THE PURPLE SPARK

3D PRINTING CASE FILE

[redacted]

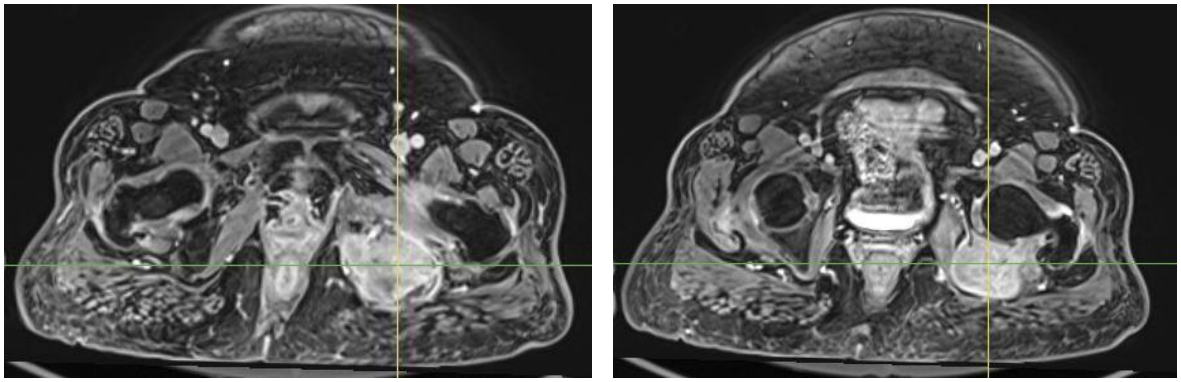
AGE & GENDER – 57 YEARS, FEMALE

CASE ID – 2204008

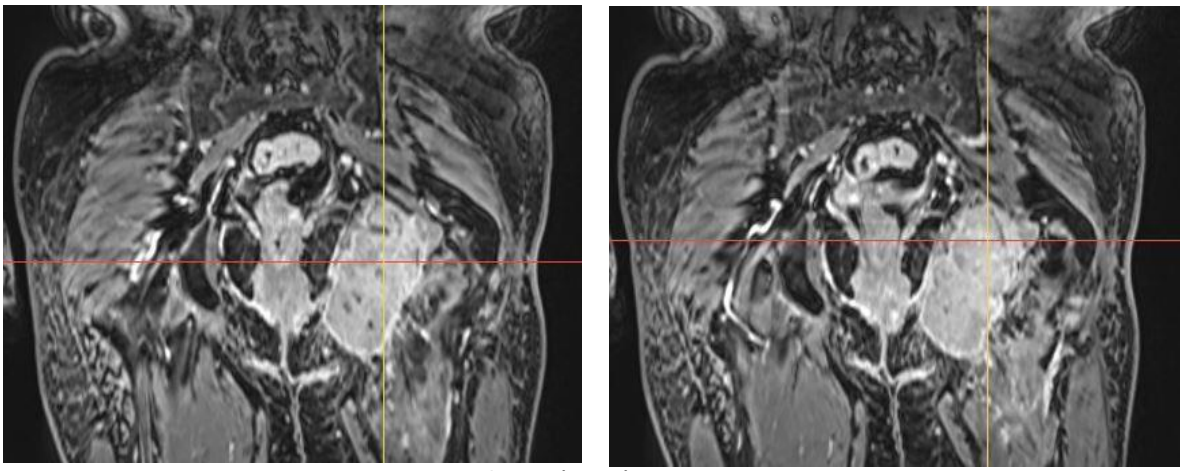
DIAGNOSIS – METASTASIS TO RIGHT PELVIS, UNKNOWN PRIMARY

DOCTOR – DR. PRAMOD S CHINDER

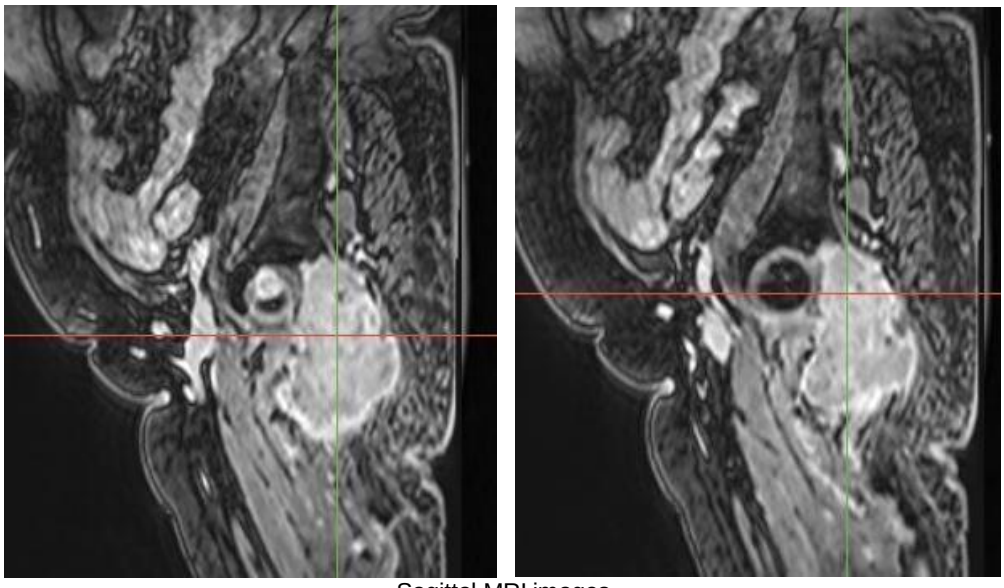
MRI IMAGES



Axial MRI images

