



NEED A NEW SKULL OR MANDIBLE : 3D PRINT IT !

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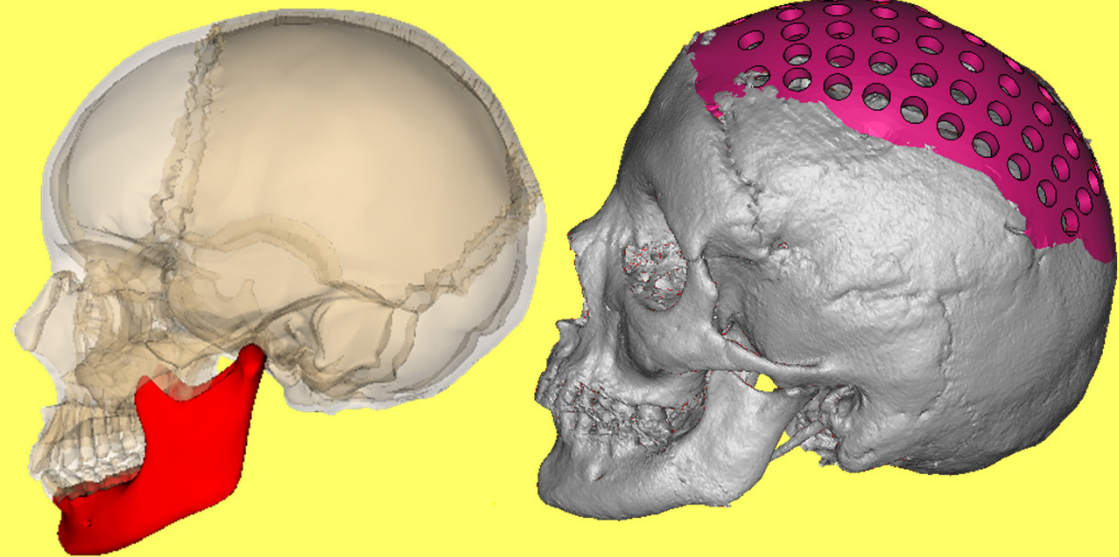
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Ing. Ruben Wauthle

Ing. Carsten Engel

Prof. Dr. J. Vander Sloten

Prof. Dr. I. Lambrichts




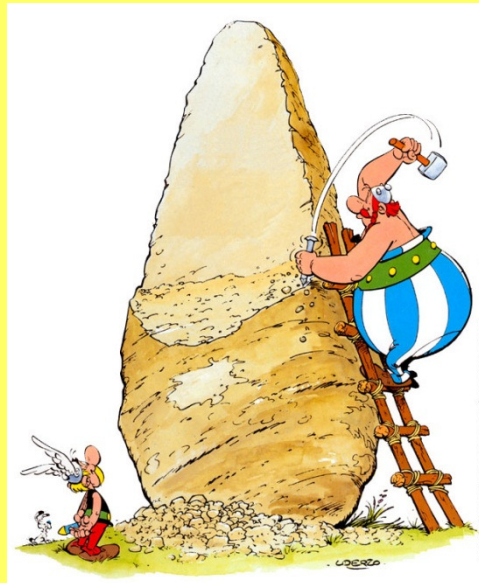
WHAT ARE CRANIO-MAXILLOFACIAL DEFECTS ?



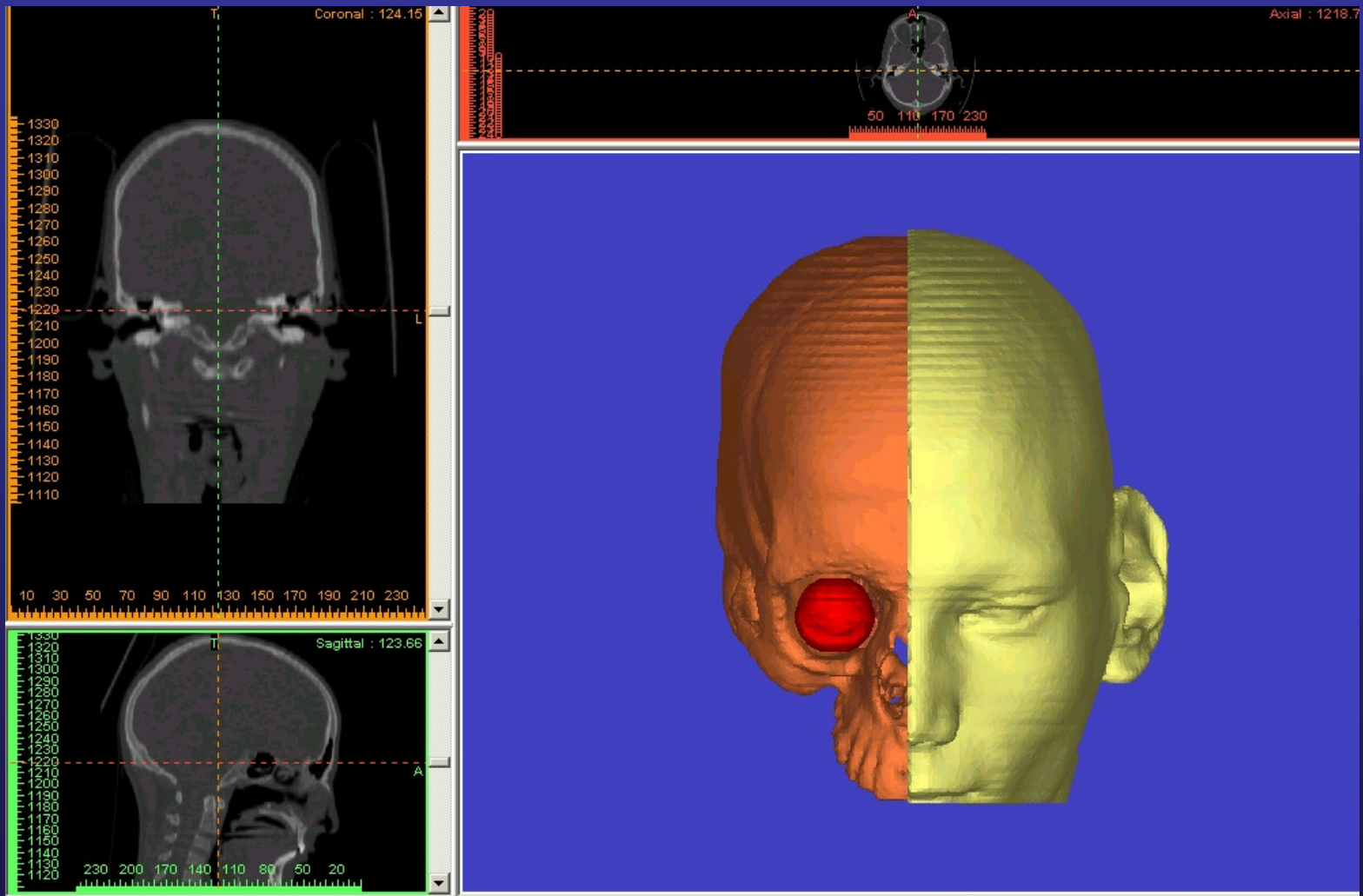
MEDICAL CAD-CAM

RAPID DESIGN AND MANUFACTURING

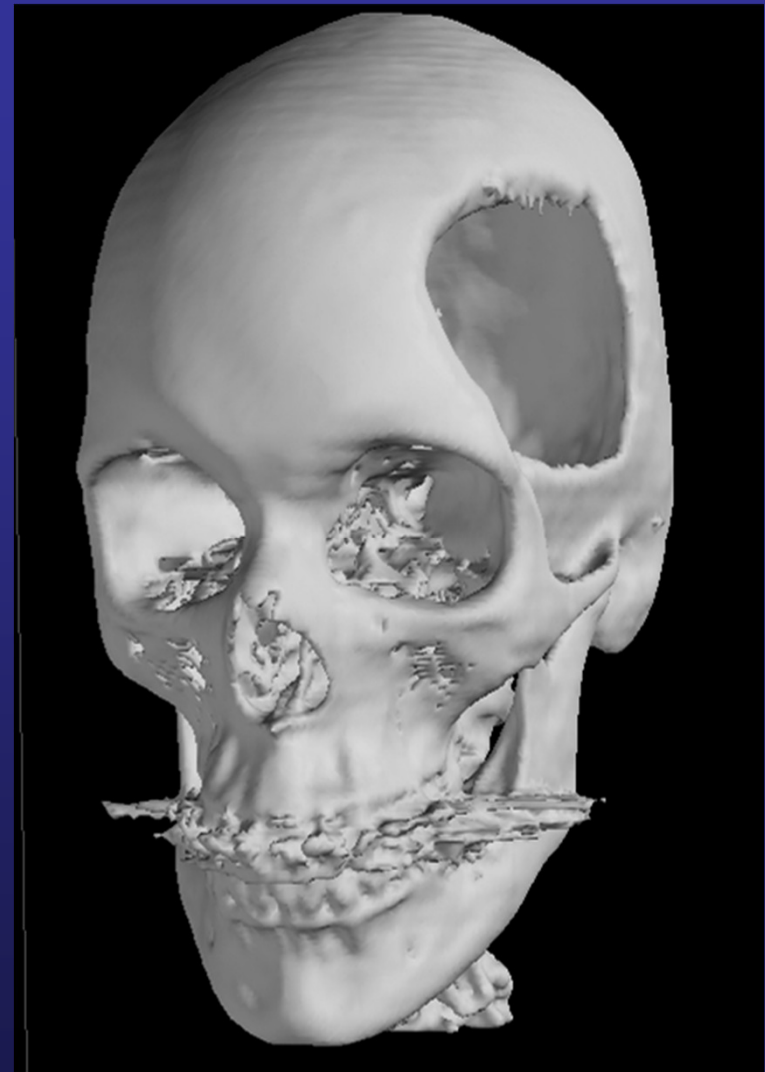
- 
1. MEDICAL REVERSE ENGINEERING (SCANNING)
 2. COMPUTER AIDED DESIGN (CAD)
 3. COMPUTER AIDED MANUFACTURING (CAM)



