contributory factors, such as a large, infrequently removed prosthesis, and difficulty with eyelid closure.

Socket contracture may result from a variety of factors, including fibrosis occurring due to the initial trauma, a poor surgical technique with excessive dissection of the conjunctiva or Tenon's capsule, multiple socket procedures, lower lid laxity causing a shallow inferior fornix, cicatrizing diseases of the conjunctiva, or irradiation. The lack of an expanding force, such as the absence of a prosthesis or a cosmetic shell, may also cause contraction.[11,14–16] The contracted socket can result in a cosmetic deformity and makes patients unable to continue with ocular prosthesis wear.

In this study, we investigated the clinical manifestations of upper and lower eyelids in patients with ocular prostheses. Ophthalmologists considering the pursuit of eye-removal surgery should understand these eyelid manifestations that can occur after wearing ocular prostheses and explain them to the patients before and after surgery. Appropriate correction of these eyelid manifestations might be able to increase patients' satisfaction and quality of life.

This study has the limitations of a retrospective design and a small sample size. In addition, because it was a cross-sectional study, the incidence of clinical manifestations according to the period of wearing an ocular prosthesis could not be investigated. Moreover, the difference in the presence of clinical manifestations of eyelids according to the type of ocular implant could not be investigated.

In conclusion, upper eyelid ptosis, superior sulcus deepening, and lower eyelid entropion and retraction were common clinical manifestations in patients wearing ocular prostheses. When following up with patients with ocular prostheses, it is important and helpful to check carefully about whether these clinical manifestations occur and to consider making appropriate corrections, if necessary.

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# Management of Palatal Fistula Using Superficial Circumflex Iliac Artery Perforator Flap With Intraoral Anastomosis and Supermicrosurgery Techniques

*Guohao Zhang, MD, Hongping Zhu, MD, and Lei Zheng, MD*

**Abstract:** Postoperative palatal fistula following primary cleft palate repair, especially wide and recurrent defects, presents significant challenges to management. When the fistula is surrounded by limited and scarred regional tissues, vascularized free flaps are recommended. The authors propose a novel method to repair a wide and recurrent palatal fistula resulting in excellent aesthetics and minor donor-site complications. The superficial circumflex iliac artery perforator flap was transferred with the application of intraoral anastomosis and supermicrosurgery techniques for palatal fistula closure.

**Key Words:** Intraoral anastomosis, palatal fistula, superficial circumflex iliac artery perforator flap, supermicrosurgery technique

Palatal fistula is a common and challenging complication following cleft palate repair.[1] There are various techniques to treat palatal fistula by applying regional tissues or free flaps, depending on the size and location of the fistula, the age and surgical history of the patient, the condition of local tissues, and the surgeon's experience.[2] For large and recurrent fistulas with limited and scarred regional tissues, vascularized free flaps are recommended.[3,4] However, microvascular flap transfer risks potential morbidity of the donor sites and cosmetic problems. We propose a novel method to repair a wide and recurrent palatal fistula resulting in excellent aesthetics and minor donor-

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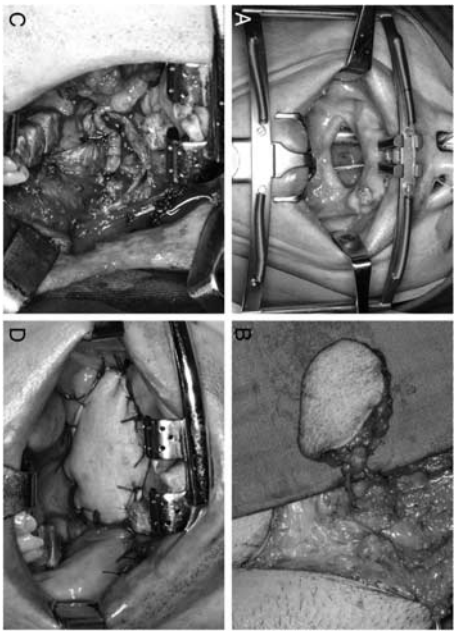


**FIGURE 1.** (A) The palatal fistula was located on the junction of the hard and soft palate and was approximately 5 × 4 cm. (B) The superficial circumflex iliac artery perforator (SCIP) flap was harvested. (C) Intraoral end-to-end anastomoses were accomplished. (D) The palatal fistula was repaired by the SCIP flap.

site complications. The superficial circumflex iliac artery perforator (SCIP) flap was transferred with the application of intraoral anastomosis and supermicrosurgery techniques.

## CLINICAL REPORT

A 51-year-old man presented to our hospital with a complaint of palatal fistula after cleft palate repair. He was born with unilateral complete cleft lip and palate, and primary cleft lip and palate repair were performed at 7 months and 17 years of age, respectively. Afterward, he had a palatal fistula, and it was repaired with regional tissues. These prior surgeries were performed in other hospitals. However, the fistula recurred, and physical examination showed that the fistula was located at the junction of the hard and soft palate and approximately 5 × 4 cm (Fig. 1A). The velopharyngeal insufficiency was diagnosed by nasal endoscopy and speech assessment. Preoperatively, we used a Doppler probe to identify perforators of the superficial circumflex iliac artery (SCIA) and superior labial artery.

Under general anesthesia, we incised the mucosa around the fistula to prepare intraoral and nasal flaps. Afterward, we made a vertical incision anterior to the left parotid papilla on the buccal mucosa and connected the vertical incision with the incision around the fistula. Then, a myomucosal flap of the buccinators was raised, and blunt dissection that went through the buccinator muscle and the buccal fat pad was performed to expose the superior labial artery and facial vein. The recipient vessels were dissected retrograde to 4 cm long for subsequent intraoral anastomoses. The parotid duct and the facial nerve were identified and maintained intact.