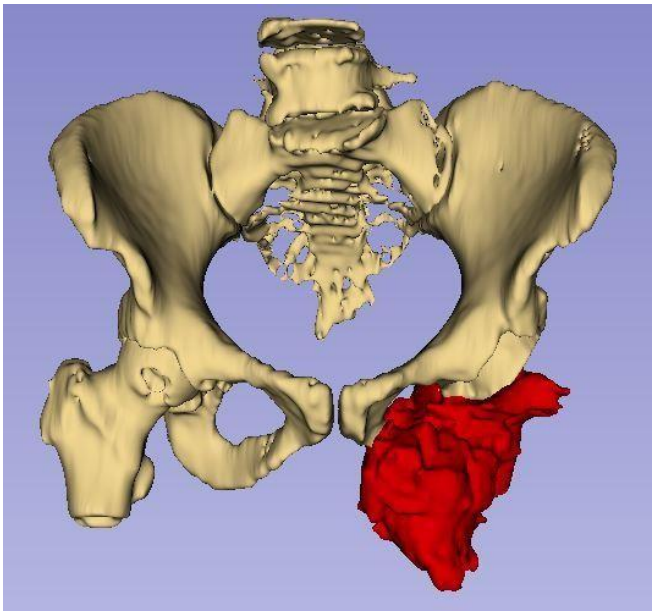


Coronal MRI images

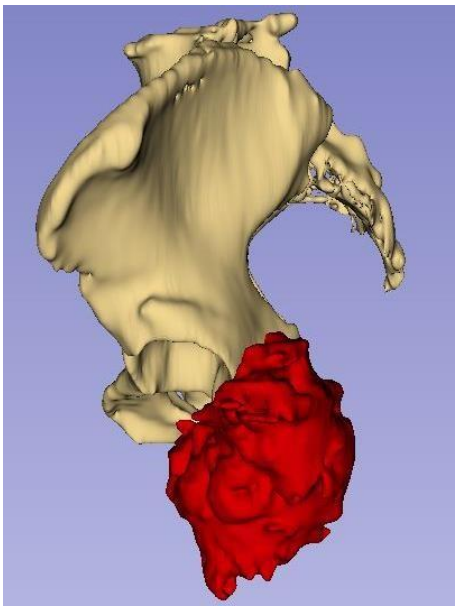


Sagittal MRI images

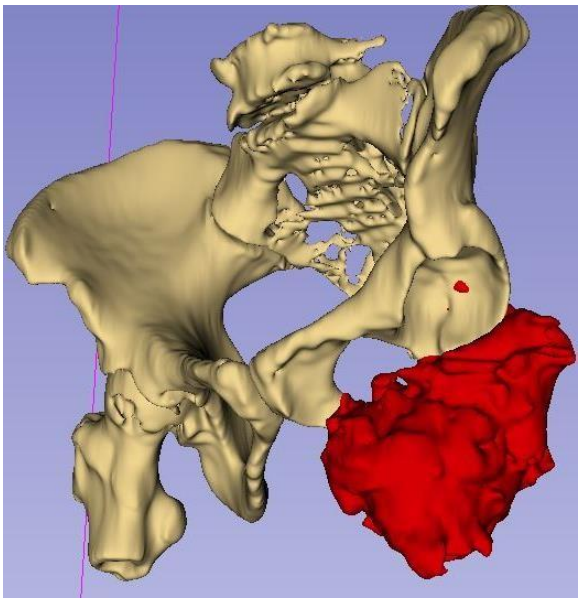
SEGMENTED MODEL



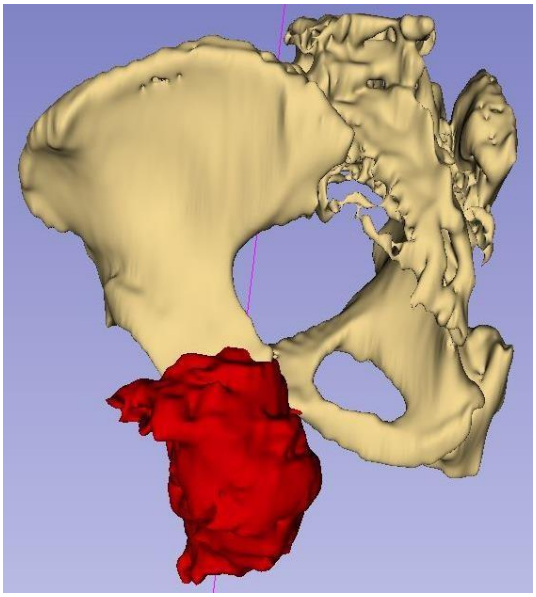
Coronal view



Sagittal view

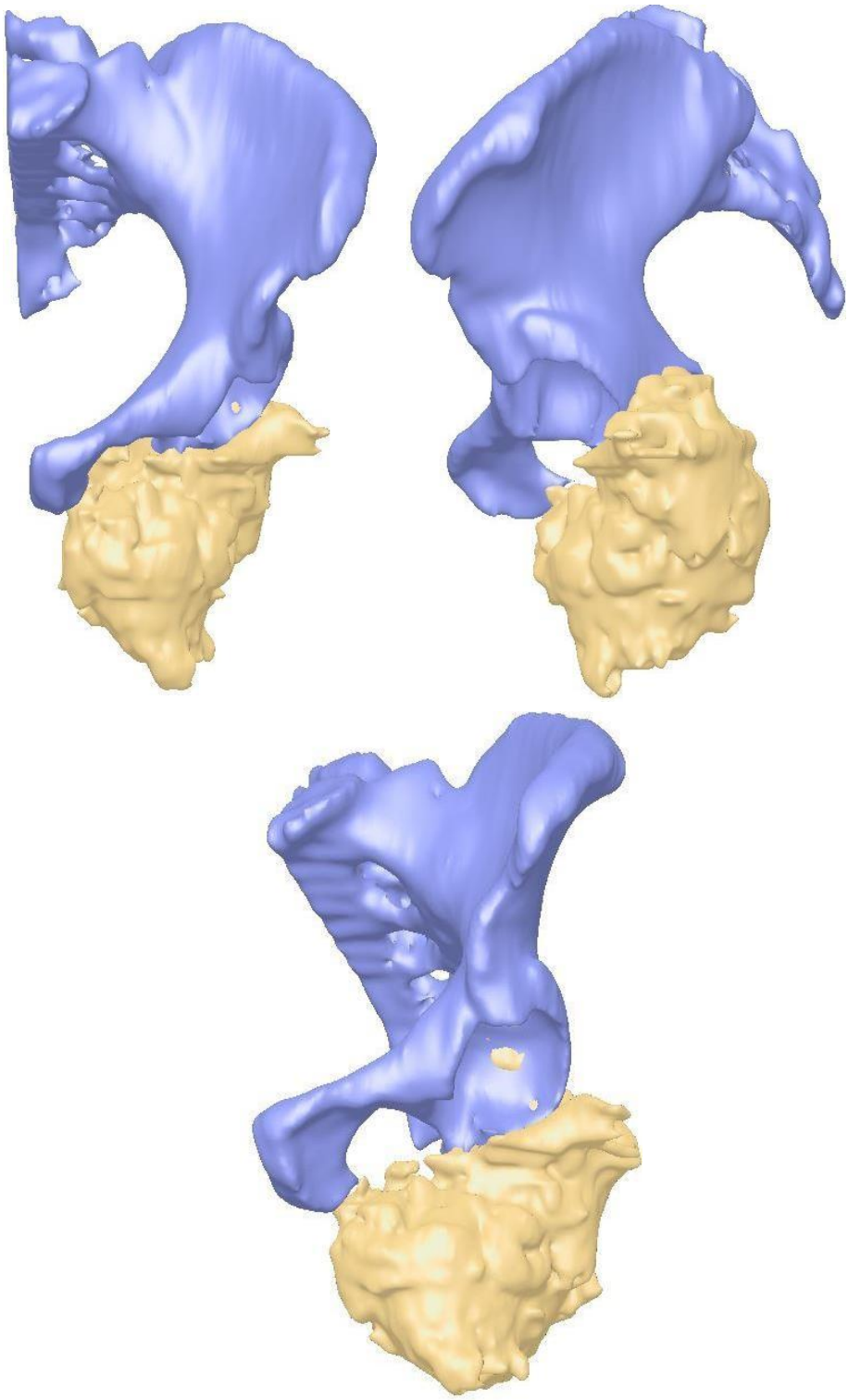


Antero-inferior view (right)