MIMICS



CRANIAL DEFECTS



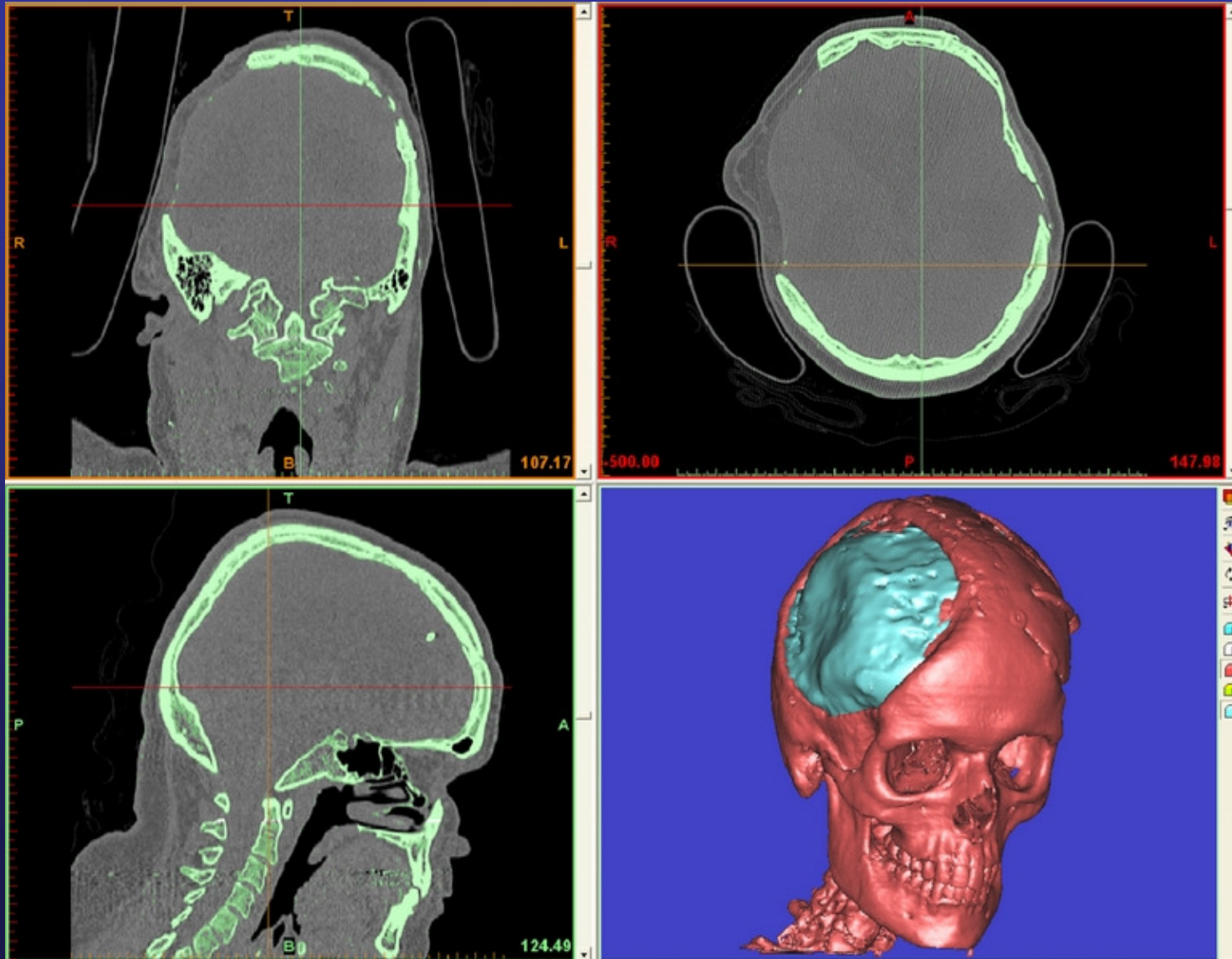


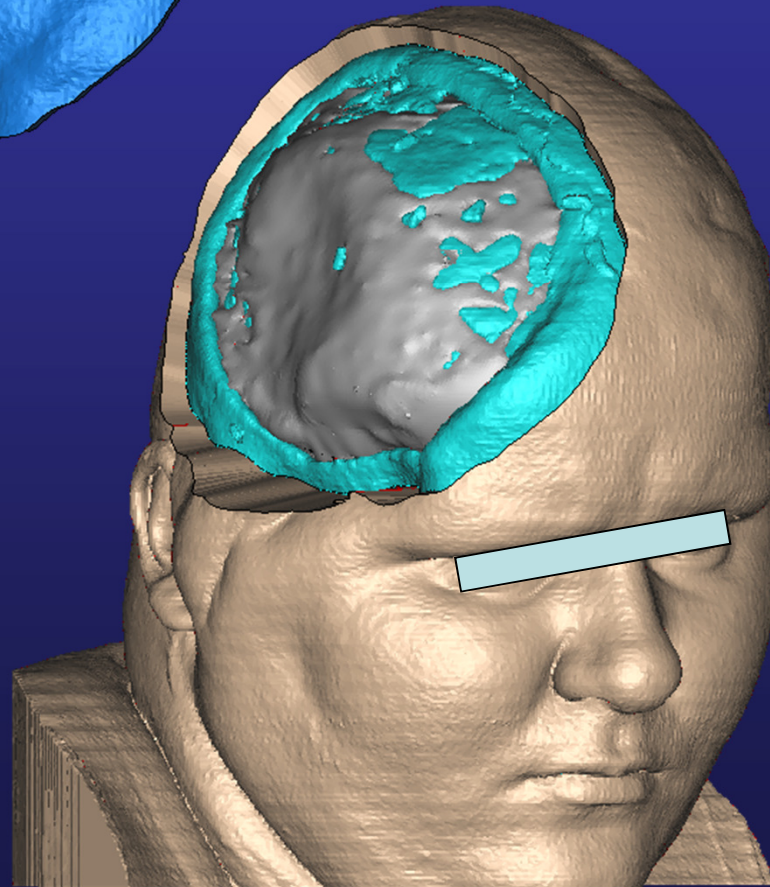
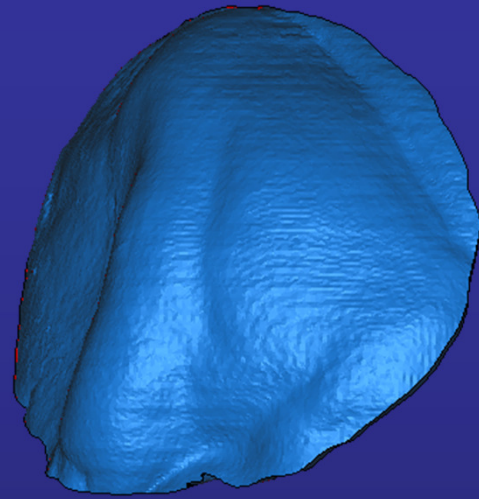
PATIENT

Young girl

- **Car accident with large skull defect**
- **Reconstruction with titanium implant**
(electron beam melting)

