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CASE REPORT
Reconstructive

Designing a Fibular Flow-Through Flap with a Proximal Peroneal Perforator-Free Flap for Maxillary Reconstruction

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Summary: Reconstruction of a composite maxillary defect is frequently performed with a fibular osteocutaneous free flap to address both the bony and mucosal defect. If during the harvest of the fibula a distal skin perforator is not present due to vascular variations, reconstruction can potentially be done using the soleus muscle for filling of the palatal mucosal defect. An additional challenge arises when the accompanying skin paddle that has been harvested is not perfused, but the fibula remains viable. This case report describes salvage following loss of the skin paddle in an osteocutaneous fibular free flap by designing a fibular flow-through flap using a proximal peroneal perforator free flap. The use of this second free flap allows a skin paddle to be positioned on the distal fibular segment, provides a surgical backup, and limits the donor sites to the same extremity. *(Plast Reconstr Surg Glob Open 2017;5:e1543; doi: 10.1097/GOX.0000000000001543; Published online 7 November 2017.)*

Reconstruction of composite maxillary defects is frequently performed with a fibular osteocutaneous flap to address both the bony and mucosal defects.[1–4] Harvesting a fibular flap with a skin paddle based on a distal septocutaneous perforator (ie, in the middle to distal-third of the leg) typically provides enough pedicle length to reach cervical recipient vessels.[2] If during harvest of the fibula, a distal skin perforator is absent, reconstruction can potentially be done using the soleus muscle to fill the mucosal defect (with or without skin grafting) or by harvesting a second independent skin flap using a second set of recipient neck vessels.[5,6] This case report describes salvage following loss of the distal skin paddle in an osteocutaneous fibular free flap by designing a fibular flow-through flap using a proximal peroneal perforator-free flap. The use of this second flap allows a skin paddle to be positioned on the distal fibular segment, provides a surgical backup, and limits donor sites to the same extremity.

METHOD/CASE PRESENTATION

The patient is a 20-year-old young woman with bilateral cleft lip and palate, severe maxillary hypoplasia, class III malocclusion, with an absent premaxilla and large contiguous types IV, V, and VI oro-nasal fistulae (ONF).[7] She had previously undergone a tongue flap that failed and LeFort I distraction with skeletal relapse at another institution. Given the previous failures, the surgical plan was a segmental LeFort I advancement (Fig. 1) and reconstruction of the central maxillary defect with closure of ONF using an osteocutaneous fibular free flap.

The armamentarium for midface reconstruction requiring bone and soft tissue is vast and includes iliac crest, scapula, radial forearm osteocutaneous, medial femoral condyle, and fibular free flaps.[4,5] These vascularized bone flaps provide coverage for composite defects in cases where local tissue transfer techniques, such as the facial artery musculomucosal flap, are insufficient in the setting of large palatoalveolar defects with the need for osseointegrated implants.[1,2] For patients with a history of a bilateral cleft and palate who present with loss of the premaxilla and palatal fistula, a fibular flap in combination with LeFort I advancement offers the potential of improved occlusion, midface advancement, dental implants, and separation of the oral and nasal cavities.[1,2,8] Santamaria et al.[9] have advocated prelaminating the fibula with buccal mucosa to reduce the need for debulking of a skin paddle. However, for patients with a large anterior palatal fistula (ie, extending more posteriorly than the width of the fibula), an osteocutaneous fibular-free flap provides a reliable method to seal the palatal fistula.

RESULTS

The maxilla was exposed by elevation of bilateral gingivo-buccal periosteal flaps, delineating the ONF. Following

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Received for publication June 6, 2017; accepted September 1, 2017.

DOI: 10.1097/GOX.0000000000001543

Disclosure: *The authors have no financial interest to declare in relation to the content of this article. The Article Processing Charge was paid for by the authors.*