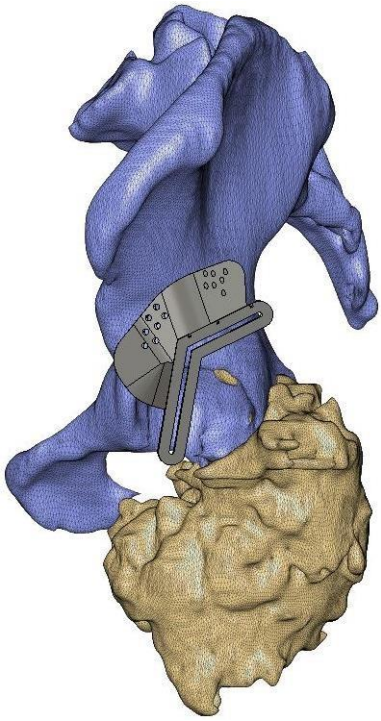
Postero-lateral view

3D MODELS



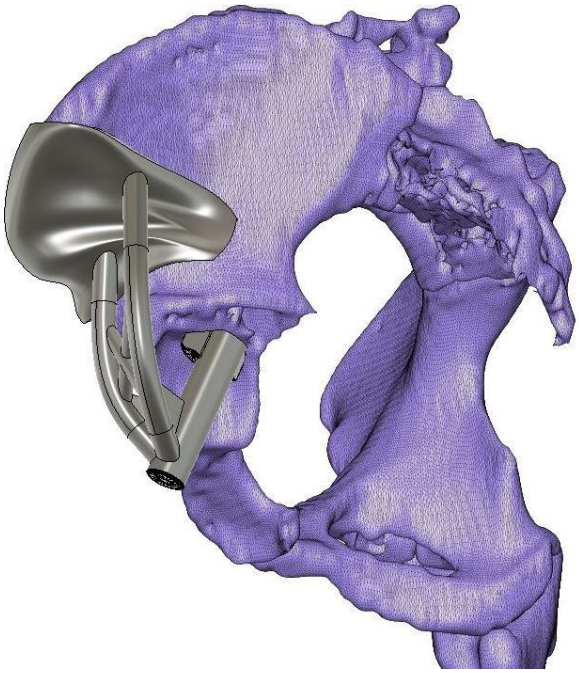
Anatomic model; Blue: Pelvis, & Yellow: Tumor (Coronal, Sagittal, and isometric view)