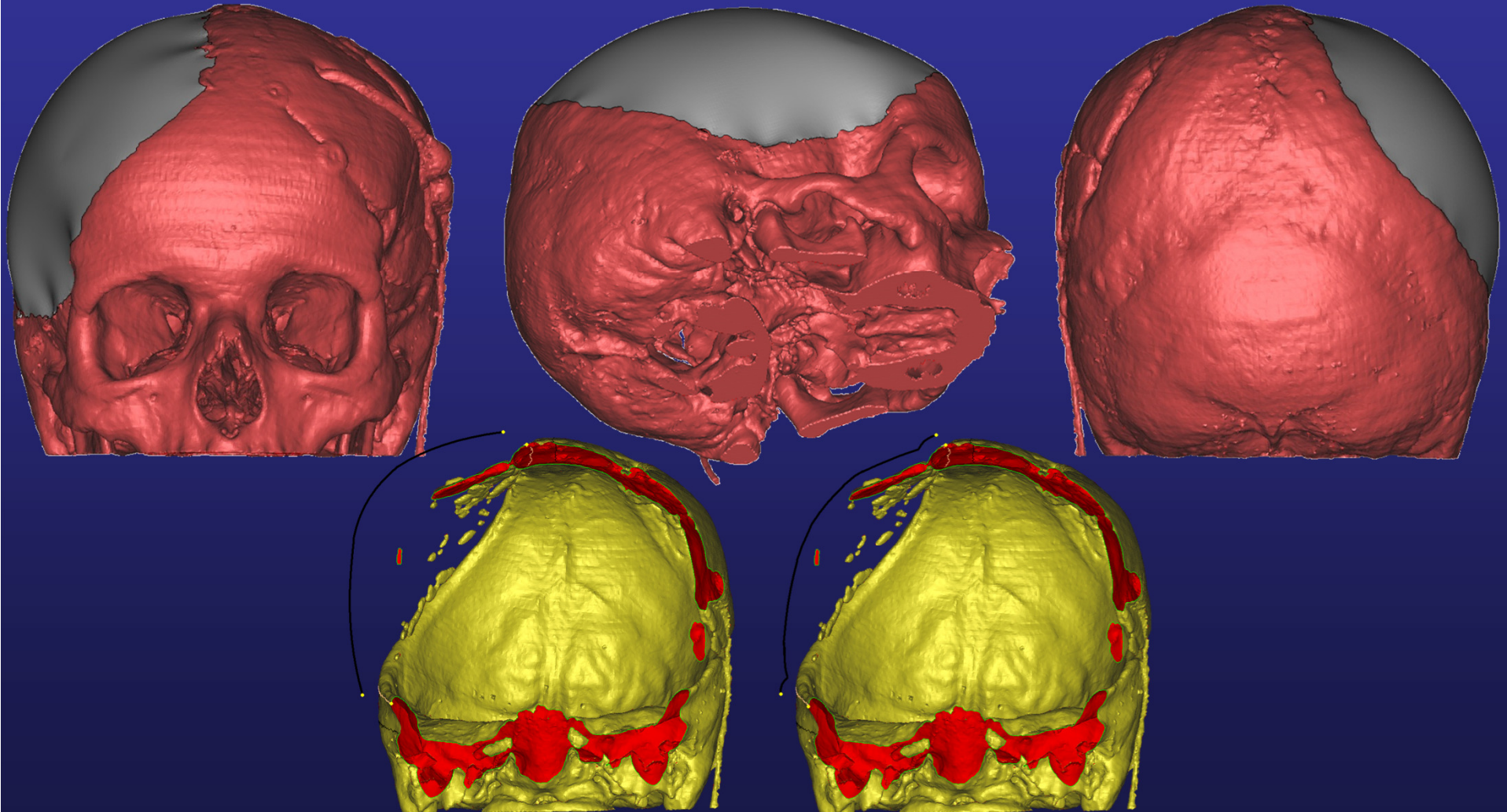
3-matic



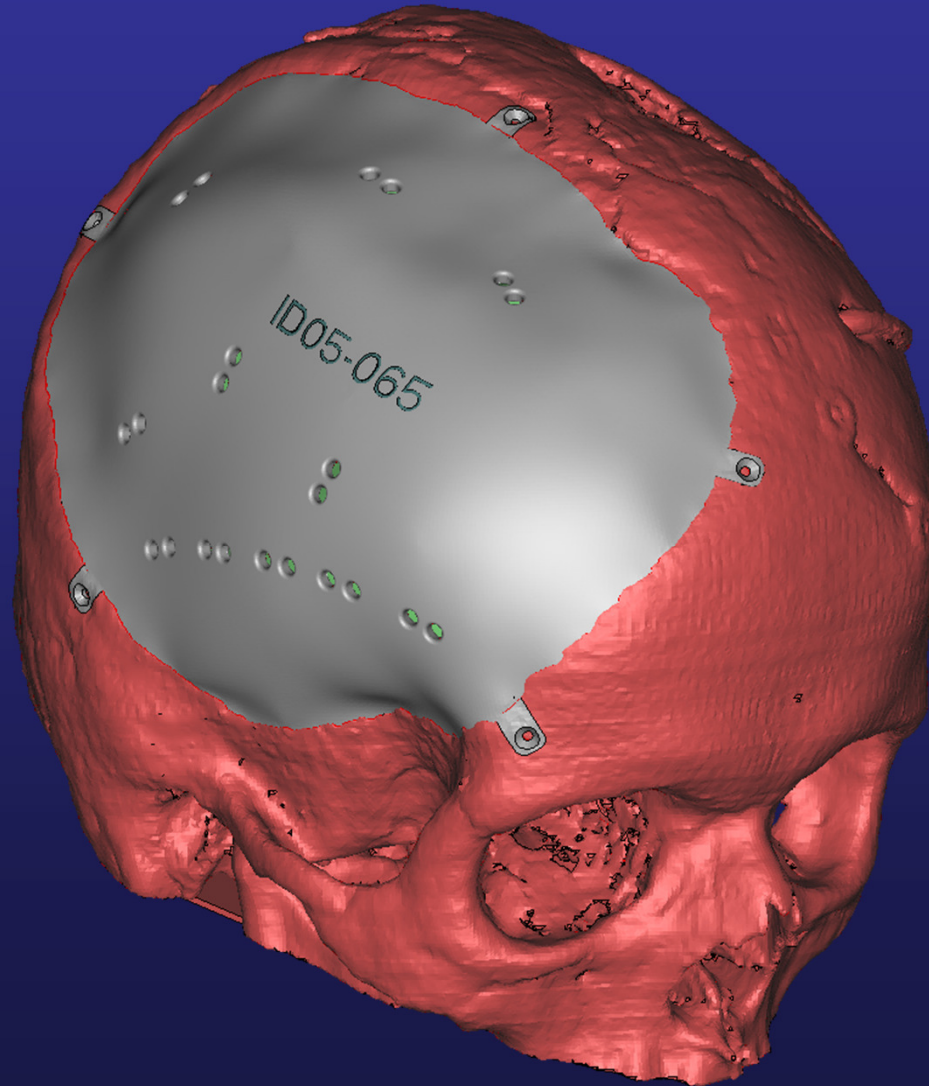




DESIGN

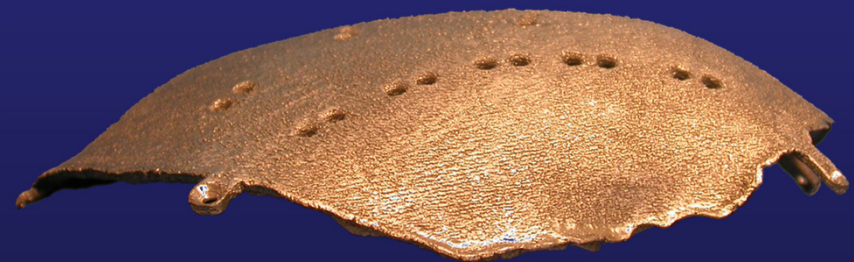
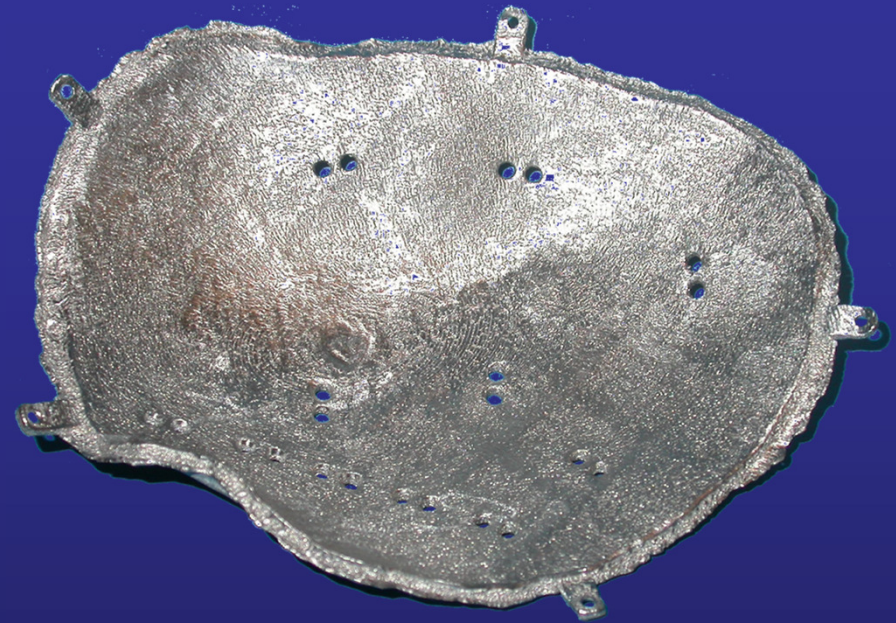
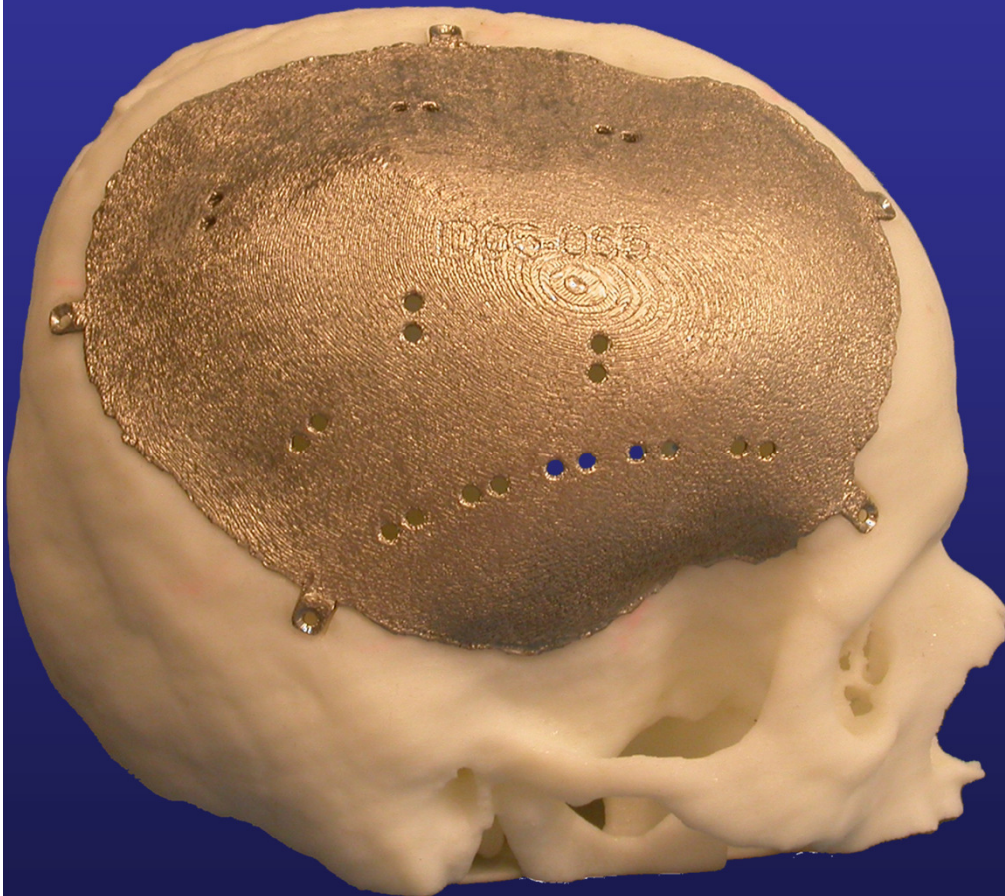


