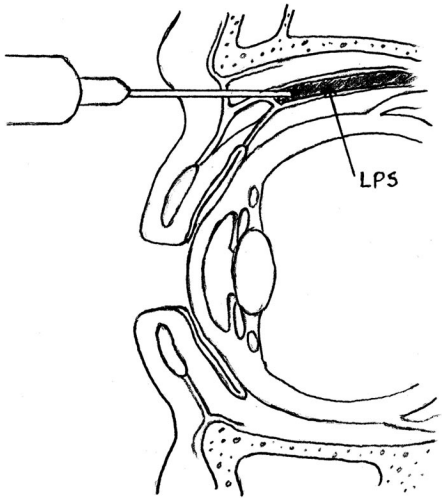

Fig. 2. Half-inch 26- or 30-gauge needle placed into the levator palpebrae superioris (*LPS*) muscle using a median dose of 12.5 units of botulinum toxin type A.

ing to increased ocular surface contact and improvement of dry eye disease symptoms.

Furthermore, botulinum toxin type A chemodenervation of the levator palpebrae superioris muscle may be a useful tool and an alternative to tarsorrhaphy in the temporary treatment of dry eye disease secondary to exposure keratopathy, thyroid eye disease, corneal hypesthesia, and facial nerve palsy, and also for persistent epithelial defects. Recent work has shown that anterior transcutaneous injections of botulinum toxin type A may decrease the incidence of superior rectus involvement; however, research should continue in this area, and patients should still be advised that diplopia is a possible side effect of treatment.

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Ana Carolina Victoria, M.D.

Alejandro Pino, M.S.I.
Miami Children's Hospital
Miami, Fla.

Correspondence to Dr. Victoria
Department of Plastic Surgery
Miami Children's Hospital
3100 SW 62nd Avenue, Suite 2230
Miami, Fla. 33155
carolinavictoria.md@gmail.com

DISCLOSURE

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Technology to Minimize the Morbidity of Le Fort III Osteotomies

Sir:

Le Fort III advancement is often required for patients with severe midfacial hypoplasia to relieve upper airway obstruction, exorbitism, and malocclusion.[1] Rare but serious complications of Le Fort III advancement include cerebrospinal fluid rhinorrhea, meningitis, meningoencephalocele, encephalocele, ocular trauma, and hemorrhage.[1,2] Complications associated with dural tearing and fractures of the cribriform plate are most likely to occur at the nasofrontal osteotomy,[1] and dental injury can occur at the pterygomaxillary osteotomy. Historically, careful preoperative inspection of computed tomographic images and reference to external anatomical landmarks was the only mechanism to prevent unfavorable osteotomies.[2]

Image-guided surgery platforms use patient references to register preoperative computed tomographic images to the patient's anatomy, and allow the surgeon to visualize and track instrument position in real time. Traditional osteotomies are performed with an osteotome or mechanical saw, both of which fail to discriminate between bone and critical soft-tissue structures. In contrast, piezoelectric surgery uses micrometric ultrasonic vibrations at frequencies that selectively cut only mineralized structures because of cessation of action on contact with nonmineralized tissues, thereby minimizing the risk of neural or vascular injury.[3] We hypothesized that image guidance and a piezoelectric saw would be ideal for performing Le Fort III osteotomies and could prevent the well-described complications of this procedure. We confirm that we have adhered to the tenets of the Declaration of Helsinki.

We present a 12-year-old girl with Crouzon syndrome who required Le Fort III advancement for treatment of obstructive sleep apnea, class III malocclusion, and midfacial hypoplasia. Using an intraoperative image guidance system (VectorVision; BrainLAB USA, Moorestone, N.J.), the three-dimensional computed tomographic scan of the patient's anatomy was referenced to the patient in real time (Fig. 1). The historically blind osteotomies from the nasofrontal suture to the skull base, and the lateral