Posterior jig

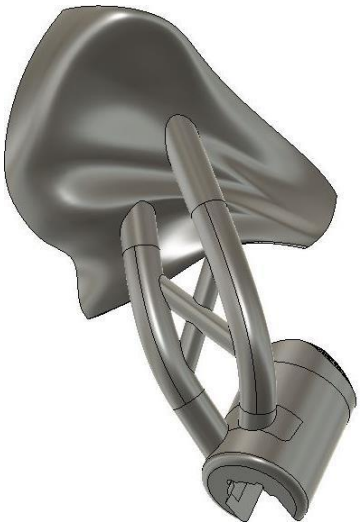


Posterior jig fitment

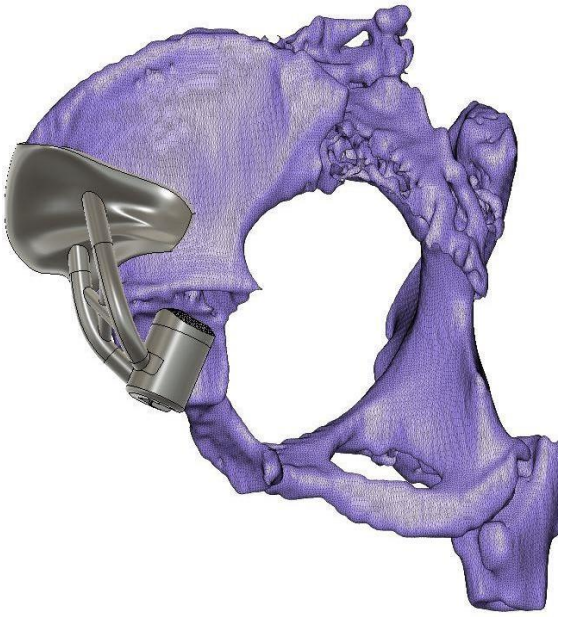
Guide wire jig



Guide wire jig fitment



Orientation jig

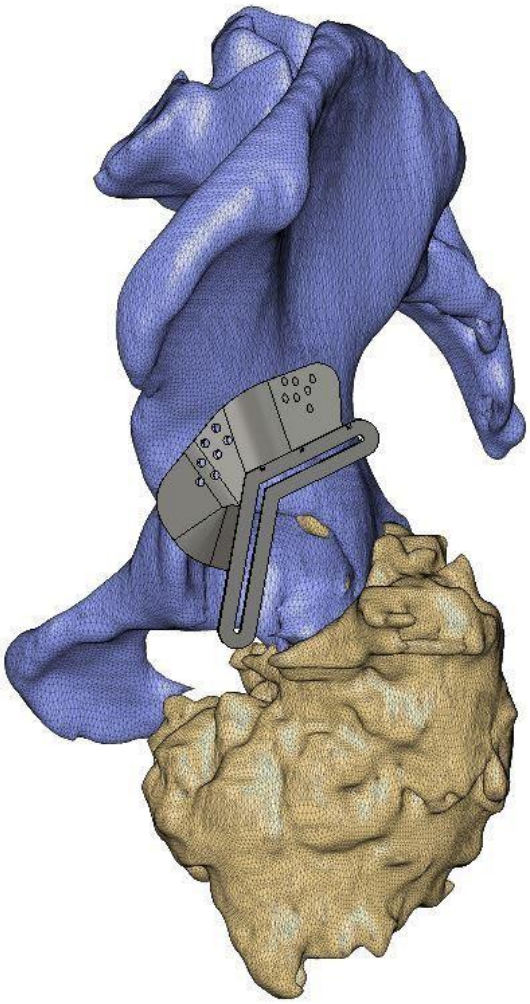


Orientation jig fitment

Acetabular cup implant

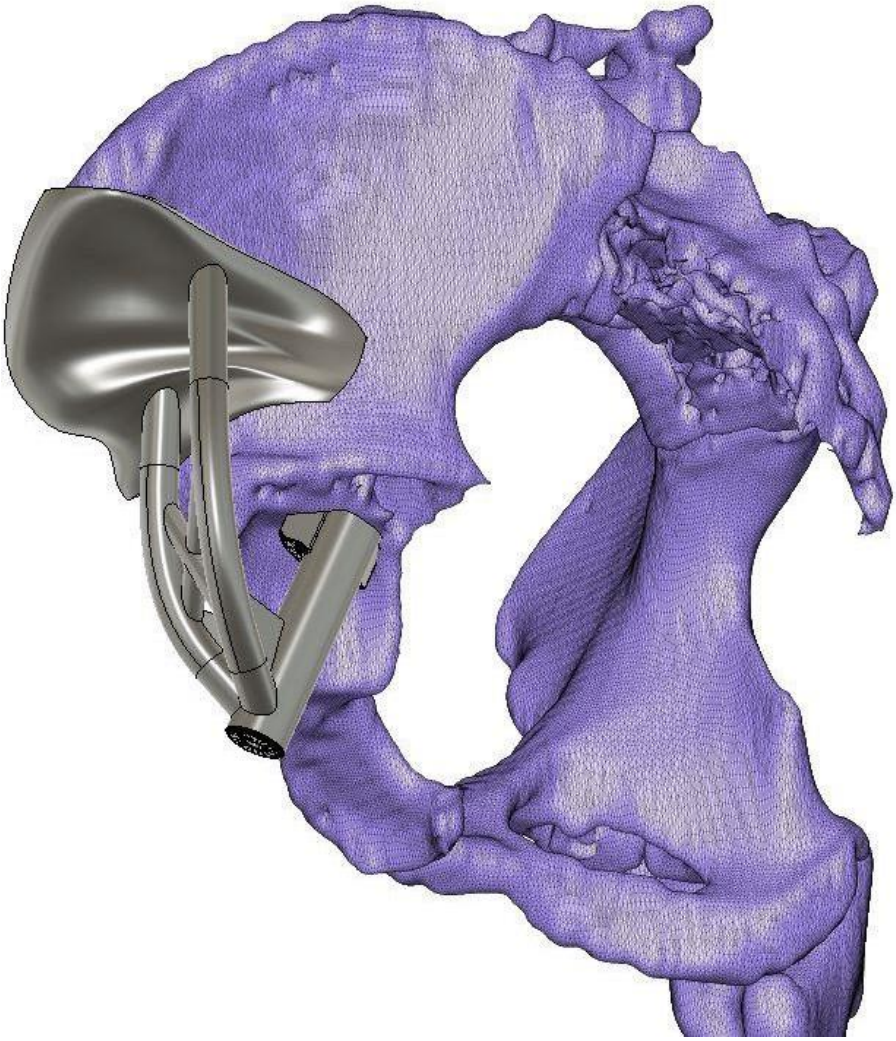
PLAN FLOW

1. TUMOR RESECTION



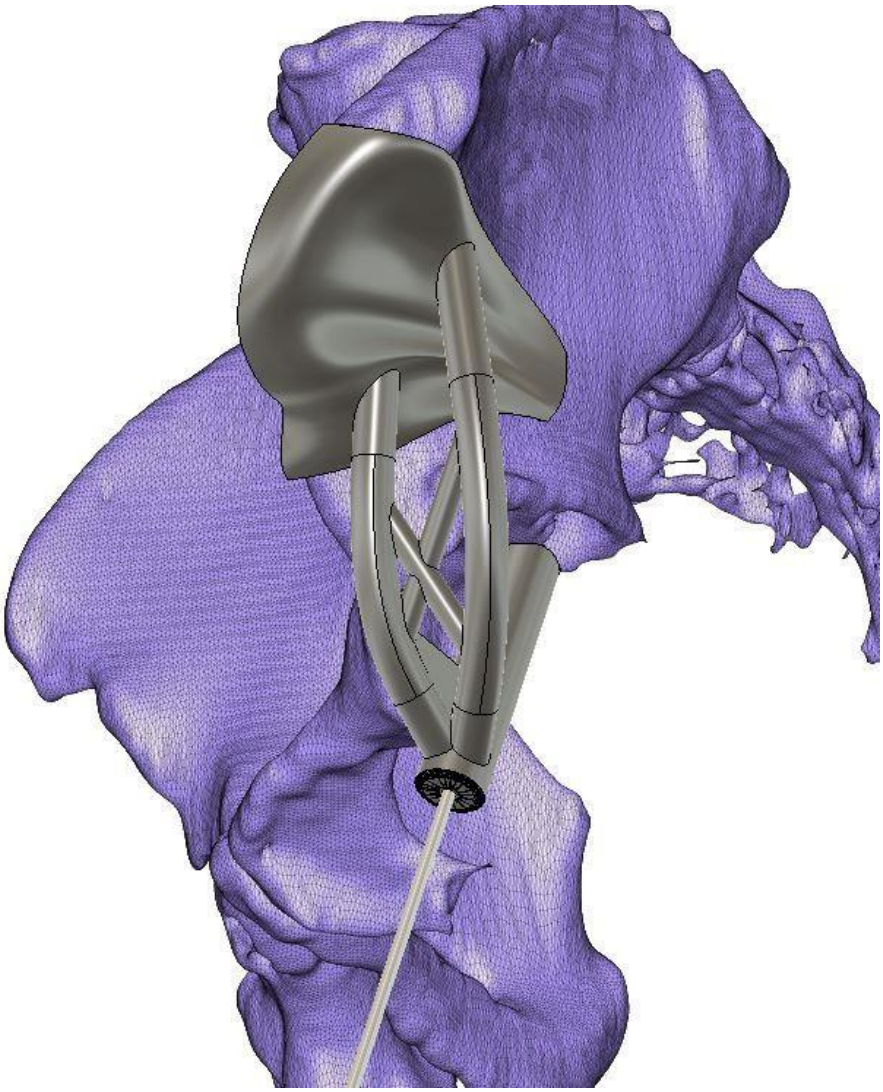
- Cutting depths mentioned on the posterior jig, as **59, 58, 57, 53, 49, 47 mm**, anterior to posterior.
- Bi-planar jig.

