

Background

- **Repairing frontal calvarial defects poses significant challenges**
 - Aesthetic demands
 - Functional restoration
 - Requires thorough understanding of intricate anterior skull base anatomy
- **Goals of frontal cranioplasty:**
 - Cosmetic improvement
 - Provide structural support for the brain and orbits
 - Separate intracranial and extracranial contents with a water-tight seal
 - Prevent CSF leak
 - Minimize dead space
- **Reconstruction materials available for cranioplasty:**
 - Autologous bone often preferred - strength, availability, osteoconduction, and compatibility
 - Synthetic Alternatives - porous polyethylene, titanium, hydroxyapatite, polymethylmethacrylate, and polyetheretherketone
- **Porous polyethylene implants:**
 - Can be custom-designed preoperatively
 - Combine the durability, structural support, and biocompatibility of autologous bone
 - Fosters fibrous tissue infiltration and bone growth to reduce extrusion rates

Case Presentation

We report two cases of secondary anterior skull base reconstruction using custom-designed porous polyethylene implants, including several innovative customizations for enhanced cosmesis.

Patient 1: 18-year-old male with a history of severe TBI necessitating bifrontal craniectomy followed by skull base repair and titanium mesh placement at an outside facility, who presented with mucocele, CSF rhinorrhea, and pneumocephalus.

Patient 2: 29-year-old female with a history of self-inflicted gunshot wound to the head necessitating multiple skull base repairs and titanium mesh placement at an outside facility, who presented with brow asymmetry and skull base defect.

Methods

Both patients underwent titanium mesh removal and frontal sinus cranialization.

Patient 1 required temporalis fascia and muscle grafts as well as a latissimus dorsi free muscle graft for sinus obliteration. This was followed by cranioplasty with modifications to thin the flange and to eliminate the flange as the implant met the orbital bar (Figures 1, 2).

Patient 2 required a multilayered skull base repair including vastus lateralis muscle plug, temporalis graft, and obliteration of the frontal sinuses followed by cranioplasty. For this patient, the flange was ultra-thin (0.85 mm), and a drill was used to contour the inferior edge of the flap in order to facilitate cosmesis (Figures 3, 4).

Discussion

Both patients had excellent postoperative outcomes with no complications, achieving successful skull base repair and superior cosmetic results.

Although cosmesis has not traditionally been a primary focus in skull base reconstruction, these innovative modifications to cranioplasty implants offer a replicable approach that can be adapted to suit the specific needs of patients and their reconstruction.

Figure 1:

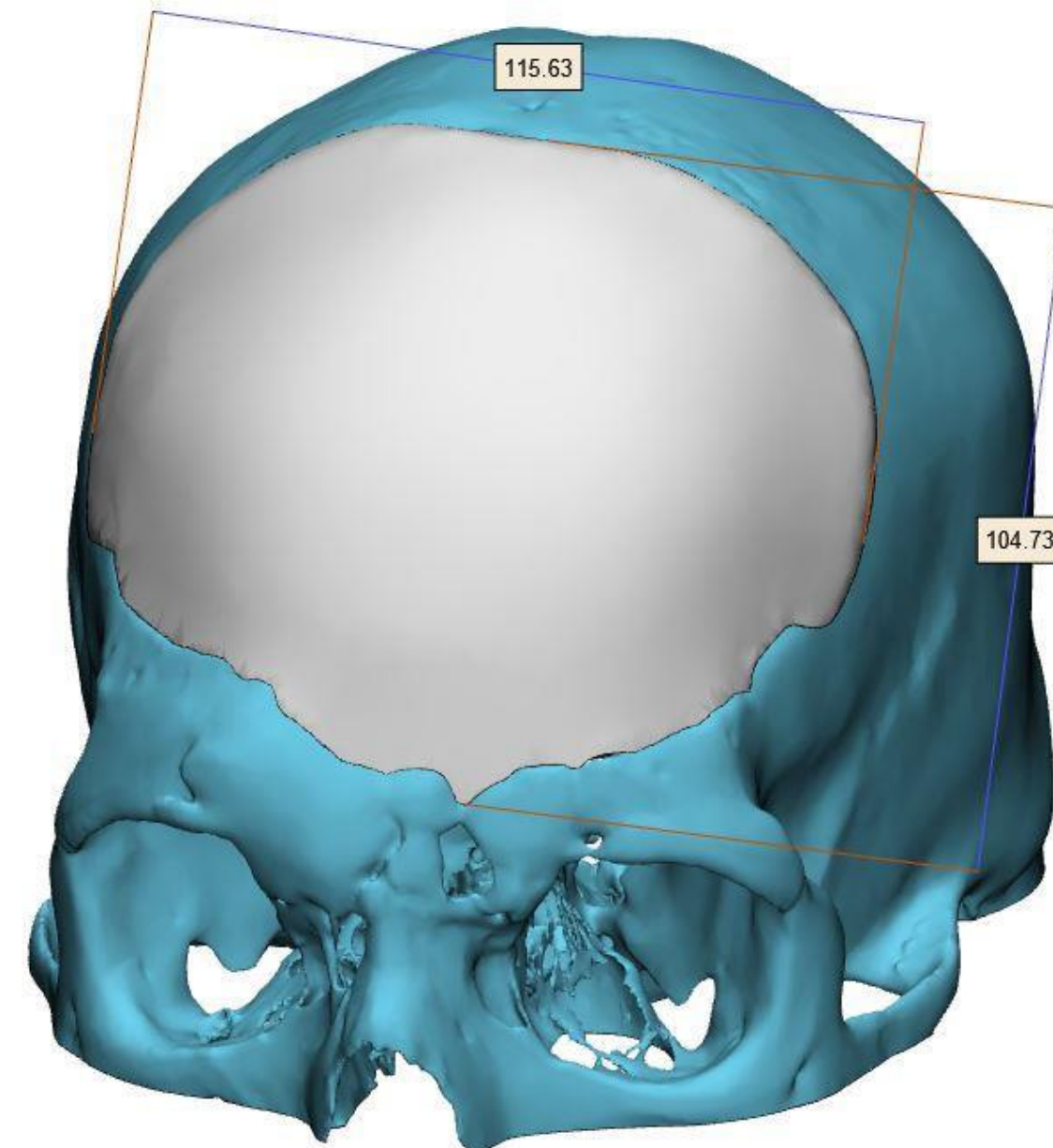


Figure 2:

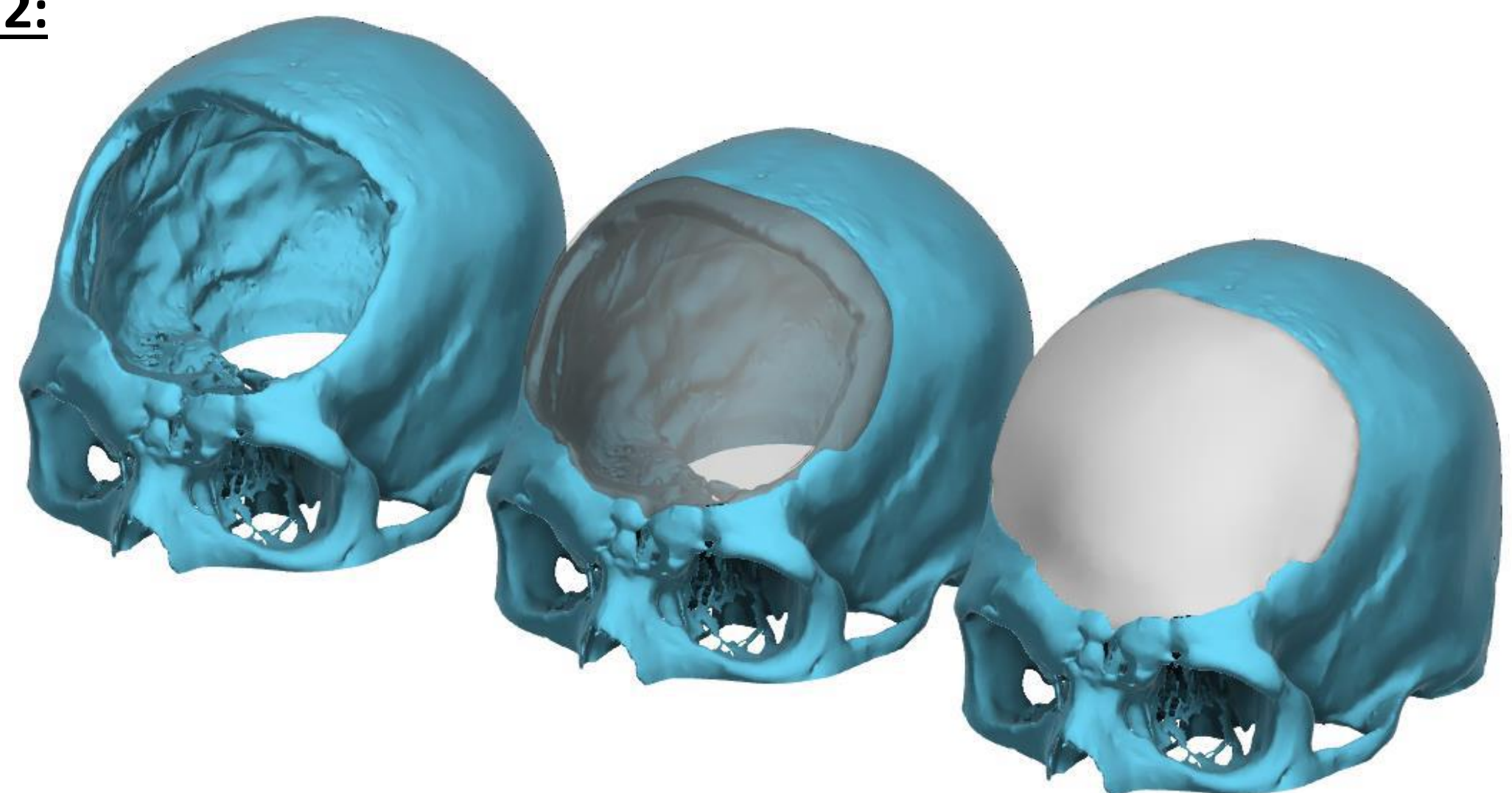


Figure 3:

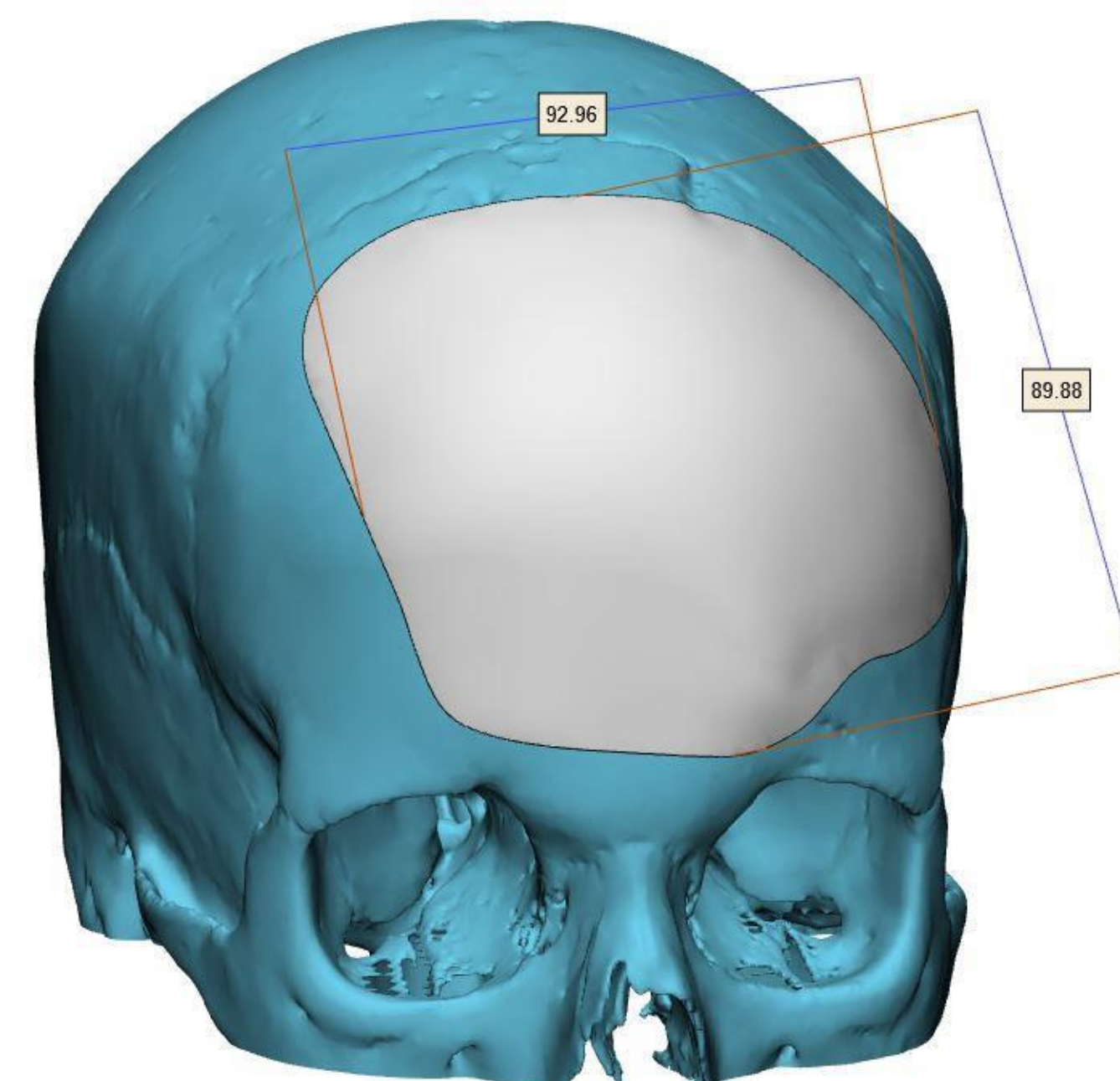
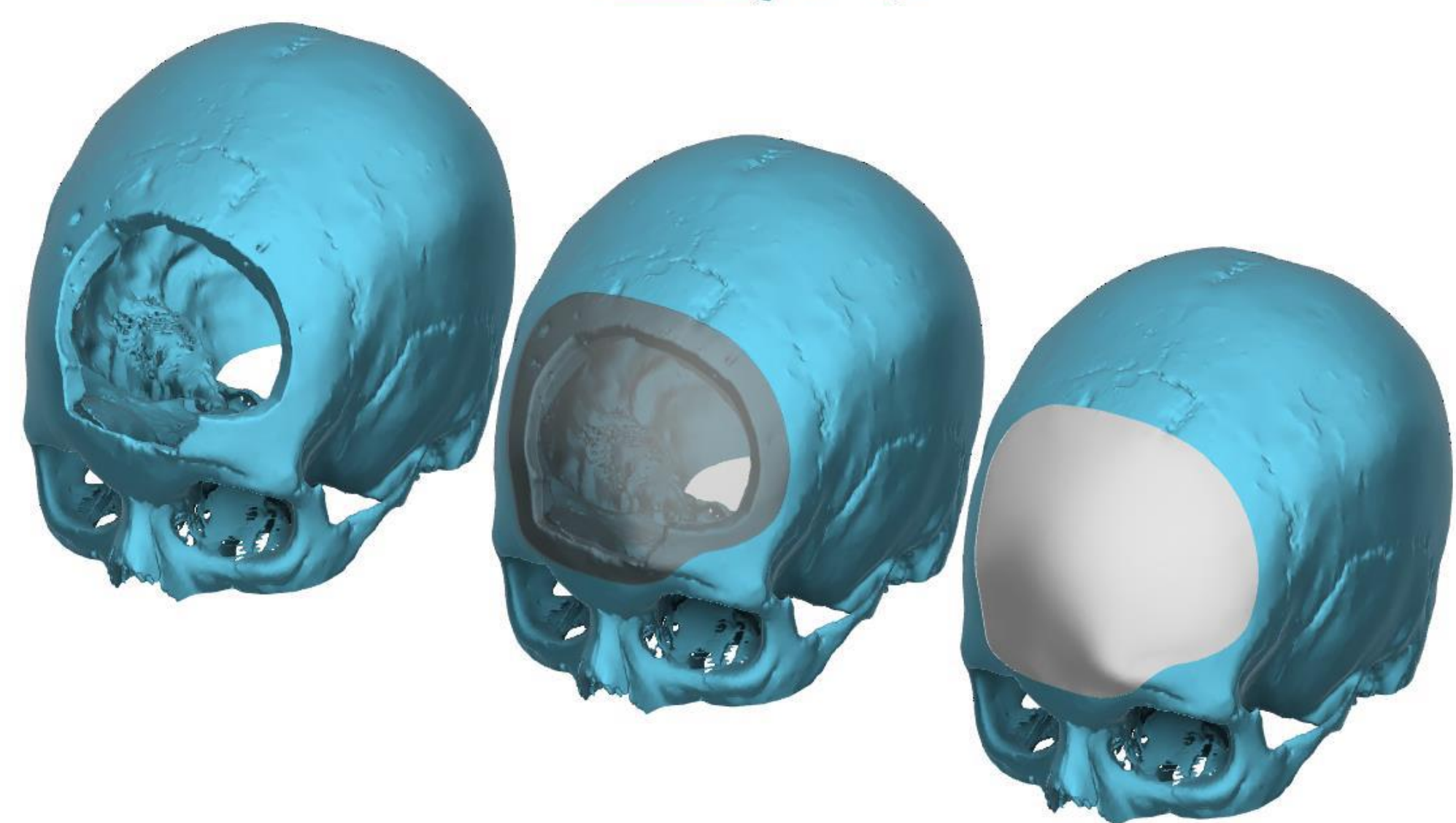


Figure 4:



Conclusions

- Innovative modifications to cranioplasty implants offer a replicable approach that can be adapted to suit the specific cosmetic and functional needs of patients and their reconstruction.

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