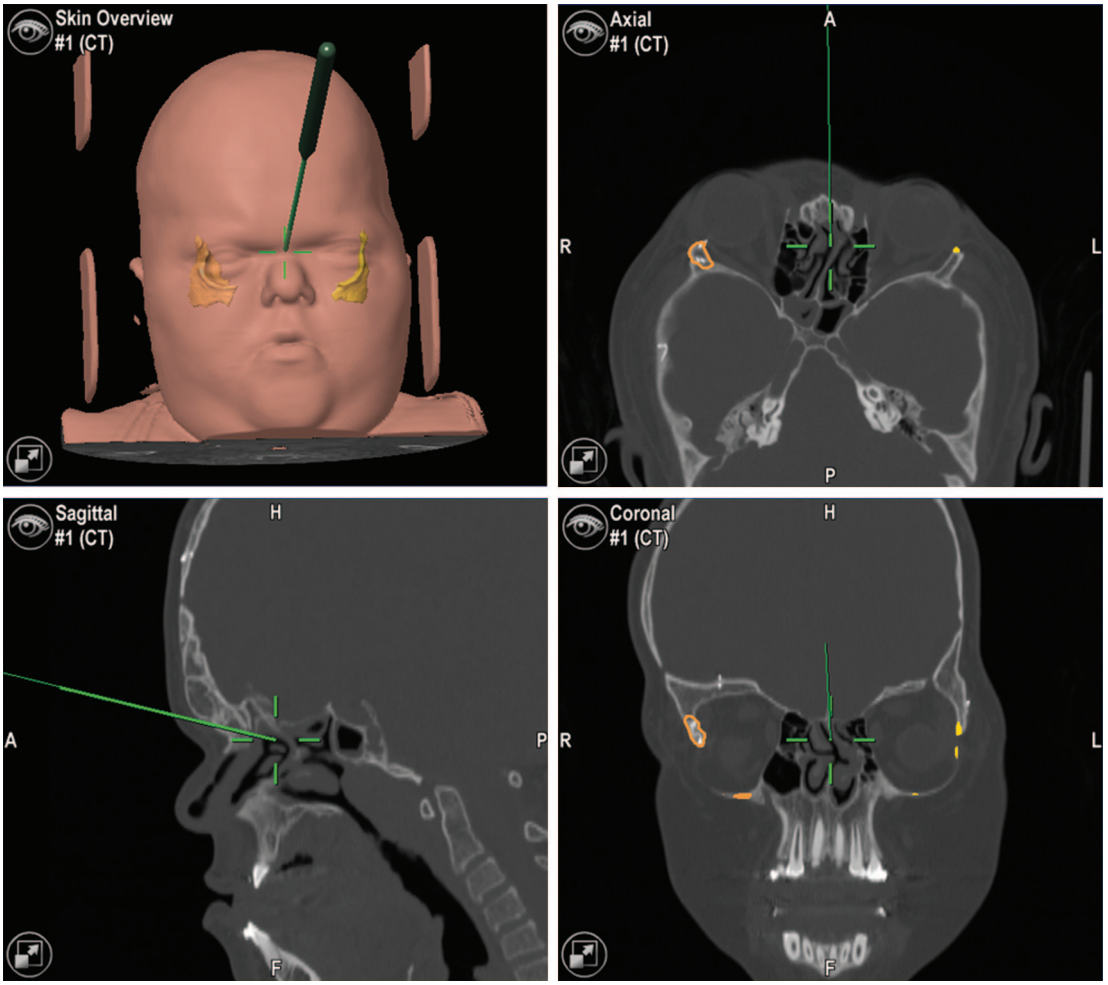

Fig. 1. Intraoperative screen shot of the nasofrontal osteotomy using an image guidance system (BrainLAB VectorVision) in three-dimensional (*above*, *left*), axial (*above*, *right*), sagittal (*below*, *left*), and coronal (*below*, *right*) views demonstrating real-time three-dimensional intraoperative position localization and trajectory planning of the osteotomy.

orbital wall to the pterygomaxillary junction, were visualized directly on the referenced computed tomographic scan. This prevented inadvertent entry through the cranial base, a well-described complication of this procedure.[4] Once a safe extracranial trajectory was confirmed with image guidance, we made the osteotomies using a piezoelectric system (Synthes). Advancement was performed with an external distraction system. Of note, the patient also required a cranioplasty for residual skull defects from her cranial vault remodeling that had been performed in infancy. The patient tolerated the procedure well, and because of the intraoperative image guidance, no immediate postoperative computed tomographic scan was required. Operative time, including the bilateral cranioplasty, was 6.5 hours, which is comparable to historical controls.[5] She was discharged to home on postoperative day 8 and has done well clinically. Follow-up computed tomographic scanning

