



PEC University
of Technology

Design of Patient Specific maxillofacial Implants, Templates and Cutting Guides



Centre of Excellence in Industrial
& Product Design

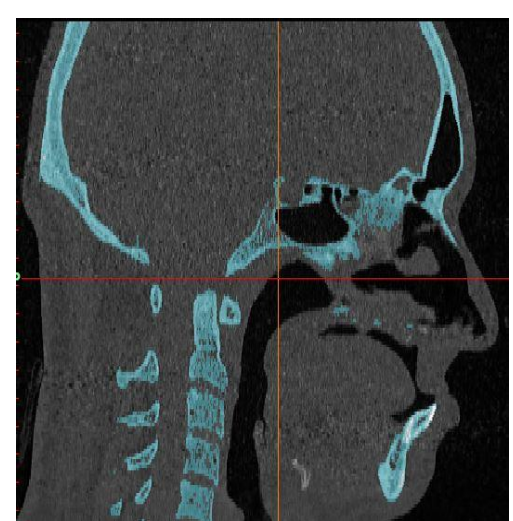
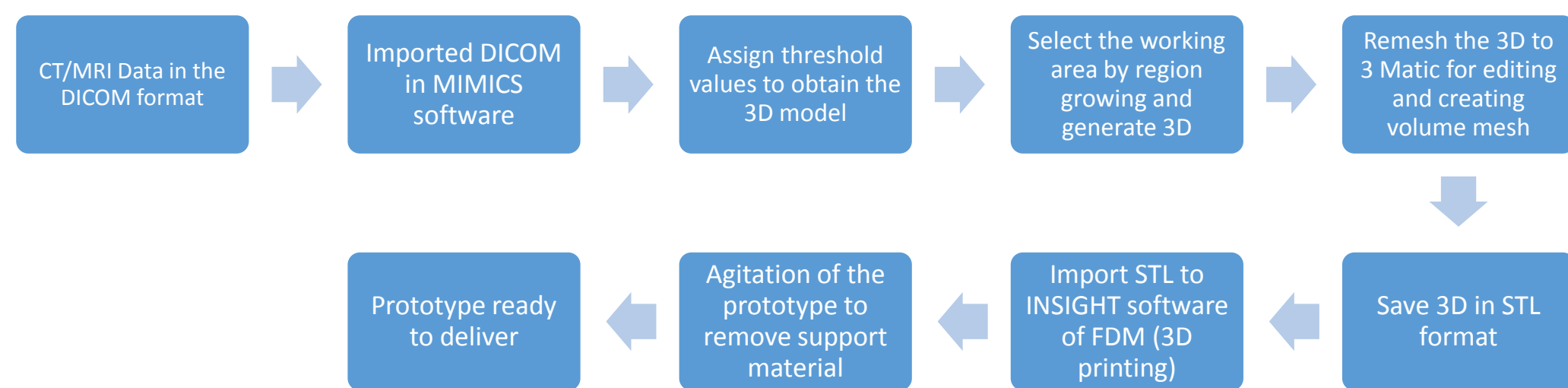
ABSTRACT

Maxillofacial prostheses are usually fabricated on the basis of conventional impressions and techniques. The extent to which the prosthesis reproduces normal facial morphology depends on the clinical judgment and skill of the individual fabricating the prosthesis. Recently, as a result of advances in technology, various computer-aided design and additive manufacturing techniques such as Fused Deposition Modelling have been successfully introduced for the automated fabrication of maxillofacial prostheses. These systems are able to provide more consistently accurate reproduction of facial morphology. Potential problems associated with conventional impressions include patient discomfort and distortion of the facial soft tissues. Also, the conventional technique available requires the technician to spend time carving and adapting the prosthesis to a cast of the deficient side of the face. Hence, these techniques rely upon the skill and individual ability of the technician. Due to the digitized imaging technology, it has become possible to obtain non-contact three-dimensional facial measurements and three-dimensional anatomic model which is more accurate and low in price,

