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CASE REPORT
Reconstructive

# Use of Rare Anatomical Variant of the Free Fibula Flap to Reconstruct the Nasal Septum

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**Summary:** The osteocutaneous fibula free flap (FFF)'s skin paddle is commonly vascularized by the septocutaneous (SC) perforators of the peroneal artery that course through the posterior intercrural septum. However, a rare anatomical variant exists in which the skin paddle is vascularized via a separate arterial system to the fibula. We report the case of a 31-year-old man who was planned for osteocutaneous FFF reconstruction of his anterior maxilla and hard palate following resection of nasal septal chondrosarcoma. Intraoperatively, he was found to have a rare anatomical variant: the perforator to the skin paddle arose proximal to the peroneal artery, off the tibioperoneal trunk. This was a fortuitous, rare anatomical variant, as it enabled a double free flap reconstruction from a single donor site—an intraoral fasciocutaneous free flap oriented with its long axis perpendicular to that of an osseous FFF. This particular defect enabled reconstructive freedom beyond that of the standard osteocutaneous free flap, in which the skin paddle orientation is limited by the risk of kinking the septal perforator. This case report summarizes the flap raising technique and the learning points relevant to the osteocutaneous FFF with no SC perforators. The extant literature on this anatomical variant is then summarized. The average estimated rate of FFF with no SC perforators is between 3% and 25%, based on four published studies. *(Plast Reconstr Surg Glob Open 2023; 11:e5450; doi: 10.1097/GOX.0000000000005450; Published online 27 November 2023.)*

## CASE REPORT

A 31-year-old man was treated for nasal septum chondrosarcoma involving his hard palate. He initially presented with intermittent epistaxis from both nostrils. A CT scan of the facial bones demonstrated a mass in the nasal septum 34×30×37 mm in dimensions. It demonstrated heterogenous enhancement with areas of necrosis. There was a destruction of a 12-mm segment of the hard palate with the extension of the mass through the nasal floor and possible contact with the root of the left maxillary canine. The mass extended into bilateral nasal cavities with erosion of the right nasal bone and the nasal process of the maxilla (Fig. 1).

The patient was otherwise fit and well. He underwent a modified infrastructure maxillectomy resection, extended to include most of his nasal septum (except for a 15-mm dorsal cartilaginous L-strut left attached to the nasal skin envelope), but preserving his teeth and alveolar arch. Although his alveolar arch was able to be preserved due to the low-grade nature of his disease, his resection left him with a 30×40 mm bony defect in his central hard palate and an oronasal fistula. Access was via a combined midface degloving and right lateral rhinotomy approach. The external skin envelope of his nose was entirely preserved. Bony and soft-tissue free flap reconstruction was planned to restore his midface projection and repair his oronasal fistula.

An osteocutaneous fibula free flap (FFF) was planned for his reconstruction. Bony reconstruction of the anterior maxillary defect was chosen to restore his upper lip projection, and to provide a solid plateform for his nasal columella and alae. The FFF skin paddle, which is typically vascularized by perforators running through the posterior intercrural septum, would then be turned 90 degrees, in

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**Fig. 1.** CT scan of the facial bones shows a soft-tissue mass arising from the cartilaginous septum. The anterior hard palate has been eroded through the nasal floor, adjacent to the maxillary spine.

the manner of a propeller flap, to reconstruct the hard palate defect.

The handheld Doppler was used to identify cutaneous perforators. A strong signal was identified approximately midway between the lateral malleolus and the fibula head. No other perforators were identified along this axis. The skin flap was planned based on this single perforator, and the anterior incision was made. Intraoperatively, we identified no perforators running through the posterior intercrural septum (Fig. 2). At the site of the handheld Doppler signal, a large musculocutaneous perforator was identified. Retrograde dissection continued through the soleus muscle, revealing its origin from the tibioperoneal trunk (Fig. 3). Harvesting of the osseous FFF was completed based on the peroneal vessels. The osseous free flap was inset to the anterior maxillary defect. The fasciocutaneous free flap based on the musculocutaneous perforator was inset into the hard palate defect to obliterate the oronasal fistula (Fig. 3). With two separate free flaps, two sets of recipient vessels (facial artery and vein at the mandibular margins bilaterally) were prepared. The patient's unique anatomy thus allowed for an ideal reconstruction of the hard palate and maxilla without the need to rotate the skin perforator at 90 degrees—a challenging inset that risks kinking the perforator. It also enabled two free flaps to be harvested from one single donor site. The lower leg donor skin defect was closed primarily.

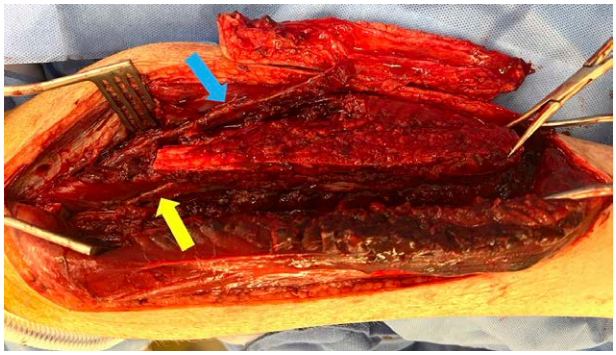

**Fig. 2.** Photograph of the rare anatomical variant encountered during raising of the free flap. The blue arrow shows the musculocutaneous perforator that was dissected through the soleus to its origin at the tibioperoneal trunk. It was the sole perforator to the skin island. The yellow arrow shows the peroneal artery which supplied the fibula. The musculocutaneous perforator was larger than the peroneal artery. Both systems had two accompanying venae comitantes.

