and through oromandibular defects following oncological resections. *Microsurgery*. 2010;30:97–104.

14. Burian F. Plastic surgery in research on the pathological process in the maxillo-facial sphere. *Acta Chir Plast*. 1966;8:159–162.

15. Cho EH, Park JG, Cha JK, et al. Dimensional change of the healed periosteum on surgically created defects. *J Periodontal Implant Sci*. 2011;41: 176–184.

16. Ruben MP. Rationale for the employment of laterally positioned flaps and free autogenous gingival grafts in periodontics (I). *Quintessence Int Dent Dig*. 1978;49:53–61.

17. Hartig GK. Free flaps in oral cavity reconstruction: when you need them and when you don't. *Int J Radiat Oncol Biol Phys*. 2007;69(suppl):S19–S21.

18. Grupe HE, Warren RF. Repair of gingival defects by a sliding flap operation. *J Periodontol*. 1956;27:92–95.

19. Robinson RE. Utilizing an edentulous area as a donor site in the laterally repositioned flap. *Periodontics*. 1964;2:79–85.

20. Corn H. Edentulous area pedicle grafts in mucogingival surgery. *Periodontics*. 1964;2:229–242.

21. Pennel BM, Higgason JD, Tonner JD, King KO, Fritz BD, and Sadler JF. Oblique rotated flap. *J Periodontal*. 1965;36:305–309.

22. Grupe HE. Modified technique for the sliding flap operation. *J Periodontol*. 1966;37:491–495.

23. Huang JF, Tsai AY, Liu CM, Yang YL, Hou LT. Double laterally-rotated bilayer flap operation for treatment of gingival recession. *J Formos Med Assoc*. 2004;103:562–567.

24. Langer B, Langer L. Subepithelial connective tissue graft technique for root coverage. *J Periodontol*. 1985;56:715–720.

25. Speroni S, Cicciu M, Maridati P, Grossi GB, Maiorana C. Clinical investigation of mucosal thickness stability after soft tissue grafting around implants: a 3-year retrospective study. *Indian J Dent Res*. 2010;21:474–479.

26. Barghetti A, Louise F. Controlled clinical evaluation of the subpedicle connective tissue graft for the coverage of gingival recession. *J Periodontal*. 1994;65:1107–1112.

27. Harris RJ. Short-term and long-term comparison of root coverage with an acellular dermal matrix and subepithelial graft. *J Periodontal*. 2004; 75:734–743.

28. Henderson RD, Greenwell H. Predictable multiple site root coverage using acellular dermal matrix allograft. *J Periodontal*. 2001;72:571–582.