Use of Composite Osteotemporoparietal Fascia Flap for Midface Reconstruction After En Bloc Resection of Squamous Cell Carcinoma Involving the Zygomaticomaxillary Complex

Daniel D. Lee* Tyler Kenning, MD† Carlos D. Pinheiro-Neto, MD, PhD‡

Summary: The osteotemporoparietal fascia flap (OTPFF) has been used for bony defects, especially on the maxilla and orbital floor. However, there are limited reports about the reconstruction of the zygoma. We report the use of composite OTPFF for reconstruction of zygomaticomaxillary complex. The patient had undergone zygomaticomaxillary complex reconstruction with composite OTPFF because of the resection of recurrent postradiation tumor. Extratemporoparietal fascia was harvested and rotated to cover the medullary surface of the bone flap. Flap was successfully transferred with complete bone integration. There were no surgical complications and excellent cosmetic result. The patient is free of disease 12 months post surgery. The OTPFF seems to be a good option in zygomatic reconstruction, even in previously irradiated fields. Utilization of extratemporoparietal fascia to cover the medullary surface of the bone flap has potential to be an advantageous technique to minimize bone exposure and improve flap integration.

CASE PRESENTATION
A sixty-eight year-old male presented with recurrent left zygomaticomaxillary complex squamous cell carcinoma treated previously with radiation therapy. One-year follow-up positron emission tomographic scan showed tumor recurrence in the body of the zygoma. Patient underwent en bloc resection of the zygoma, orbital floor, and part of the maxilla (Fig. 1). Reconstruction was performed with an OTPFF for the zygoma and a porous polyethylene implant for the orbital floor (Fig. 2). Computed tomographic scan on postoperative day 1 demonstrated good position of the bone flap (Fig. 3). At the 12-month follow-up, the flap was completely integrated with no facial asymmetry on clinical examination. The patient is currently free of disease with no diplopia.

Surgical Technique
The flap harvest was achieved by a left hemicoronal incision followed by dissection in the subfollicular plane. The incision was carried up to the contralateral superior temporal line. Dissection continued inferiorly to the temporoparietal fascia and deep through the galea over the crown of the head. Subsequently, the pericranium and the fascia were carefully elevated, and the calvarium was drilled using

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 Albany Medical College, Albany, N.Y.
the predetermined margins. A diamond bur and curved osteotomes were used to separate the outer cortical from the inner cortical. The temporoparietal fascia was elevated from the deep temporalis fascia, and the conjunction of bone attached to the fascia was freely mobile.

A tunnel for the flap transposition was developed deep to the temporalis fascia to the zygomatic defect. The medullary surface of the osteopericranial flap was completely covered by extratemporoparietal fascia and transposed into the zygomaticomaxillary defect. The natural curve of the calvarium appropriately approximated the natural curve of the zygoma and malar eminence. A polyethylene Medopor Titan implant was used to reconstruct the orbital floor defect. A vascularized buccal fat flap was harvested and used to cover the roof of the maxillary sinus. Deep and soft tissues were approximated and incisions were closed.

**DISCUSSION**

The TPFF is one of the most reliable flaps for head and neck reconstruction because it is thin and pliable and has a long pedicle and a rich vascularity.\(^1\) Harvesting the underlying calvarium provides additional support, especially for bony defects of the head and neck.\(^2\) Successful head and neck reconstructions have been done using free grafts from the iliac crest, fibula, radius, rib, and scapula.\(^3\) Although these are acceptable options, free flaps require revascularization, necessitating the need for complex microvascular techniques and prolonged operative times.\(^5\)

The calvarium is an ideal site of harvest because of its proximity to the head and neck, allowing the flap to remain vascularized from perforators of the superficial temporal artery.\(^5\) Vascularized flaps are reported to be more reliable, have lower rates of infection, and allow earlier bone integration.\(^3\)

The OTPFF is commonly reported for the reconstruction of the palate and orbital floor; however, few reports mention the use of OTPFF with or without the temporalis muscle for midface reconstruction. Parhiscar et al\(^2\) reported 11 OTPFF cases with 1 failed flap because of pedicle torsion. Pollice et al\(^6\) reported 6 OTPFF reconstructions and Davison et al\(^3\) reported 8 with complete success. These studies describe a small series of patients with different diagnosis, including trauma, congenital defects, and tumor resections. The OTPFF seems to show good reliability and integration for head and neck reconstruction; however, very few cases report using this flap specifically for the zygoma.