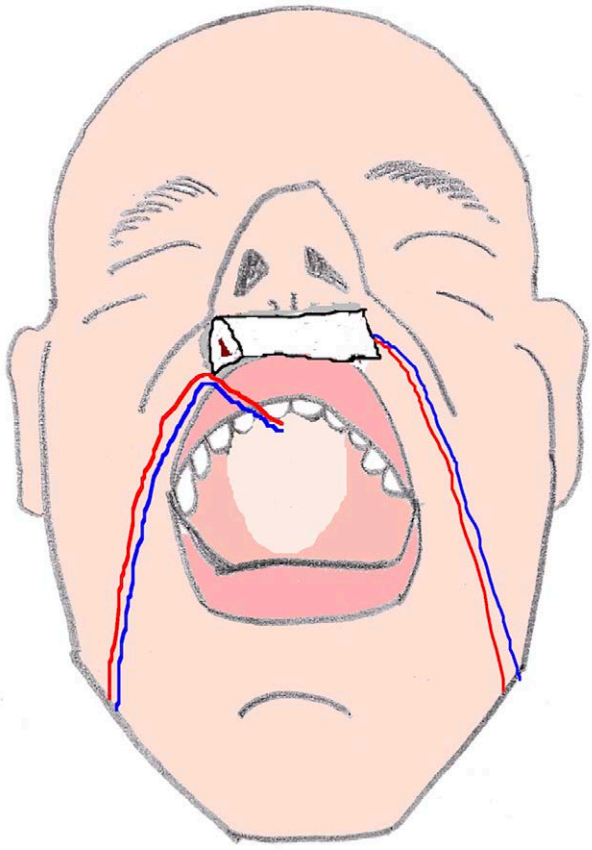

**Fig. 3.** Diagram of the inset of the osteocutaneous FFF. The osseous free flap was inset to the anterior maxillary defect, superior to the intact alveolar arch with teeth left in situ, and anastomosed to the left facial artery and vein. The fasciocutaneous free flap was inset to the hard palate defect to prevent an oronasal fistula. It was anastomosed to the right facial artery and vein.

Histopathology was reported as chondrosarcoma (grades 1 and 2) with clear margins. The multidisciplinary team consensus was that postoperative radiotherapy was not indicated. Twelve months postoperatively, the patient has had no wound healing issues and has maintained midface projection (Fig. 4).

**Fig. 4.** Photograph of the patient 3 months after surgery showing good midface projection.

## DISCUSSION

Chondrosarcoma of the nasal septum is a rare disease.[1] This is only the second case report to describe free flap reconstruction postresection of a nasal septal pathology. Ono and Asai describe a similar case of a 54-year-old man with chondrosarcoma of the nasal septum eroding the right maxillary sinus, ethmoid sinus, and hard palate. He underwent subtotal bilateral palatomaxillectomy and reconstruction with an osteocutaneous FFF. Orientation of the skin paddle with reference to the fibula was not discussed.[2]

The exact incidence of the osteocutaneous FFF with no septocutaneous (SC) perforators is not known. However, its existence has been previously mentioned in the literature. The osteocutaneous FFF with no SC perforators was first described in 1986 by Wei et al. Their study involved an anatomic study of 20 cadaveric legs and 15 clinical cases. One of the 20 (5%) cadaveric legs had no identifiable SC branches. In this case, musculocutaneous branches supplied adequate circulation to the same skin area. In two of the 15 (13%) clinical cases, no SC branches were found. In case 2, an osteocutaneous FFF was raised in a 4-year-old girl. No SC perforators were identified, but a large musculocutaneous branch arising from the tibioperoneal trunk supplied the skin paddle. Their clinical photographs are similar to our Figure 3. Overall, their total incidence of FFF with no SC perforators is three of 35 (8.6%).[2] Since then, other cadaveric studies have estimated the incidence of FFF with no SC perforators to be between 3% and 25%.[3–5]

In 2012, Yadav et al published the largest clinical case series of 386 FFFs with the aim of classifying skin paddles based on the dominance of different perforator systems.[6] They developed a classification system of four types of skin paddles (A–D). Type A skin paddles (95.8% of fibula flaps) received their vascularity via the peroneal system only, typically through an SC perforator. Type B skin paddles (3.6%) received their vascularity via both the peroneal and posterior tibial systems. Type C skin paddles (0.5%) received their vascularity from the posterior tibial system via soleus musculocutaneous perforators. Type D skin paddles (0%) received vascularity from the popliteal system. Yadav et al did not encounter any type D skin paddle. The anatomical variant in our case report would be considered type D.

## CONCLUSIONS

Despite the challenging nature of the defect, free flap reconstruction should be considered postresection of nasal septal chondrosarcoma as a means of maintaining midface projection. This case has two salient points. First, the FFF should be raised in a defensive manner, with the surgeon cognizant that the fasciocutaneous flap could be vascularized by a separate system, despite the low incidence. An SC pathway cannot be assumed, and all cutaneous perforators should be clearly visualized and dissected to their origin. Second, an osteocutaneous FFF with a divergent system, although more time-consuming and requiring a second set of anastomoses, allows for unparalleled flexibility in the orientation of the skin paddle relative to the bone.

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## DISCLOSURE

*The authors have no financial interest to declare in relation to the content of this article.*

## PATIENT CONSENT

*The patient provided written consent for the use of his image.*

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