Simultaneously, a skin paddle of 6 × 4.5 cm was designed and marked in the groin region. We first incised the medial border of the flap, going through the skin and subcutaneous tissue. Then, the superficial circumflex iliac vein and the superficial branch of the SCIA were identified and dissected until a 6-cm pedicle was obtained. Then, we incised the other flap

**FIGURE 2.** The 10-month follow-up results showed an excellent repair effect.

border to raise the skin paddle in a suprafascial plane (Fig. 1B). The flap was transferred to the recipient area, and the skin paddle of the flap was sutured to the palatal mucosa to close the fistula. The diameters of the donor artery and vein were 0.7 mm and 1.8 mm, respectively. Intraoral end-to-end anastomoses with supermicrosurgery techniques were then performed. The superficial branch of the SCIA was anastomosed to the superior labial artery by using the operating microscope and 10/0 nylon. The superficial circumflex iliac vein and facial vein were anastomosed using a microvasâ cular anastomotic device (Fig. 1C). Then, the oral wound was closed (Fig. 1D).

One day after the operation, the patient could walk without restriction of movement. The SCIP flap survived, and no complications were observed (Fig. 2). The patient was satisfied with the cosmetic outcomes after surgery. The postoperative nasal endoscopy examination showed that the velopharyngeal valve can close completely during speech.

## DISCUSSION

Postoperative palatal fistula presents significant management challenges. Furthermore, large and recurrent fistulas require vascularized free flap transfer to be closed due to limited and scarred surrounding tissues after prior unsuccessful operations.[3–5] The radial forearm flap is a preferred option due to its pliable skin paddle and reliable vascular pedicle.[3] Nevertheless, disadvantages are also evident in terms of the sacrifice of a major hand artery, the influence on the function and sensation of the arm and hand, and the visible scar on the donor site. Other free flaps have also been reported, but all leave visible scars on the neck due to extraoral anastomosis. For patients with tumors who undergo lymph node dissection, the extraoral approach can also be used for recipient vessel preparation and anastomoses. However, for patients with cleft lip and palate, the extra visible scar may be unacceptable.

Plastic surgeons continue to pursue methods for reconstructing the defects with more concealed incisions and less damage to donor sites. The groin flap was chosen as the workhorse flap in the early period of microsurgery, and the scar can be covered by underwear after surgery.[6] With the evolution of perforator flaps, Koshima[7] first introduced the SCIP flap to modify the groin flap for limb defect reconstruction. Currently,

the SCIP flap is widely used to reconstruct the lower and upper extremities as well as the head and neck.[8] However, the short pedicle and small-caliber vessel still pose barriers to perform anastomosis. In this case, the length and caliber of the harvested donor artery were 6 cm and 0.7 mm, respectively.

Intraoral anastomosis can be an ideal solution for short flap pedicles. Gaggl et al[9] first described the intraoral anastomosing technique for alveolar defect reconstruction. The recipient vessels in the oral cavity are located close to the defect, so a suitable flap with a short pedicle can be used. Moreover, the application of the intraoral anastomosis and the SCIP flap are all in accordance with the idea of pursuing better cosmetic outcomes. In addition, compared to extraoral anastomosis, injuries to the facial nerve and submandibular gland can be easily avoided. However, the superâ microsurgery technique is required for small-caliber donor vessels. The supermicrosurgery technique is defined as anastomosis for vessels with a diameter of less than 0.8 mm.[10] It is an evolution of microsurgery as a result of advancements in microscopes, instruments, knowledge, skill, and training. Advanced microscopes and loupes can increase the clarity of the surgical view when performing dissection and anastomosis, and special instruments designed for supermicrosurgery are also of great assistance. Although advantages are obvious, it is quite challenging to perform vessel dissection and anastomosis with the supermicrosurgical technique in the oral cavity, which requires a longer learning curve and rich experience.

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# Hard Tissue Preservation and Recovery in Minimally Invasive Alveolar Surgery Using Three-Dimensional Printing Guide Plate

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**Background:** For completely impacted teeth, it is of great significance to locate teeth accurately, preserve hard tissue and recovering the height of alveolar ridge. This can be effectively solved by the digital three-dimensional printing guide technology.

**Methods:** Ten patients with completely impacted tooth were selected in this experiment. After cone-beam computed tomography scan, the dicom formal computed tomography data was analyzed for threedimensional reconstruction by mimics 17.0 software. Then determining the surgical plan and making surgical guide plate. Threedimensional printing guide plate assisted piezosurgery was used to remove bone and extract impacted teeth. After that, the removed bone cap was back to the original position. Cone-beam computed tomography was used for each operated patients after 1 week and 6 months.

**Result:** The surgical guide plates can locate teeth accurately and the surgery time was reduced for all patients. A week later, all patients healed well and removed the stitches on time. Cone-beam computed tomography showed that the retention of bone caps was good and there was no displacement. All patients showed a normal parameter of pain. Six months later, cone-beam computed tomography showed good bone formation in the extraction area, which filled with new bones completely. The recovery of bone outline and height of alveolar crest at the surgical site were basically consistent with those before the operation.

**Conclusions:** Three-dimensional printing guide plates combining with fenestration and bone-cap restoration can locate impacted teeth accurately, reduce the extraction volume of bone, shorten

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