Final design



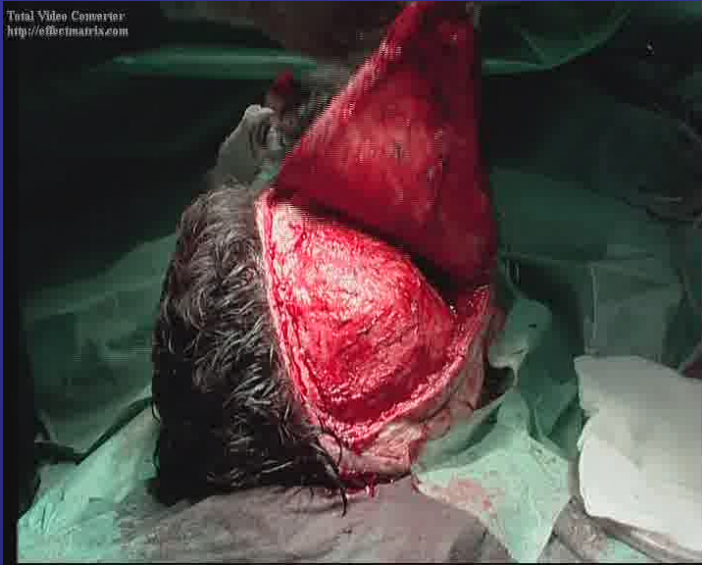
Implant

Ti6Al4V

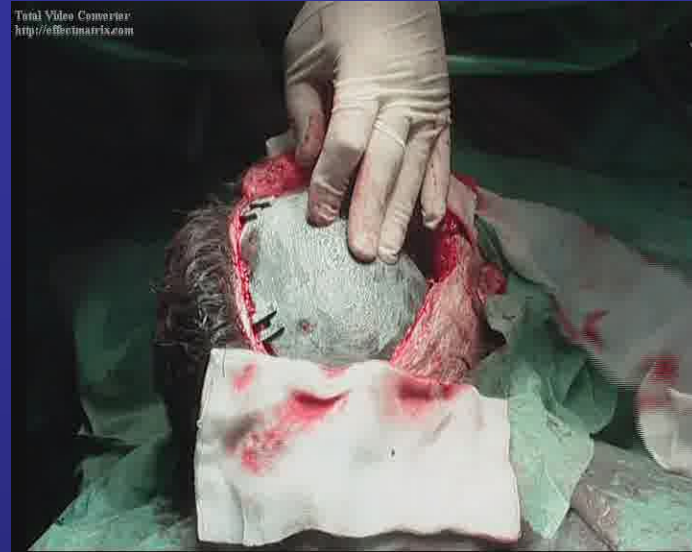


ELECTRON BEAM MELTED
(EBM) (ARCAM)

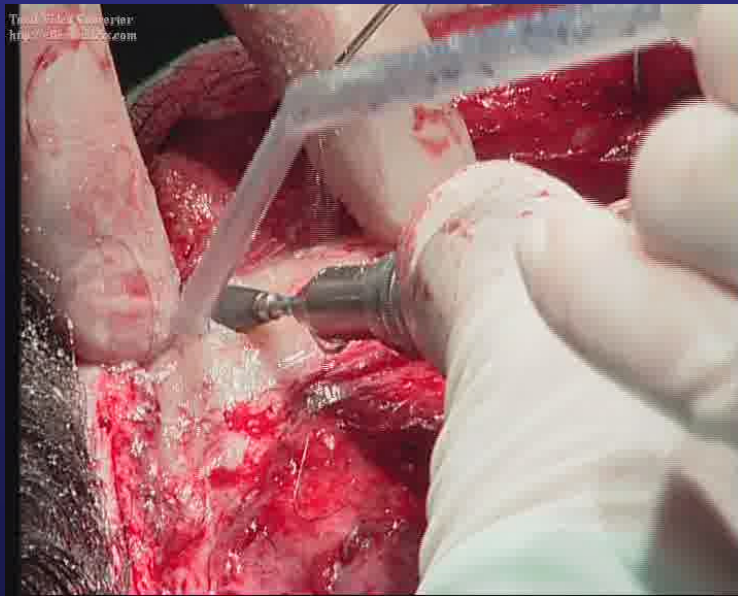
Total Video Converter
<http://effectmatrix.com>



Total Video Converter
<http://effectmatrix.com>



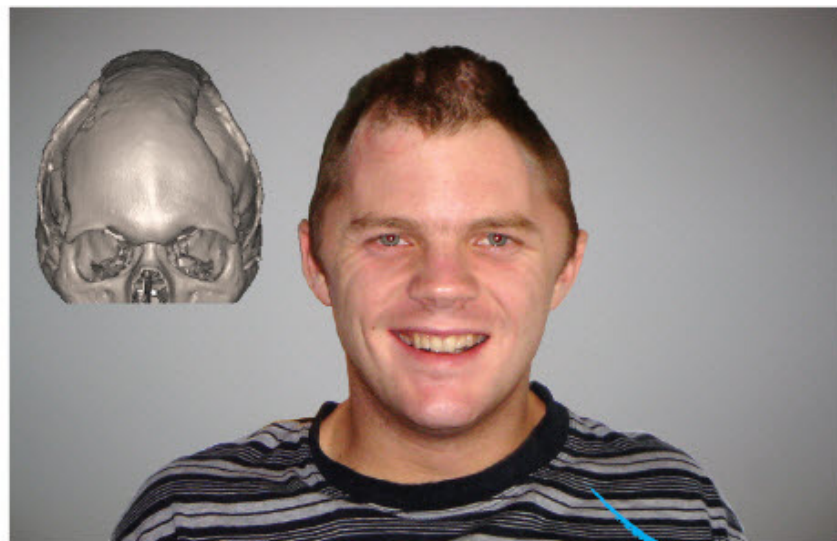
Total Video Converter
<http://effectmatrix.com>



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CLINICAL RESULT



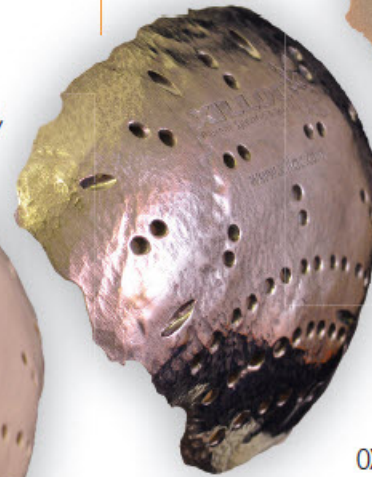
COOPERATION ENGINEER + SURGEON



Variety of materials to reconstruct defects

Using selective laser melting to build patient-specific implants from Ti6Al4V ELI creates the possibility of adding porosity throughout the material with unlimited shape complexity.

This titanium alloy is commonly used in medical applications due to its strength, low weight and excellent biocompatibility.