2. GUIDE WIRE JIG PLACEMENT



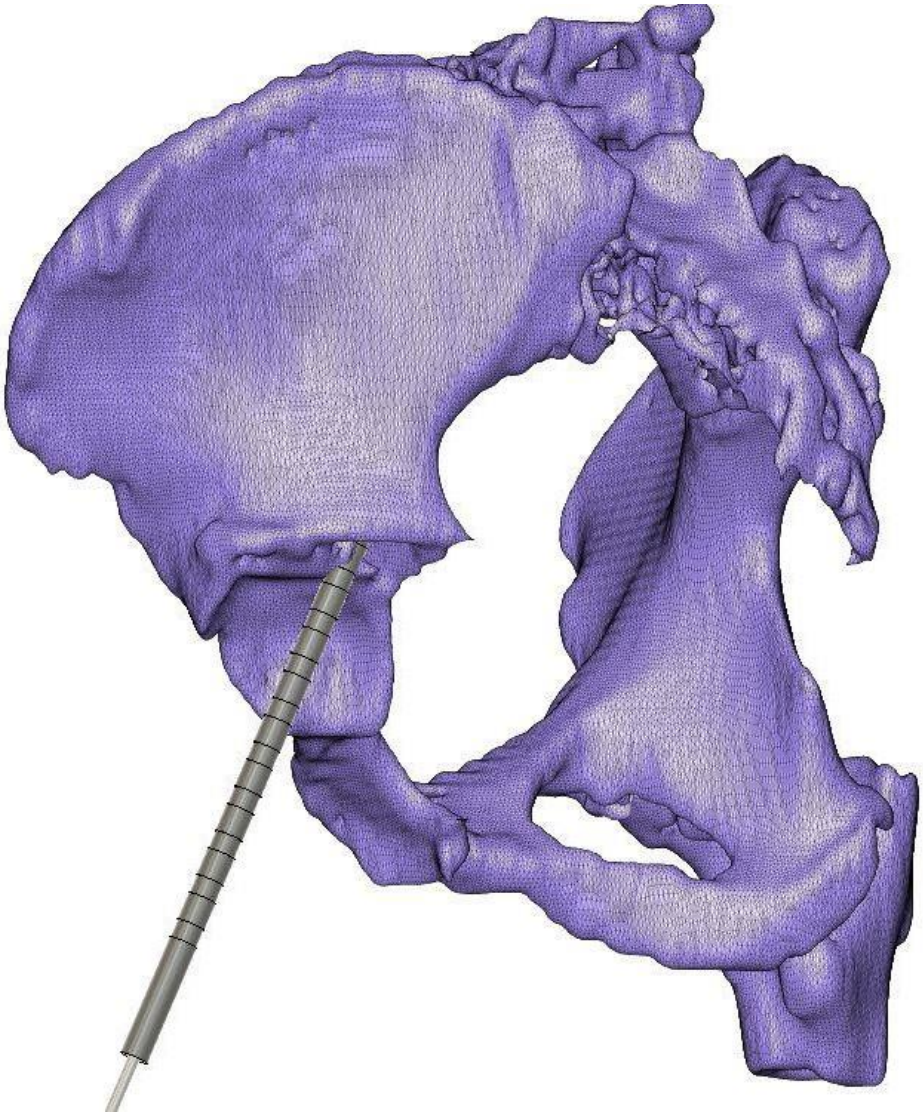
- Guide wire jig made of PLA (FDM).
- Guide tunnel rests on the remaining part of acetabulum.
- Fixation by K-wires.

3. GUIDE WIRE INSERTION



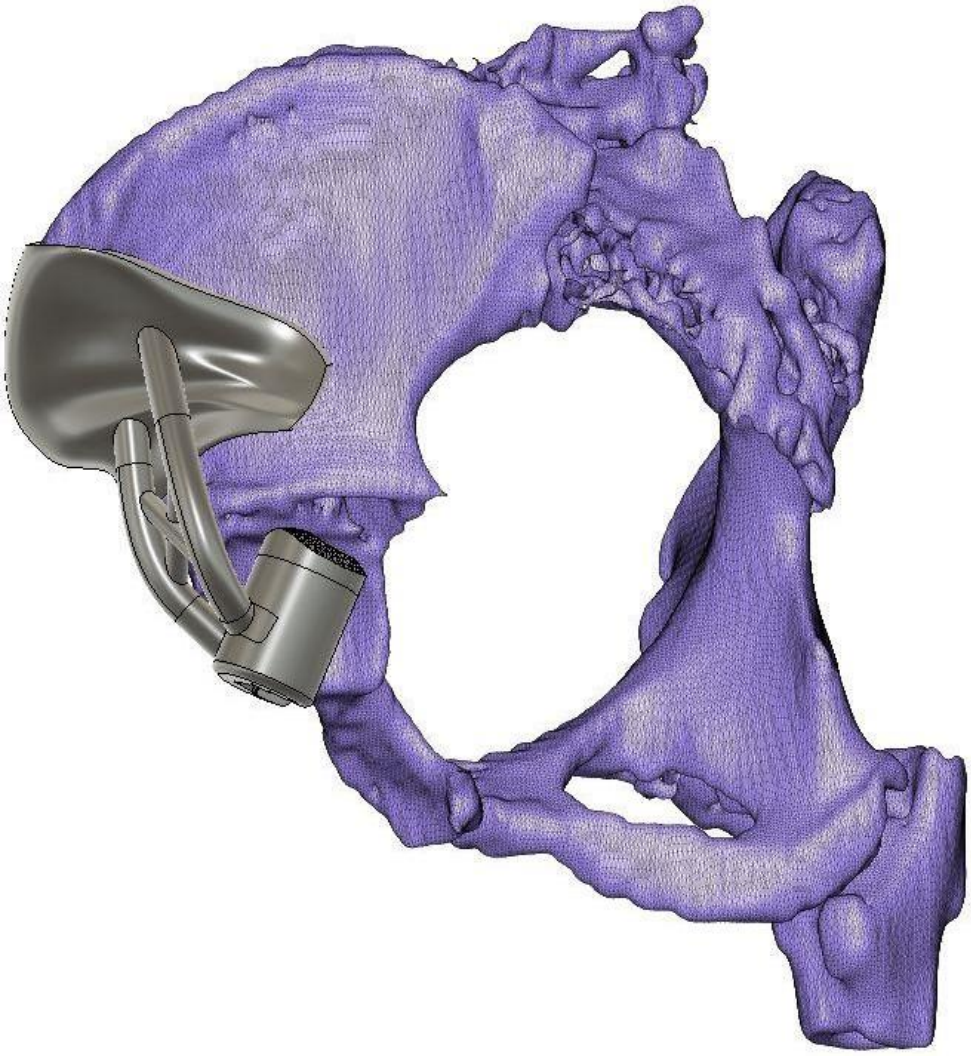
- **2.5 mm** diameter guide wire inserted.
- Insertion depth: **122 mm from the tunnel top**.