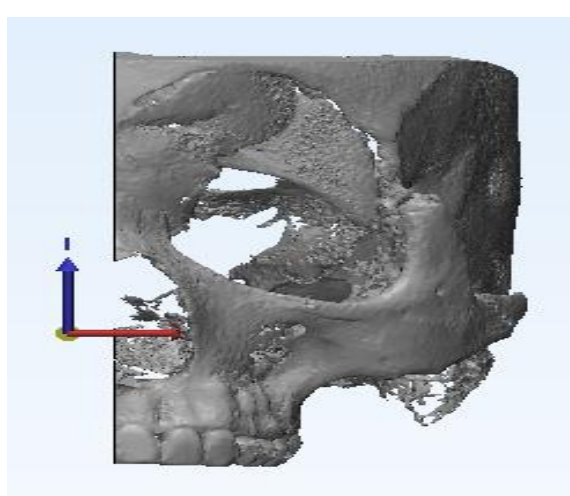
TARGET CUSTOMER

General public, government and private hospitals/doctors, investors/ NGO's

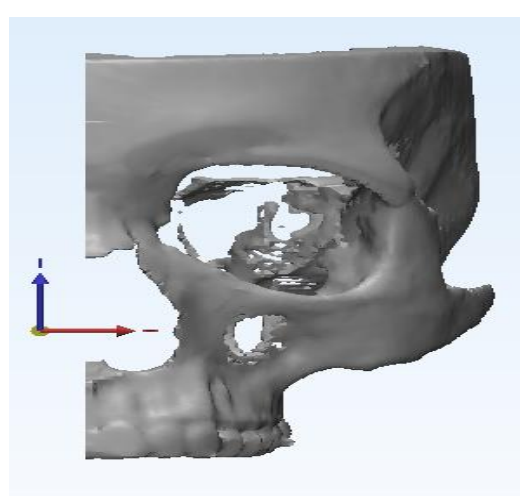
METHODOLOGY



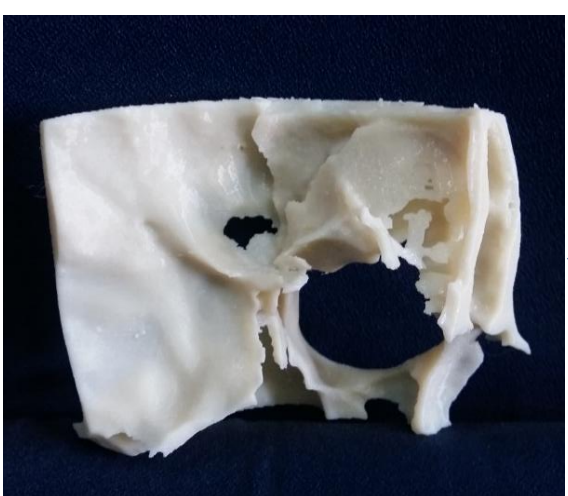
3D Model of Fractured Frontal Bone



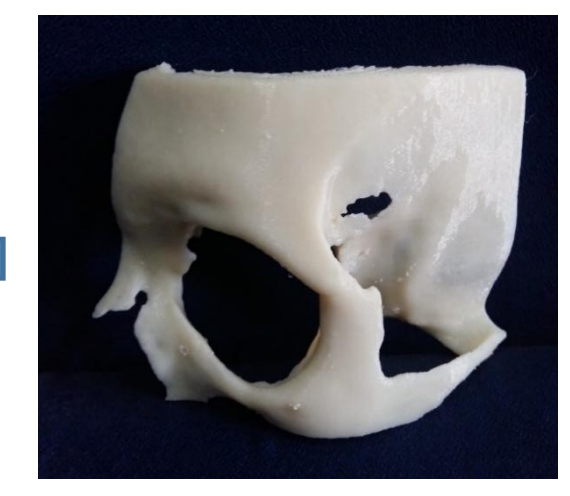
3D Model of Fractured Frontal Bone



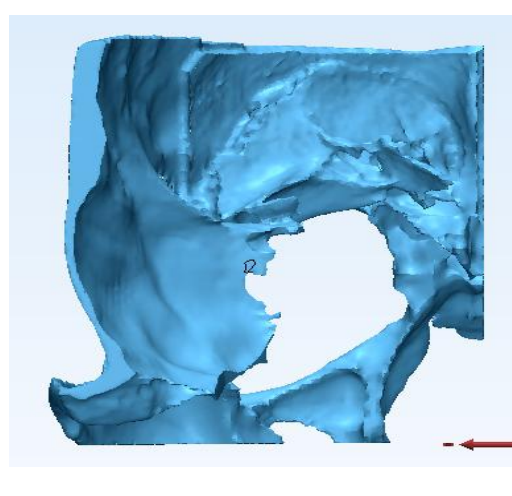
3D Model of Virtually Repaired Bone



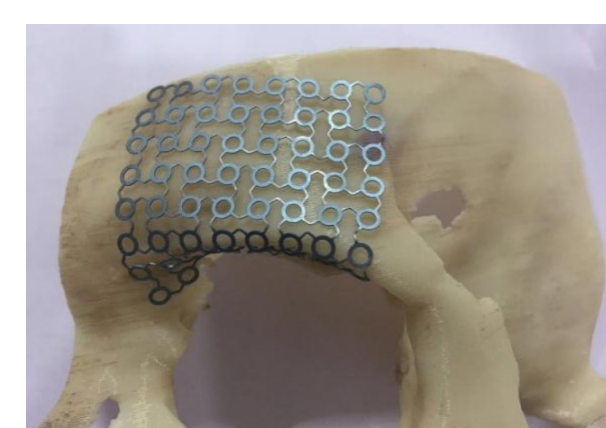
Prototype- Fracture reference at the back