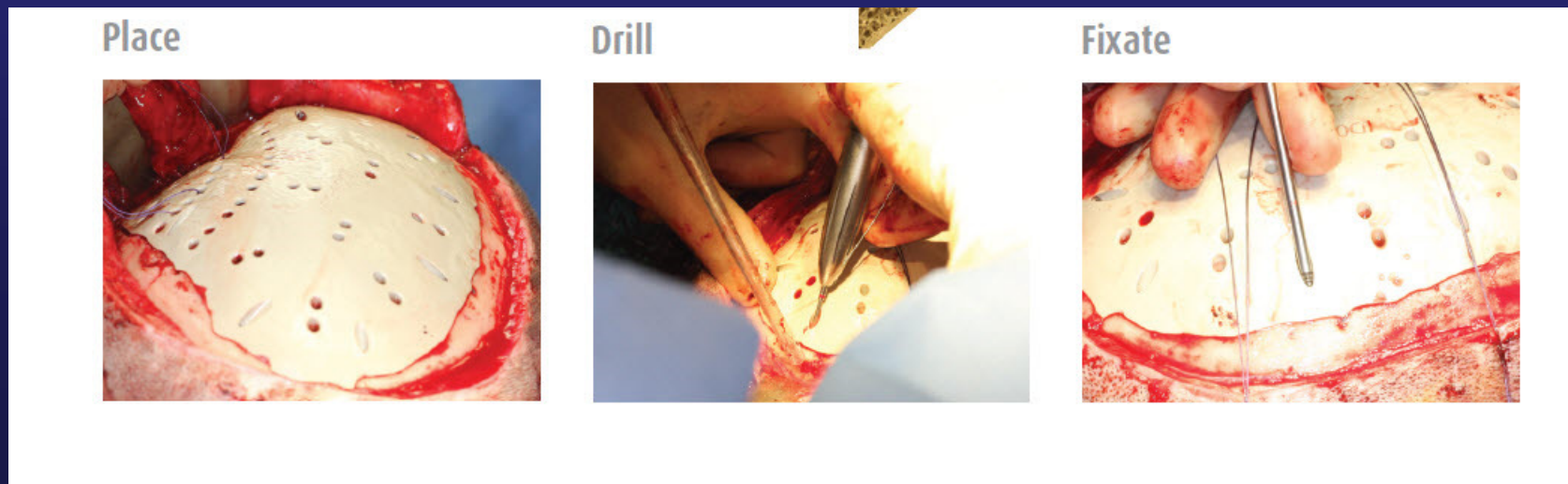
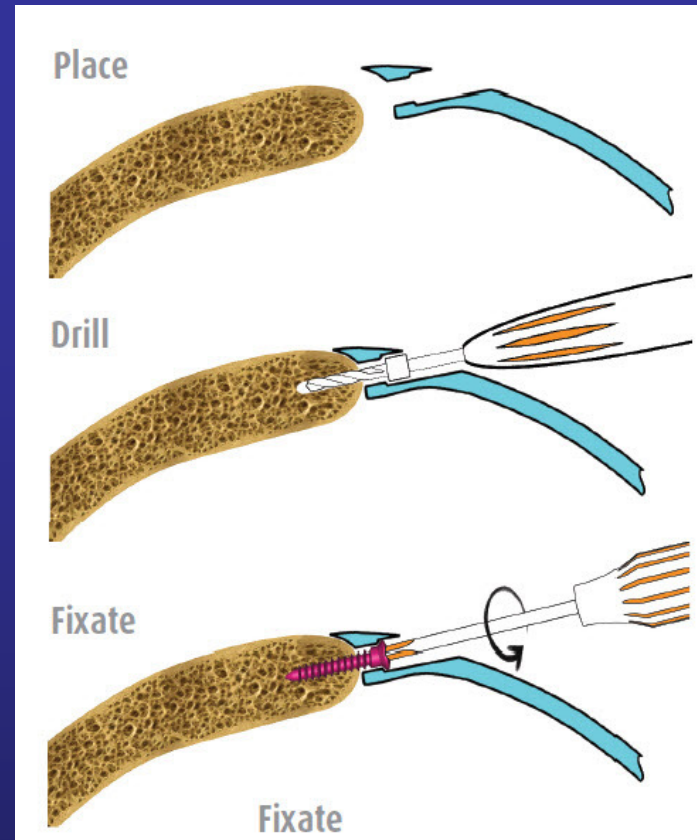


PEEK-OPTIMA® is a versatile polymeric biomaterial with strong and durable characteristics. A superior combination of high strength, stiffness and toughness, together with its proven biocompatibility, make PEEK-OPTIMA ideally suited for patient-specific implants.

OXPEKK OsteoFab™ is available from Q4 of 2011 and utilises an inert biocompatible, synthetic OXPEKK®-IG polymer which has a long history of safe implantation.

NEW DEVELOPMENTS

INTERFIX[®] EASY FIXATION TANGENTIAL SCREW FIXATION



MANDIBULAR CASE

- **WOMEN 83 y.**
- **Med. Hist. : Osteoporosis**
- **Problem : large chronic wound /ulcer chin area**
- **Diagnosis**
 - **extensive bone destruction**
 - **fast progressive osteomyelitis**

Case



Foto 1
08-03-2011 21:09

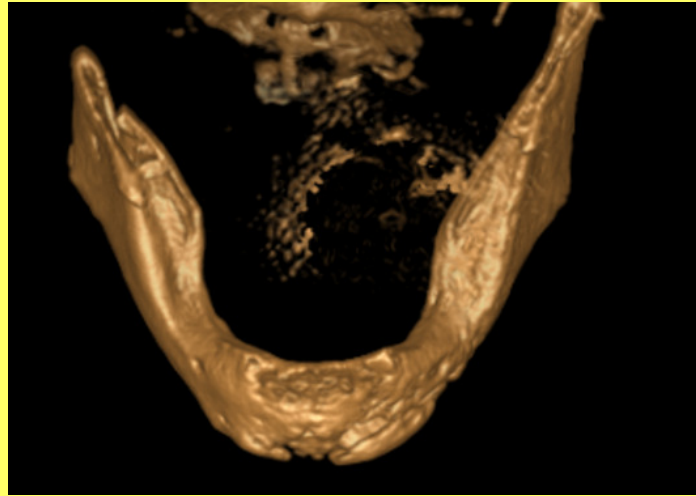


Foto 2
08-03-2011 21:09

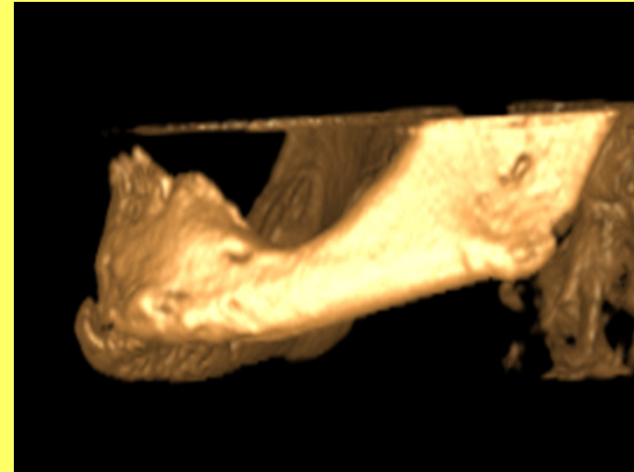




PRE-OP X-RAY



CT-SCAN



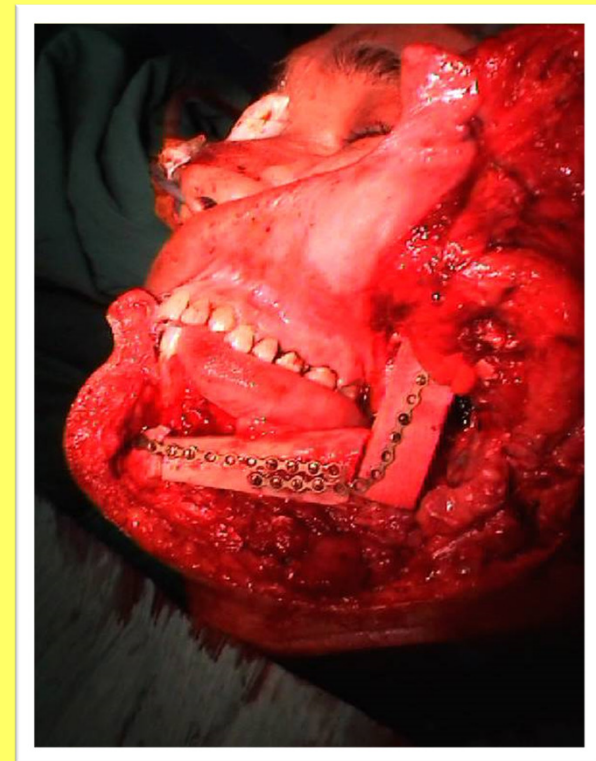
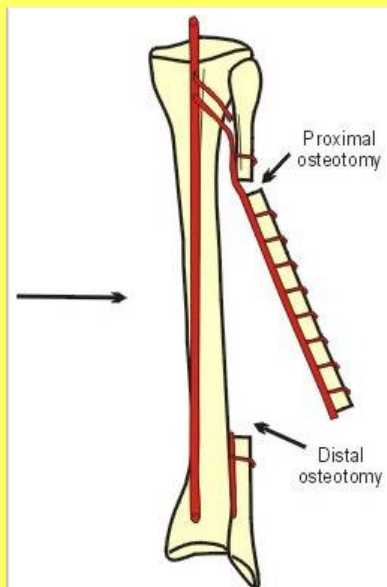
NUCLEAR SCAN