4. HOLE REAMING



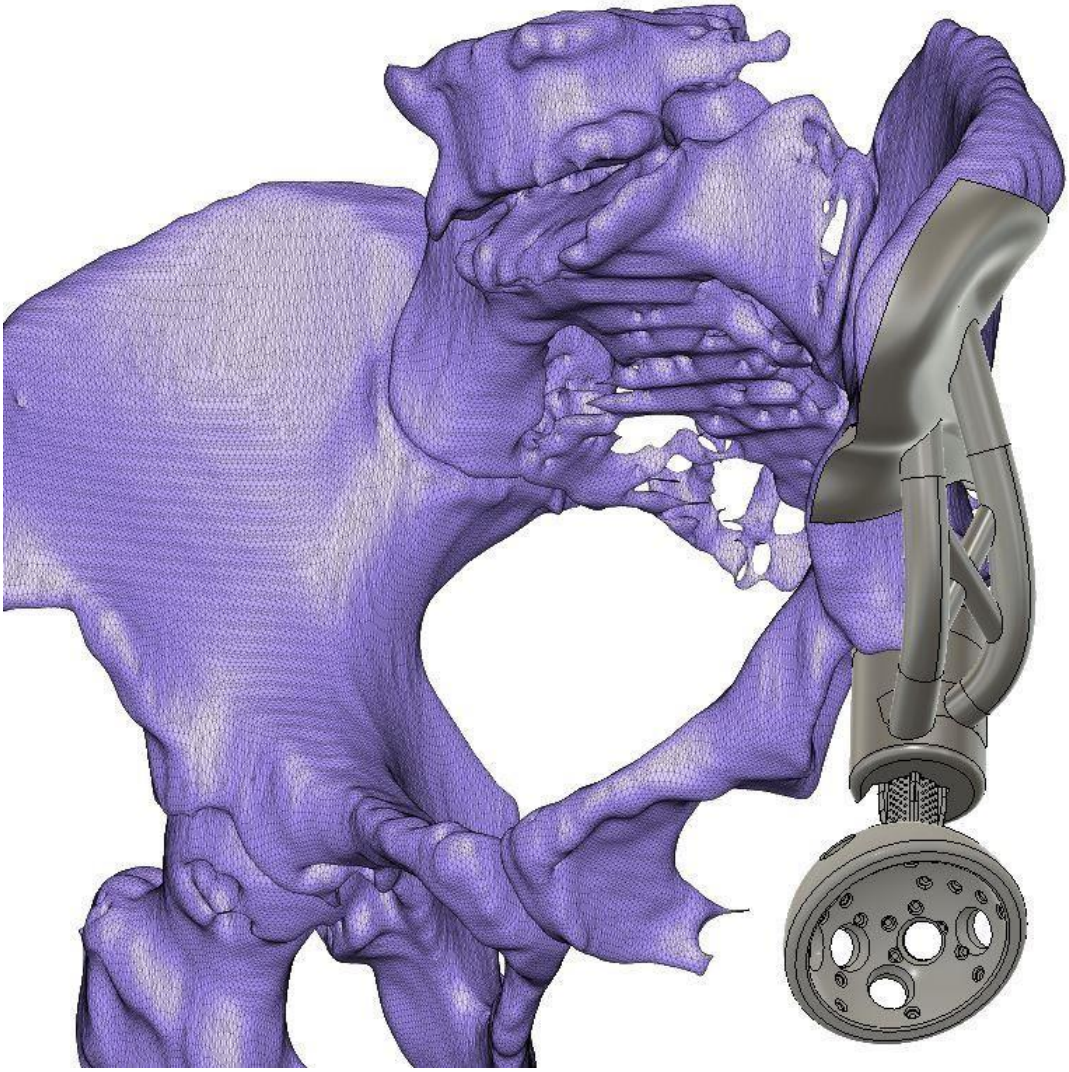
- Guide wire jig removed.
- **6 mm diameter** cannulated reamer inserted.
- Reaming depth: **upto guide wire insertion depth**.

5. ORIENTATION JIG PLACEMENT



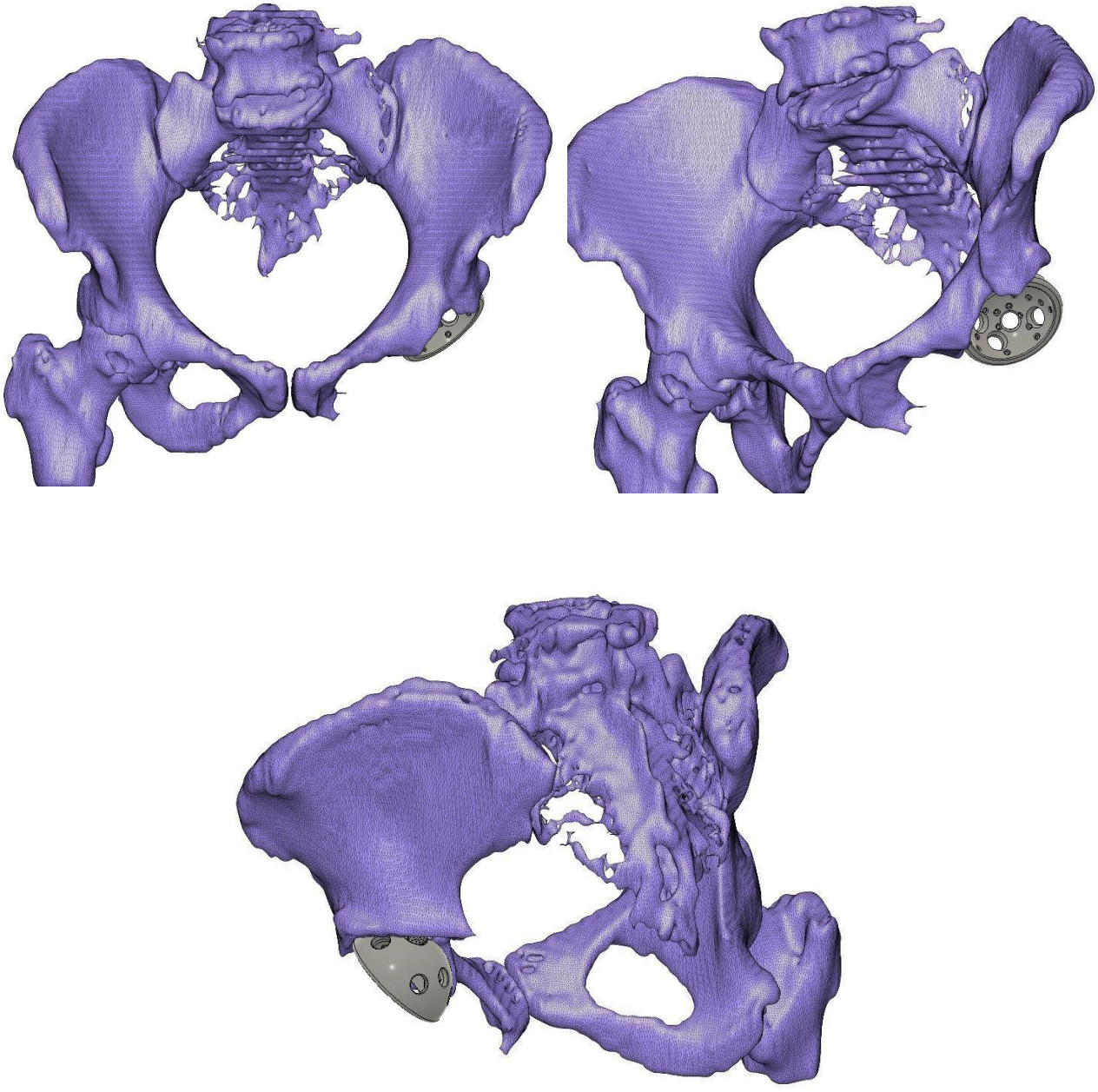
- Orientation jig made of PLA (FDM).
- Color coded for proper insertion.
- Fixation by K-wires.