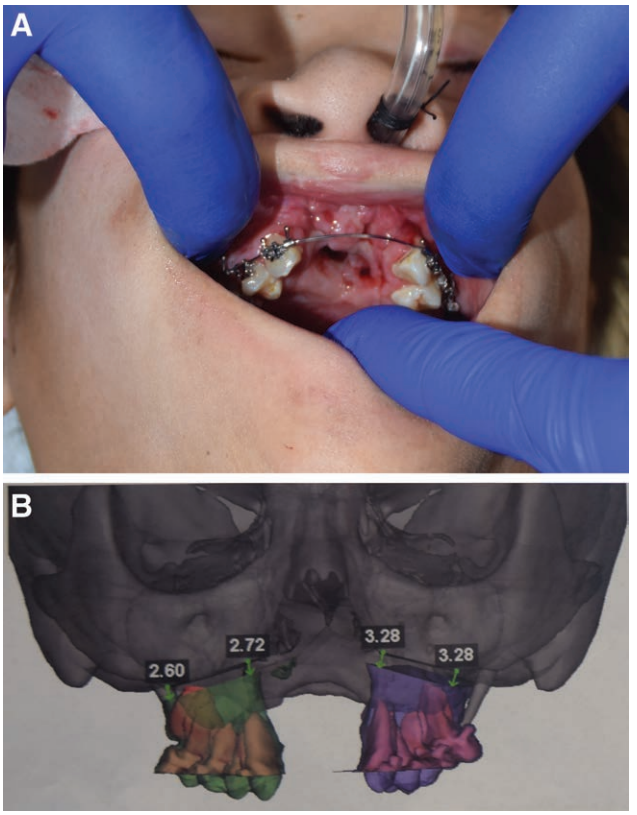

Fig. 1. Three-dimensional computed tomography: preoperative planning for the LeFort I advancement. A, Preoperative image showing oronasal fistula. B, Planned movement of the segmental 2-piece Le Fort I maxillary advancement, as predicted by virtual surgical planning. The movement consisted of transverse expansion, anterior advancement, and vertical lengthening of the posterior maxillary segments.

LeFort I osteotomy and downfracture, the nasal lining was closed primarily. The posterior segments were advanced into the planned position, guided by an occlusal splint, and stable fixation was applied to lateral buttresses. The central maxillary skeletal defect was measured at 2 cm.

During the harvest of the fibular flap, 2 perforators were identified: 1 proximal (8 cm distal to the fibular head) and 1 distal (8 cm proximal to the lateral malleolus). Because the distal perforator appeared relatively small and had a weak signal by Doppler, the proximal perforator was used to design a separate cutaneous free flap that could be used if additional soft tissue was needed. The proximal perforator and the accompanying venae comitantes were dissected back to the peroneal system. To assess flow to the distal skin paddle in situ, the section of fibula to be discarded was dissected free, necessitating that the proximal perforator be freed as well (Fig. 2). This left 2 cm of harvested fibula and the distal skin paddle still attached to the peroneal system. Unfortunately, it was apparent that the skin paddle overlying the distal fibular segment was not being perfused by the distal perforator. Therefore, the distal skin paddle was discarded, and the cutaneous free flap based on the proximal peroneal perforator was then anastomosed to the distal end of the peroneal artery as a flow-through flap to salvage reconstruction (Fig. 3).

Fig. 2. Simultaneous harvest of the proximal peroneal perforator free flap and the fibular osteocutaneous free flap. Assessing viability of the distal skin paddle of the fibular osteocutaneous free flap, in situ. Long solid arrow: distal skin paddle. Short solid arrow: harvested fibula, obscured by distal skin paddle. Long dashed arrow: proximal peroneal perforator flap, harvested as a life boat. Short dashed arrow: discarded section of fibula.

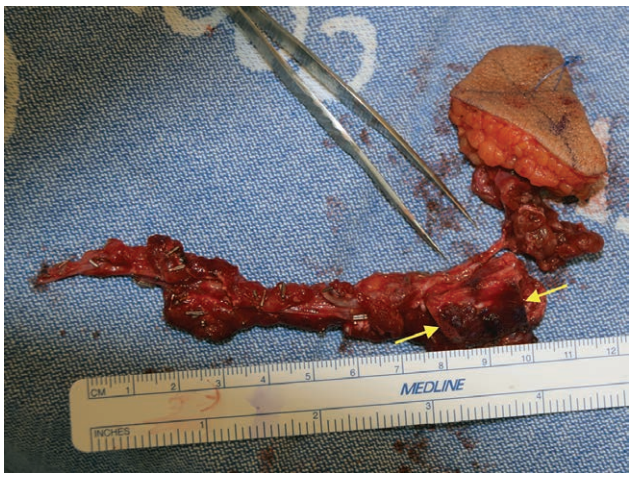

Fig. 3. Fibular-free flap with the attached proximal peroneal, perforator flap (ie, flow-through free flap). Flow-through flap is shown following microvascular anastomoses that were completed while the fibula was still attached in the leg. Fibula identified between the arrows.