Printed Template of Refined Skull Prototype



Fracture reference at the back



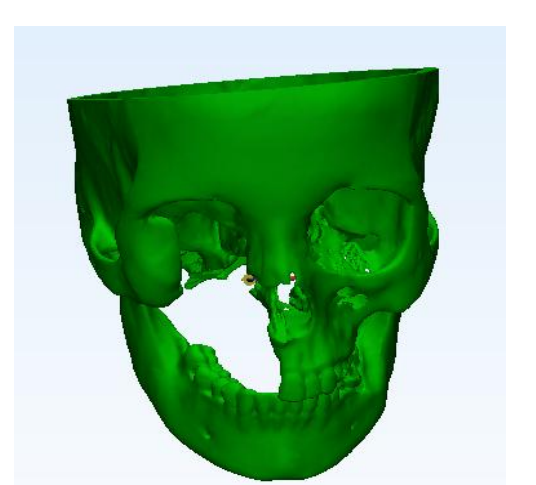
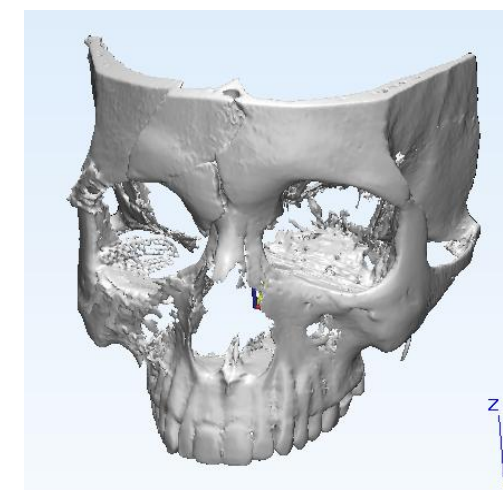
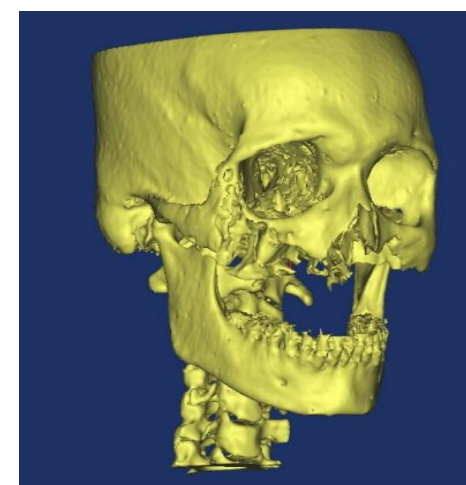
Mesh Plate Adaptation

TEAM DETAILS

PEC University of Technology	PGIMER
Dr. Prof. Parveen Kalra (Chief Coordinator, COE)	Dr. Sunil Gaba (Plastic Surgeon)
Mr. Shagun Sharma (Senior Research Fellow)	Dr. Vidya Rattan (Maxillofacial Surgeon)

PROBLEM DEFINITION

Maxillofacial injuries can be complex and multi-specialty involvement in their management may be needed. Injury can involve the skin and soft tissues as well as resulting in fractures. Acute and long-term psychological problems can result from maxillofacial trauma and disfigurement. Maxillofacial trauma is usually caused by-Assault (most common; domestic violence is an important cause; alcohol may be involved), road traffic accidents (midface fractures can occur), sporting accidents. The fracture ratio mandibular:zygoma:maxillary is 6:2:1. X-ray and CBCT scanning provide the mainstay of fracture investigation. The management depends on injury/fracture, pain control will be needed, early photographs may be helpful both to plan treatment and to counsel the patient. Fractures associated with the Zygomatic Arch and Orbital Fractures, Eye Trauma and mandibular reconstruction are most common at PGIMER, Chandigarh.



Maxillofacial Deformities

UNIQUE INSIGHTS/BENIFITS

- The prototypes are useful for rehearsal of osteotomies and pre bending plates
- Useful for complex cases or where software is not available
- Medical models represent good value for money in specific applications, reduces errors and increases accuracy
- At PEC COE, the patient specific implant or template will be designed indigenously and printed as a prototype which can further be outsourced taking lesser time.
- The research scholars at COE are continuously in contact with the doctors as they can come at the lab, sit along, discuss, check the product, and suggest changes during the developing phase.
- Team of research scholars and Phd scholars.
- Collaborating with hospitals will help in brand building as it is easy for PGI to have straight communication with PEC as both institutes are at a walking distance

KEY IMPLEMENTATION CHALLENGES

- Project Funding.
- More work is needed to develop surgical guides for osteotomies.
- More research is needed to direct implant manufactures.
- More collaborating medical institutes and companies.

PROJECT POTENTIALS

	Patient Specific Custom Implant Development for Maxillofacial Patient		Mesh plate Bending for fractured frontal bone
	Orbital Floor reconstruction		Development of Surgical Tool Guides
	Maxilla reconstruction from fibula free flap		Evaluation of the position of condyle after orthognathic surgery and OT's clinical correlation with temporomandibular joint disorders

- The projects at COE contribute to the MAKE IN INDIA approach. It promotes indigenous design and manufacturing.
- Government institutes and private industries can take up projects which will benefit them under the MAKE IN INDIA scheme and generate funding for research.