CURRENT STANDARD CLINICAL PROCEDURE

- Vascularized bone transplants
 - **Fibula**





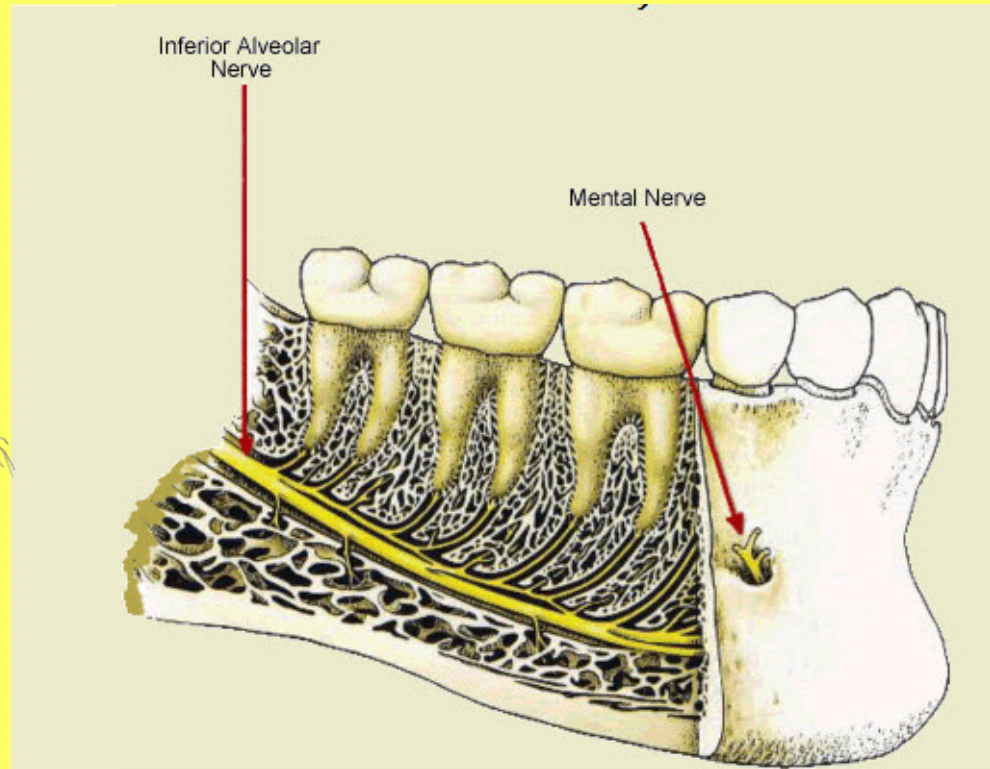
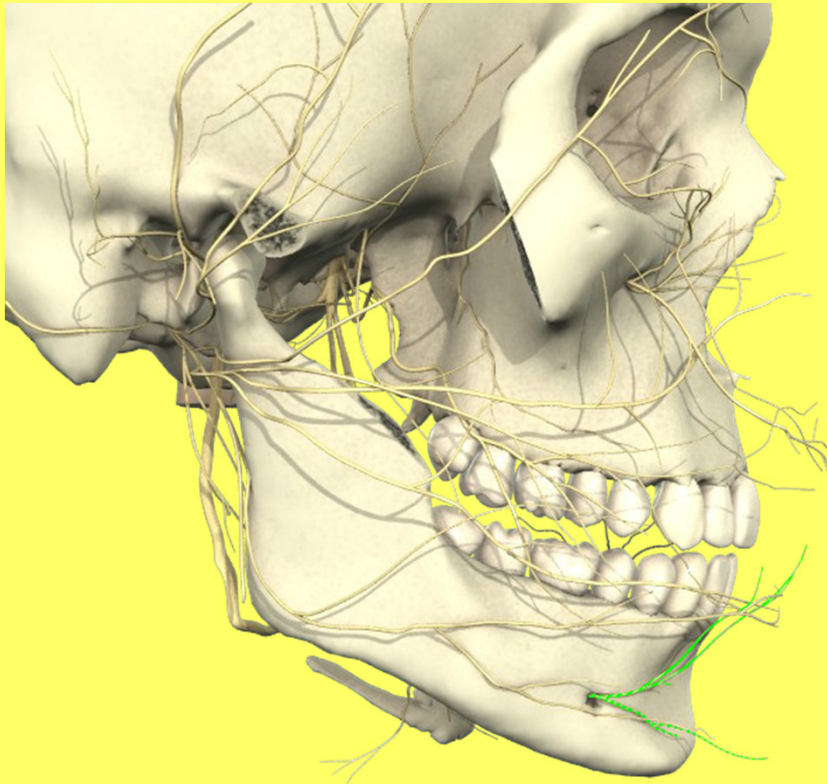
CURRENT STANDARD CLINICAL PROCEDURE

Custom bended reconstruction plate with condylar head part

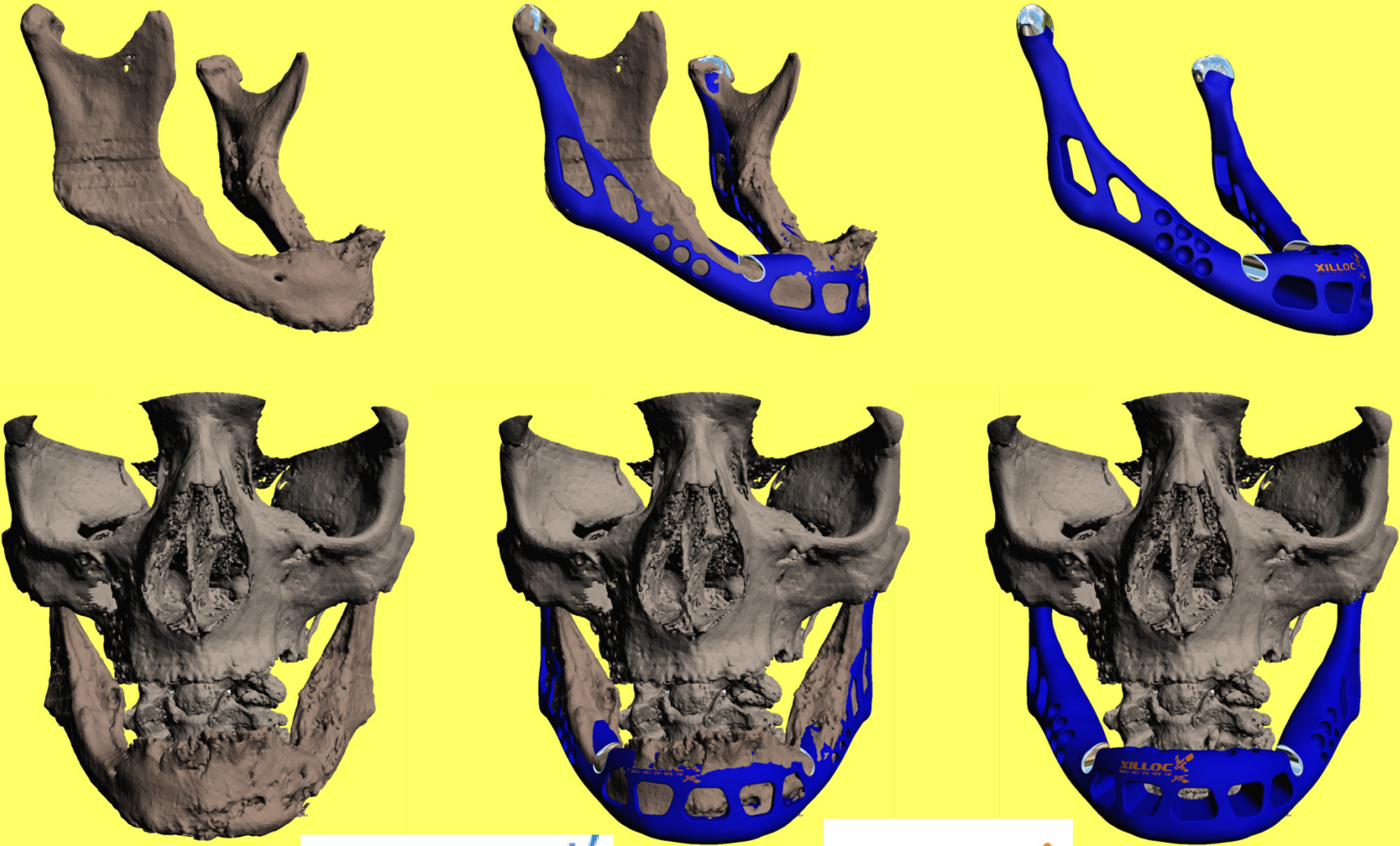




Computer Aided Design (CAD)



Computer Aided Design (CAD)