6. IMPLANT INSERTION



- Coned Acetabular Implant inserted by the reference of Orientation jig.
- Both the jig and dummy implant are color-coded.
- Orientation jig removed after robust insertion of the implant.

7. INSERTED IMPLANT



Front and isometric views of the operated pelvis with implant

8. HIP PROSTHESIS

- Poly-liner insertion (Internal Diameter: **22.25 mm**, Outer Diameter: **32 mm**)
- Cement layer thickness: appx **2 mm**.
- Femoral head insertion (Diameter: **22.25 mm**)
- Femur preparation.
- Femoral stem insertion (into femur) (**No.1- 205 Exeter Long Stem**).
- Assembly of Femoral head & Femoral stem (Hip Joint).

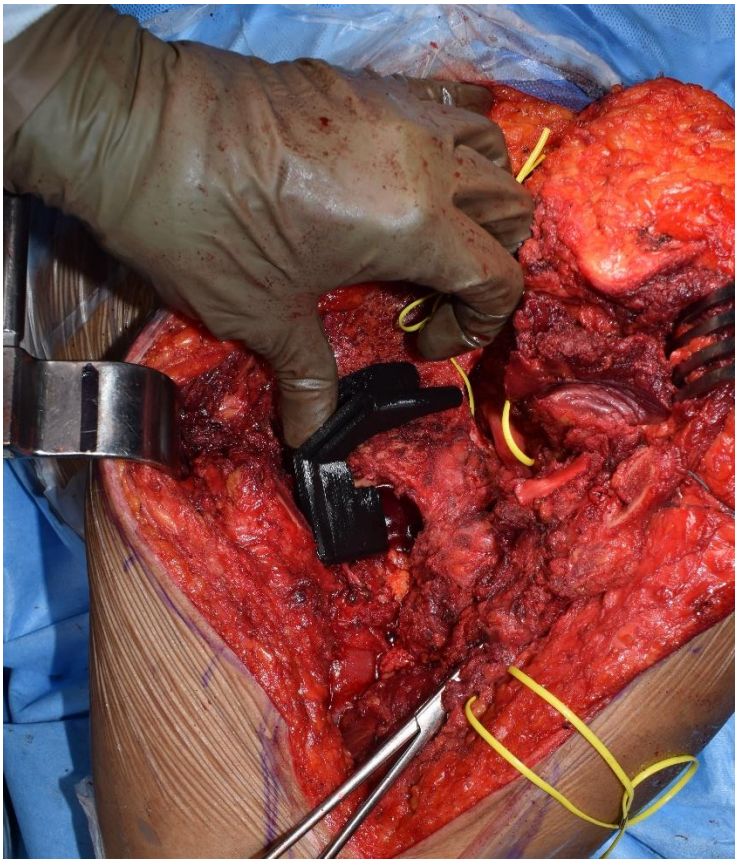
3D PRINTED MODELS

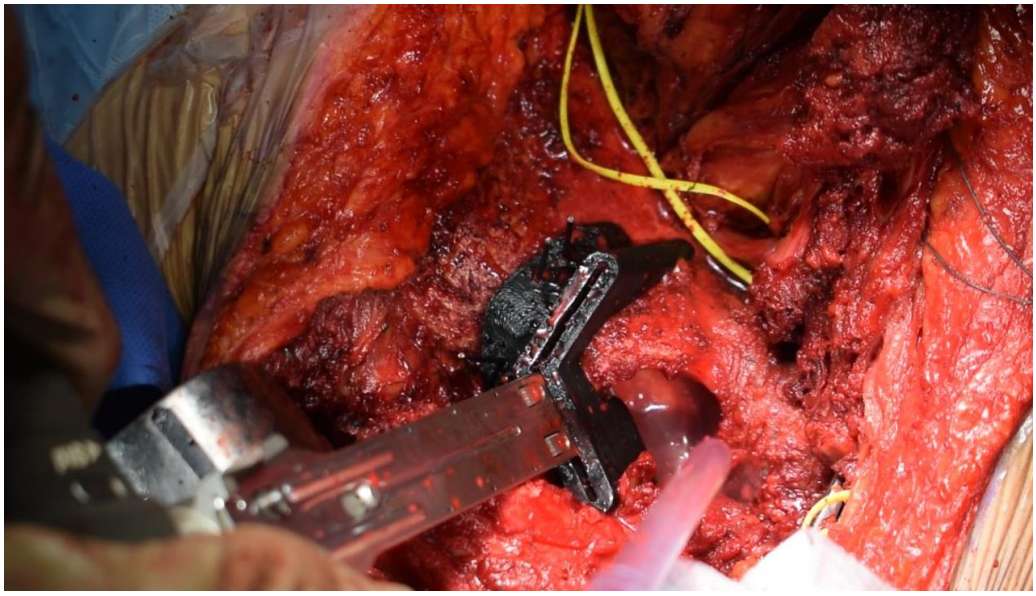
Anatomic model of half pelvis, having the tumor (top); Posterior jig for acetabular resection (bottom)