In our patient, the flap was used to reconstruct a previously irradiated area. Irradiated fields create a poor environment for angiogenesis and osteogenesis, leading to increased risk of flap failure.\(^3\) Well-vascularized bone grafts, such as the OTPFF, seem to overcome the unfavorable effects of irradiation, as our patient displayed excellent bone integration at the 12-month follow-up.

During the procedure, extratemporoparietal fascia was harvested and folded to cover the medullar surface of the bone. This was indicated to theoretically decrease the risk of bone exposure. Creation of this barrier eliminates direct communication between the bone and the nose, which could subsequently decrease the risk of flap infection. To the best of our knowledge, there is no literature report on this technique.

**Fig. 1.** En bloc resection of the body of the zygoma with tumor.

**Fig. 2.** Intraoperative pictures of the reconstruction. A, Osteotemporoparietal fascia flap elevated. B, Porous polyethylene plate was used to reconstruct the orbital floor defect. Note that the plate was fixed with screws to the osteotemporoparietal fascia flap.
We also used a porous polyethylene implant for the orbital floor defect, which provided an alternative way to supply orbital support. This was performed to decrease donor-site morbidity, as a temporalis muscle or bone graft would no longer be needed. In addition, the maxillary surface of the implant was covered with a free buccal fat graft, minimizing the exposure of the hardware. Donor-site alopecia is the most common complication of TPFF because of thermal damage or failure to dissect in a subfollicular plane. Using a synthetic implant and minimizing unnecessary dissection have potential to decrease complications. To the best of our knowledge, this is the first report to use an OTPFF with a synthetic implant for a large zygomaticomaxillary complex defect.

CONCLUSIONS
The OTPFF seems to be a good option for midface reconstruction, even in previously irradiated fields. The use of a synthetic implant in conjunction with OTPFF might be advantageous to decrease donor-site morbidity. Harvesting additional temporoparietal fascia to cover the medullar surface of the bony flap might be interesting to minimize the risks of bone exposure. All this information is still to be proven, and further studies are needed. Our goal is to further explore the adaptability of these new techniques for the reconstruction of zygomatic defects.

Carlos D. Pinheiro-Neto, MD, PhD
Division of Otolaryngology/Head and Neck Surgery
Department of Surgery
Albany Medical Center
47 New Scotland Avenue, MC–41
Albany, NY 12208
E-mail: pinheic@mail.amc.edu

REFERENCES
1. Jaquet Y, Higgins KM, Enepekides DJ. The temporoparietal fascia flap: a versatile tool in head and neck reconstruction. Curr Opin Otolaryngol Head Neck Surg. 2011;19:235–241.
2. Parhiscar A, Har-El G, Turk JB, et al. Temporoparietal osteofascial flap for head and neck reconstruction. J Oral Maxillofac Surg. 2002;60:619–622.
3. Davison SP, Mesbahi AN, Clemens MW, et al. Vascularized calvarial bone flaps and midface reconstruction. Plast Reconstr Surg 2008;122:10e–18e.
4. Lam D, Carlson ER. The temporalis muscle flap and temporoparietal fascial flap. Oral Maxillofac Surg Clin North Am. 2014;26:359–369.
5. Davison SP, Boehmler JH, Ganz JC, et al. Vascularized rib for facial reconstruction. Plast Reconstr Surg. 2004;114:15–20.
6. Pollice PA, Frodel JL Jr. Secondary reconstruction of upper mid-face and orbit after total maxillectomy. Arch Otolaryngol Head Neck Surg. 1998;124:802–808.