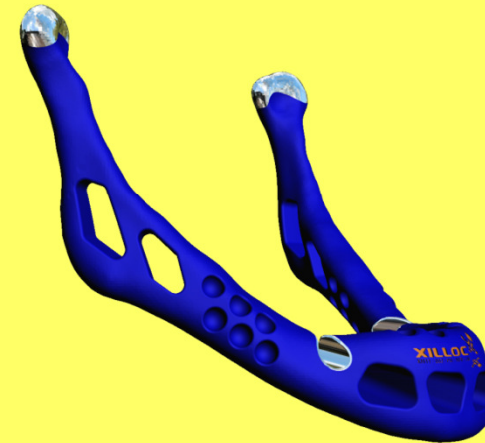
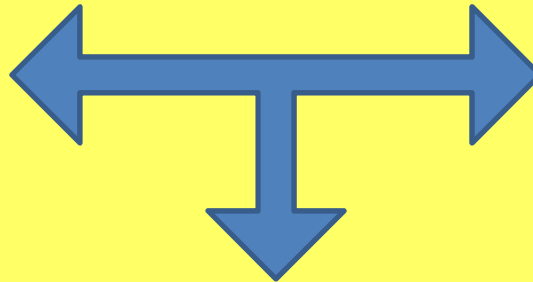
RENDERED FINAL DESIGN



Computer Aided Manufacturing (CAM)



