Three-Dimensional CT derived custom implant for repair of facial defects

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ABSTRACT
This is a case report of a 28 year old male with a history left maxillary tumor. The defect was treated utilizing a customized 3D implant.

CASE REPORT
A 28 year-old male with a past medical history significant for a left maxillary sinus tumor, treated via subtotal maxillectomy and rectus abdominis free flap to the left malar region presented one year post-operatively with chief complaints of epiphora, intermittent medial canthal swelling and pain, left lower lid deformity, and poor facial cosmesis. Physical examination was consistent with left lower eyelid vertical shortening, chemosis, keratitis, dacryocystitis, and cicatricial ectropion secondary to atrophy of the rectus abdominis flap with skin tethering. The patients work up included dacrocystogram, ophthalmologic consultation, and three dimensional (3D) computed tomography (CT). The patient underwent open dacrocystorhinotomy, lateral canthoplasty, and reconstruction of the left maxilla using a customized 3D computed tomography (CT) guided implant created to precisely match the patients left maxillary defect. The surgery was successful in resolving the patients ophthalmic symptoms and significantly improved facial cosmesis.

DISCUSSION
The restoration of craniofacial defects continues to pose a significant challenge to the reconstructive surgeon, however, the advent of customized implants based on three dimensional computer tomography has improved the precision, accuracy, and cosmetic outcomes in the reconstruction of facial defects. Here we discuss the indications, contraindications, advantages, and complications associated with the use of customized implants in the craniofacial region. Current indications for the use of custom implants include large, full-thickness defects in the craniofacial skeleton secondary to trauma, oncologic resection or congenital deformity. Custom implants have also been useful in cheek augmentation for patients suffering from facial lipodystrophy secondary to HIV infection. Custom implants are particularly effective in treating defects secondary to traumatic injuries and congenital anomalies.¹

3D CT guided implants, allow for preoperative production of an implant that precisely represents the anatomical defect. These customized implants decrease operative time as they eliminate the need to hand carve implants, reduce the removal of healthy bone, eliminate the need for bone grafting, and promote effective planning of implantation while improving surgical accuracy. Three dimensional modeling also allows improves symmetry with the contralateral anatomic subunit, therefore, enhancing postoperative cosmesis. Available materials include high-density polyethylene, expanded polytetrafluoroethylene, silicone, and combinations of materials such as polymethylmethacrylate (PMMA), polyhydroxethylmethacrylate (HEMA) and a calcium hydroxide coating. Complications associated with custom implants include; sensitivity reactions, peripheral neuropathy, migration, extrusion, implant fracture, infection, prominence of the implant in last post-operative period and the need for revision procedures.¹⁻⁴ Post-operative satisfaction surveys of patients undergoing surgery with custom implants have shown high patient satisfaction. Patients have specifically commented that their implants remain stable in position after implantation and retain their original size and structure. They are also pleased with their aesthetic outcomes.¹, ²

REFERENCES

CONCLUSIONS
3D CT customized implants have revolutionized craniofacial reconstruction, providing improved precision, accuracy and cosmetic outcomes for restoring facial defects and should be added to each reconstructive surgeons armamentarium.