The facial artery and vein and external jugular vein were prepared as recipient vessels via 2 small 1.5 cm incisions at the right mandibular border and neck, respectively. We conventionally utilize 2 veins for anastomosis in head and neck cases. A 6 cm lesser saphenous vein graft from the fibular harvest site was anastomosed to the external jugular vein and delivered to the incision along the mandible. The flow-through flap was then brought to the oral cavity. The fibula was fixated to the medial buttresses and the skin paddle was used to reconstruct the deficient oral lining. The pedicle (12 cm in length) of the flow-through flap was tunneled to the mandibular incision where 2 venous and 1 arterial anastomoses were done, the

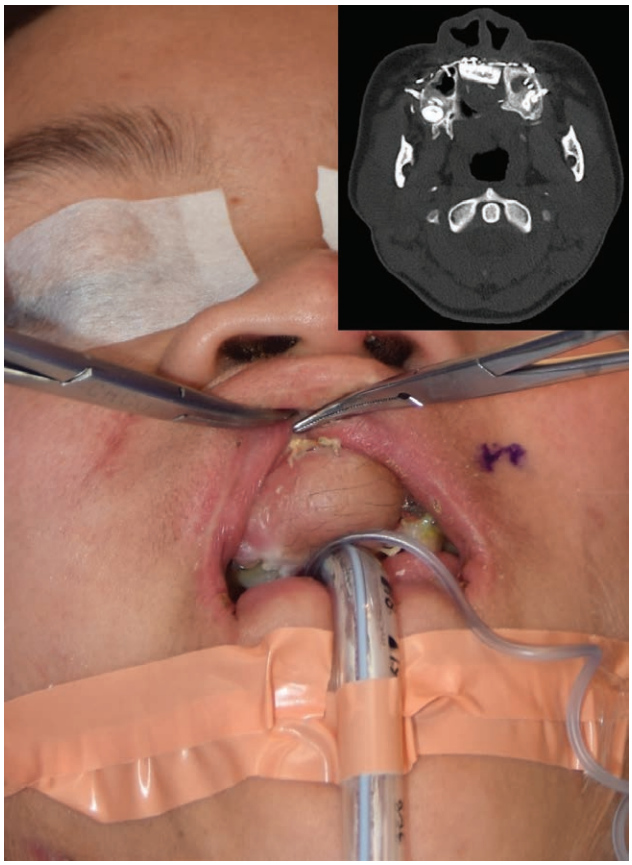

Fig. 4. Postoperative outcomes following LeFort advancement and fibular osteocutaneous free flap with proximal peroneal perforator flow-through flap. Six-week postoperative image at the time of flap debulking. Top right: computed tomography imaging 6 weeks postoperatively showing bony reapproximation.

latter in an end-to-end fashion using interrupted 8-0 nylon suture.

The patient healed well without donor-site complications or early skeletal relapse of the advanced maxillary segments. The skin paddle was entirely viable. Six weeks postoperatively, the patient demonstrated bony alignment on imaging with class I molar contact and underwent subsequent debulking of the skin paddle (Fig. 4).

DISCUSSION

This case report describes salvage of a fibular osteocutaneous free flap with a nonviable distal skin paddle by employing a flow-through flap using a proximal peroneal perforator flap for maxillary composite reconstruction. Loss of the overlying skin paddle and difficulties identifying perforators due to vascular variations are known challenges when raising fibular osteocutaneous flaps. Parr et al.[6] describe a case in which the fibular blood supply was completely separate from that of the lateral skin paddle. They utilized a posterior tibial perforator flow-through flap to complete reconstruction of a segmental mandibulectomy with partial floor of mouth defect. Although preoperative color flow duplex can be used to noninvasively identify vascular variations and choose the more ideal leg based on the position of perforators, we do not routinely obtain duplex imaging in our pediatric patients.[10] Rather, to ensure that 2 separate free flaps (ie, a proximal peroneal perforator cutaneous free flap and a fibular flap with a skin paddle based on a more distal perforator) can be harvested from the same leg, we design the proximal leg incision approximately 1–2 cm anterior to the anterior-lateral septum. The location and the size of the septocutaneous perforators to the skin are noted, and if a distal perforator is not present, the proximal perforator can be dissected. In this case, surgical planning to include considerations for back up coverage of the mucosal defect proved critical.

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