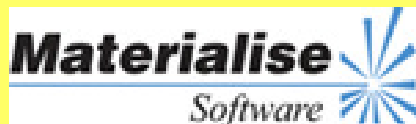
*Raw material :
titanium powder*



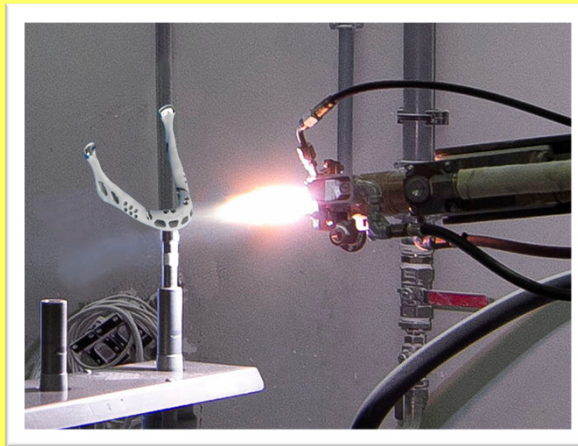
3D CAD design



*SLM
Selective Laser
Melting*



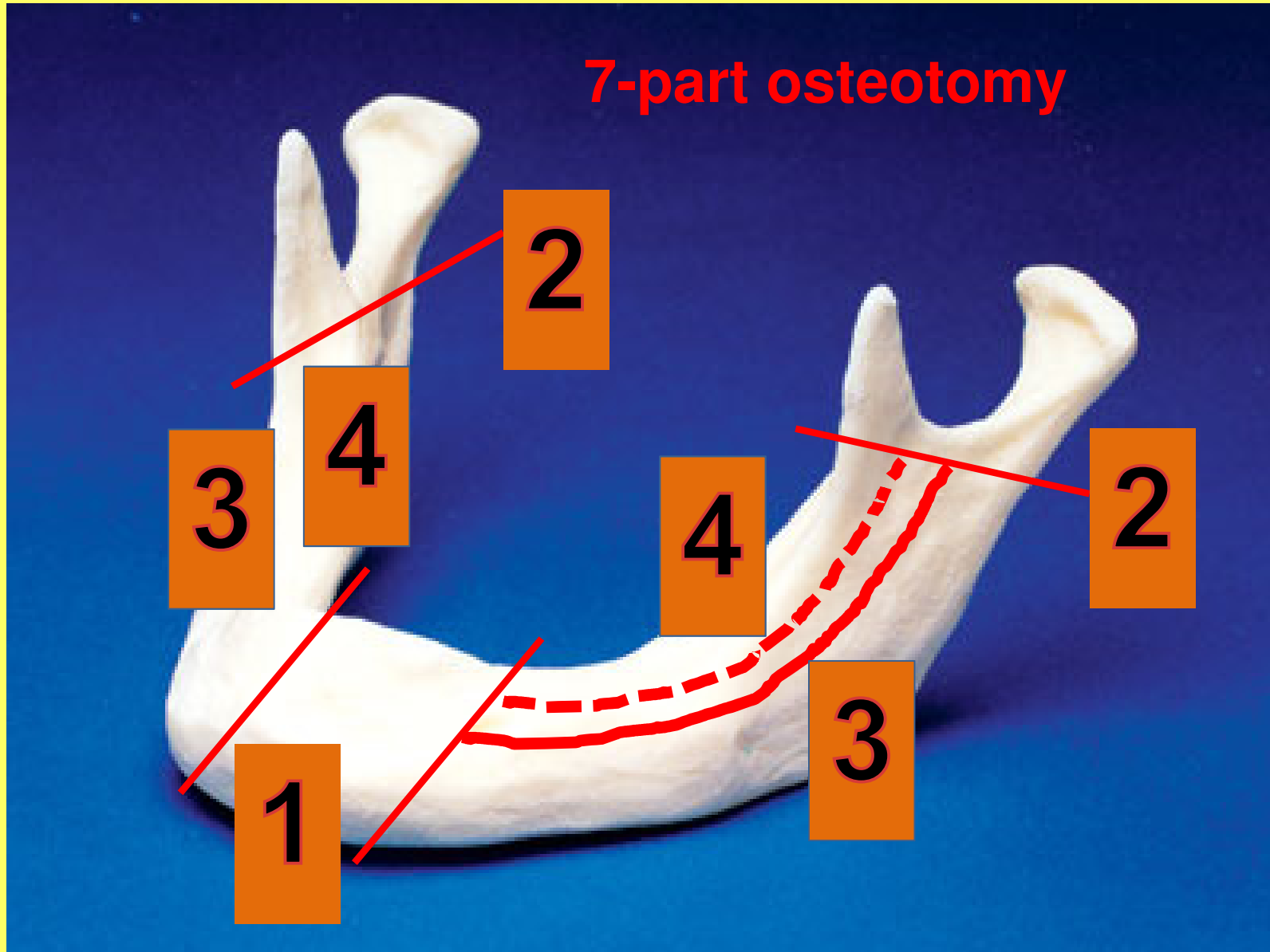
PLASMA COATED HYDROXY-APATITE



cambioceramics



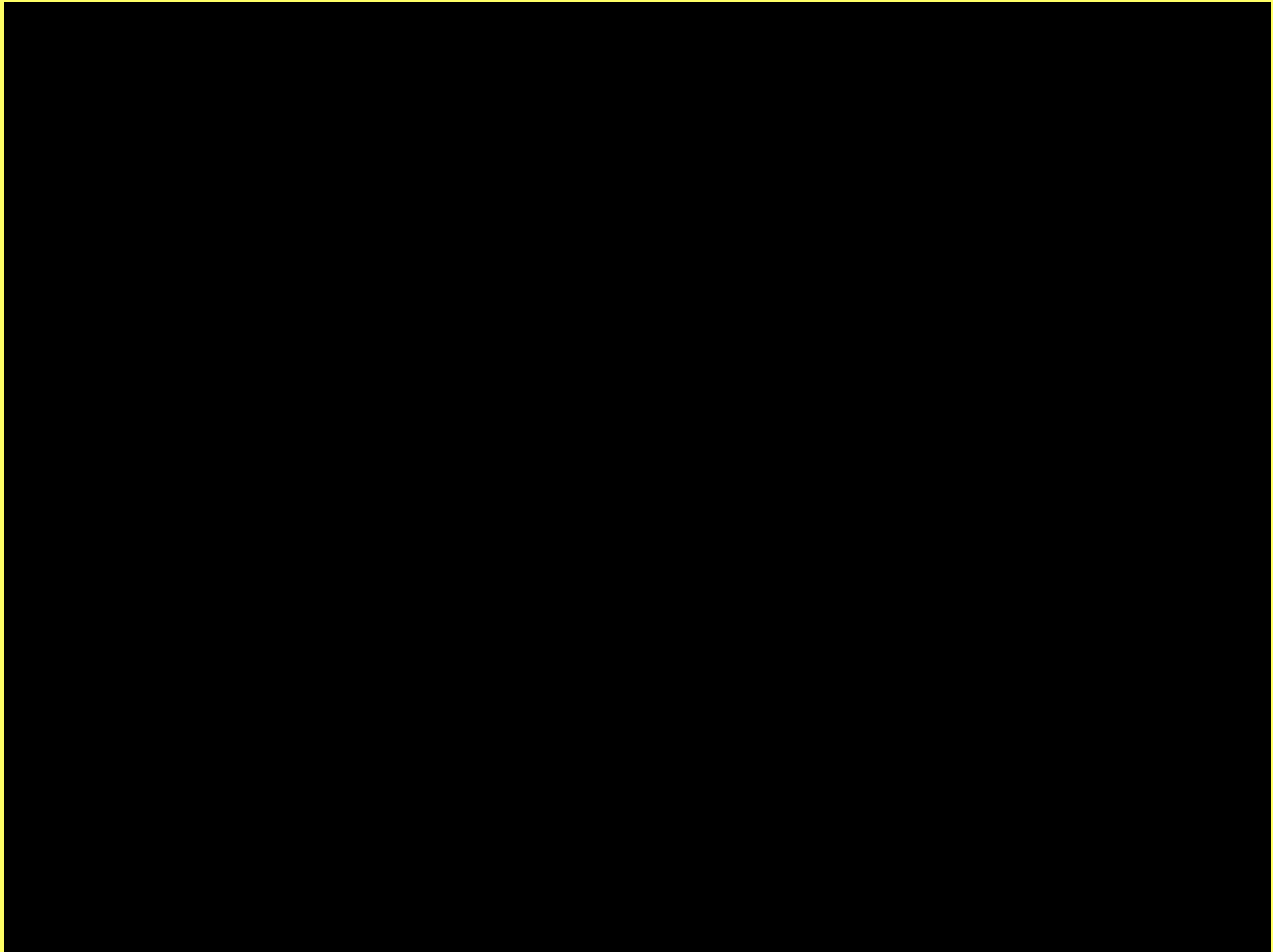
7-part osteotomy



OPERATION VIDEO

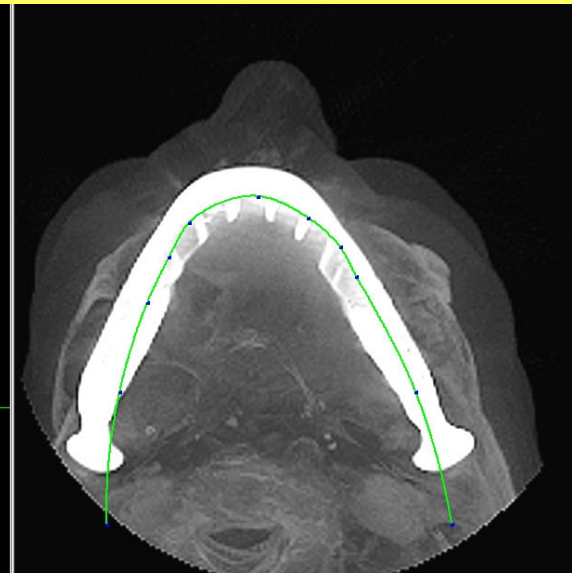
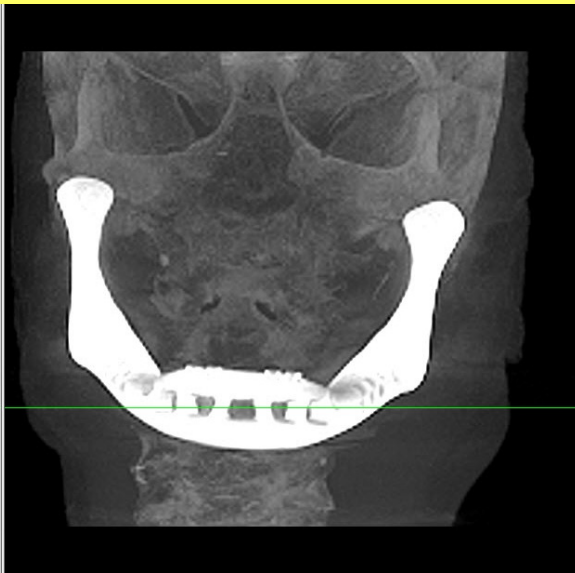
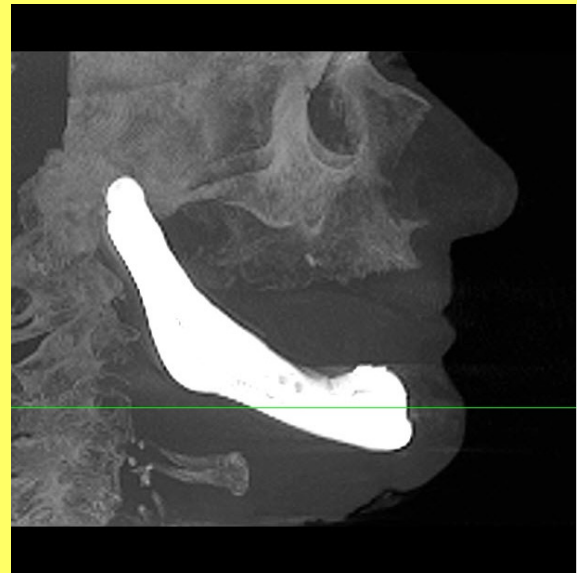
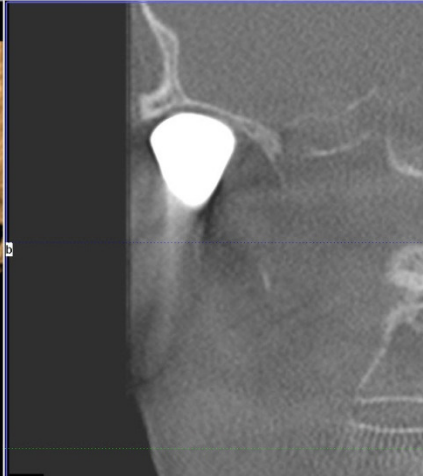
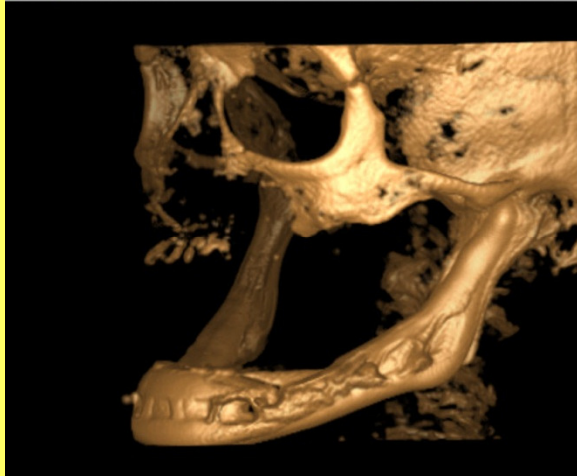
- **NOW FOLLOWS OPERATION VIDEO**
- **NOT SUITED FOR SENSITIVE VIEWERS !**

OPERATION VIDEO MANDIBULAR IMPLANT

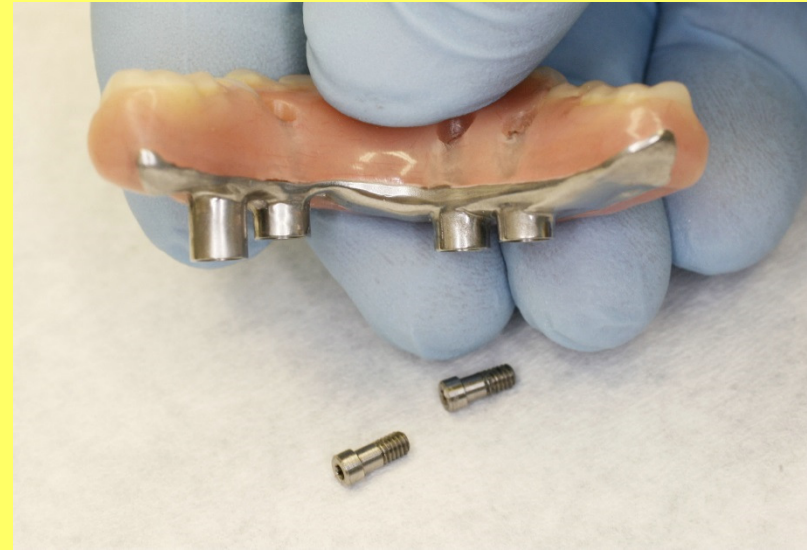
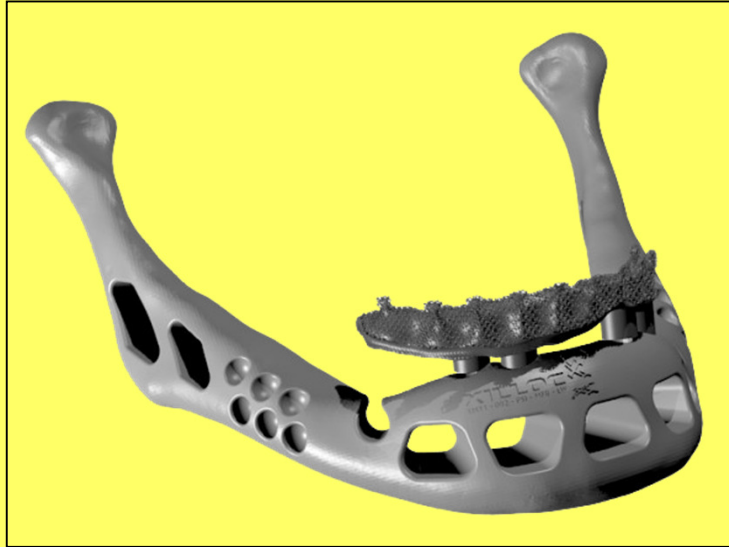




POSTOP X-RAY



POSTOP





CONCLUSION

CUSTOM AND PATIENT SPECIFIC IMPLANTS MANUFACTURED BY 3D PRINTING AND ADDITIVE MANUFACTURING WILL BECOME STATE OF THE ART IN CUSTOM IMPLANT TREATMENT IN NEAR FUTURE.



THANKS FOR YOUR ATTENTION !