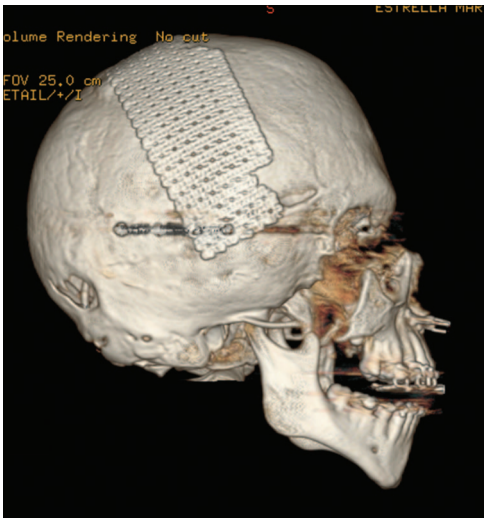

Fig. 2. Postoperative computed tomographic image demonstrating maxillary advancement without disruption of the cranial base.

demonstrates maxillary advancement and no disruption of the cranial base (Fig. 2).

We report a combined application of intraoperative three-dimensional image guidance and piezoelectric surgery to more safely perform osteotomies in Le Fort III advancement. Nasofrontal and pterygomaxillary osteotomies, which were historically performed blindly and with instrumentation capable of neural and vascular injury, can be more controlled with these adjunctive tools. We suggest that real-time image guidance and ultrasonic bone saws minimize the potential morbidity and mortality of this procedure, reduce the need for immediate postoperative imaging, and do not extend operative time.

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Laurel S. Karian, B.A.
University of Vermont College of Medicine
Burlington, Vt.

Benjamin Z. Phillips, M.D., M.P.H.

Clinton S. Morrison, M.D.
Division of Plastic Surgery

Petra M. Klinge, M.D., Ph.D.
Department of Neurosurgery

Stephen R. Sullivan, M.D., M.P.H.

Helena O. Taylor, M.D., Ph.D.
Division of Plastic Surgery
The Warren Alpert School of Brown University
Providence, R.I.

Correspondence to Dr. Taylor
Division of Plastic Surgery, MOC 180
2 Dudley Street
Providence, R.I. 02905
helena_taylor@brown.edu

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PATIENT CONSENT

The patient provided written consent for use of the images.

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A New Route for Passing a Free Flap Vascular Pedicle Using Contralateral Facial Vessels as Recipient Vessels in Skull Base Reconstruction

Sir:

The choice of recipient vessels is critical in skull base reconstruction for recurrent maxillary cancer invading the skull base after multiple treatments in a patient with no suitable recipient vessels in the ipsilateral face and neck. This report describes a new route through which to pass a free flap vascular pedicle from the recipient site to the contralateral facial artery and vein through the contralateral maxillary sinus. The distances from the skull base to the various recipient vessels through various routes were compared using a skull model, and the versatility of this new route was evaluated. This report also presents a patient who underwent successful reconstruction using this route.

The measured distances of routes were from the anterior skull base to the contralateral superficial temporal vessels through the subcutaneous layer (route 1), the contralateral facial artery and vein through the subcutaneous layer (route 2), the contralateral superficial temporal vessels through the maxillary sinus (route 3), the contralateral facial artery and vein through the maxillary sinus (route 4), and the ipsilateral cervical vessels (route 5) (Fig. 1). The distances of the routes were 11 cm (route 1), 10 cm (route 2), 10 cm (route 3), 7 cm (route 4), and 7 cm (route 5). Route 4 was as long as that using the ipsilateral cervical vessels and thus was the shortest of the routes using contralateral vessels.

A 40-year-old man who had a recurrent maxillary cancer invading the skull base after administration of intraarterial chemotherapy two times through an implantable subcutaneous port with a catheter inserted into the external carotid artery, partial maxillectomy (two times), radiotherapy (68 Gy), and right radical neck dissection was referred to this clinic. Extended maxillectomy including anterior skull base resection with reconstruction using a free flap was planned. The ipsilateral branches of the external carotid artery could not be used as a recipient artery because of the previous intraarterial chemotherapy. There was no vein suitable for use as a recipient vein in the ipsilateral neck because the jugular veins had been