Guide wire jig (top); Orientation jig (bottom)

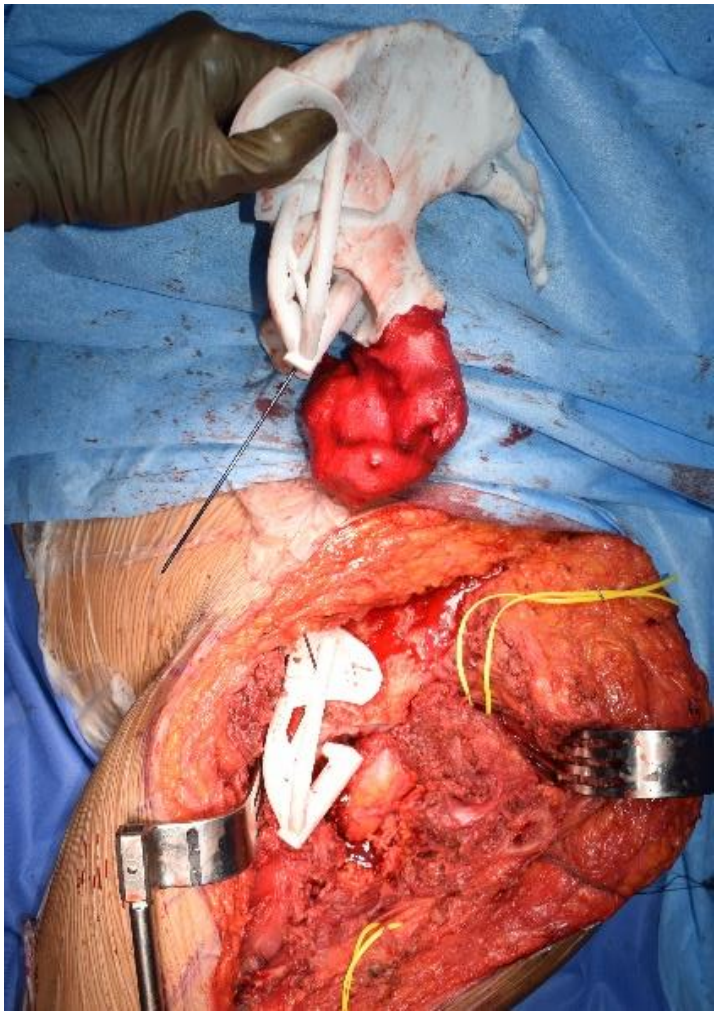
Dummy implant model (top); Actual Implant – Ti64 (bottom)

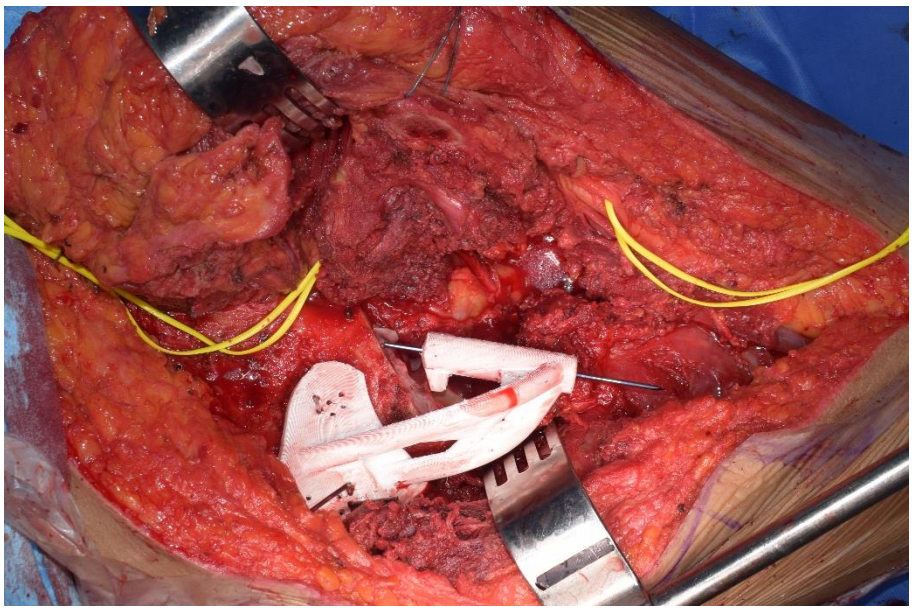
INTRA-OP PICTURES



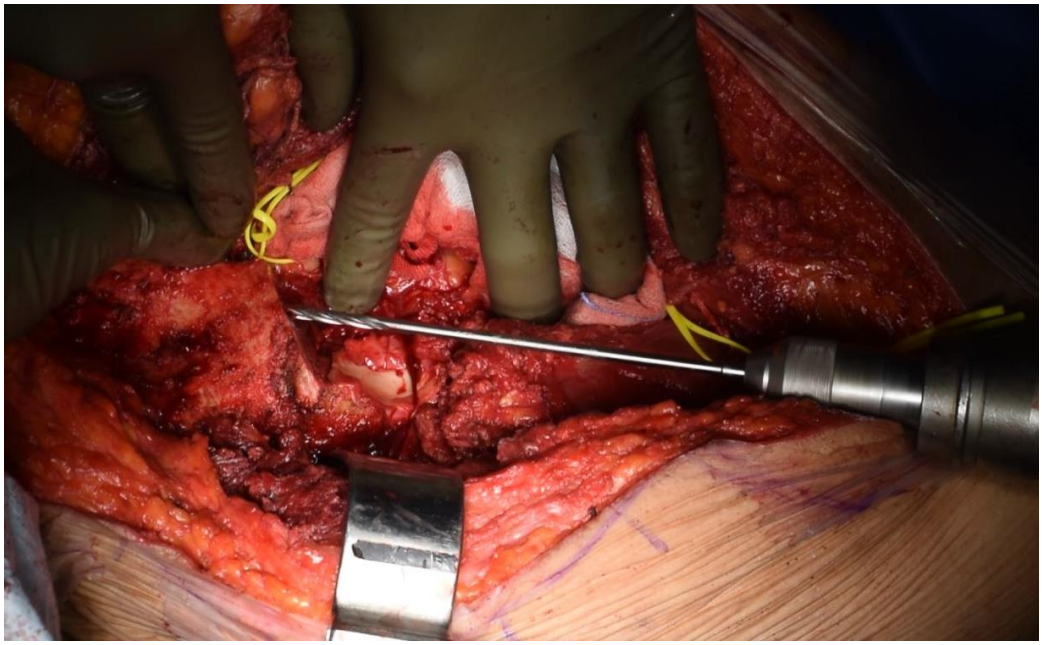


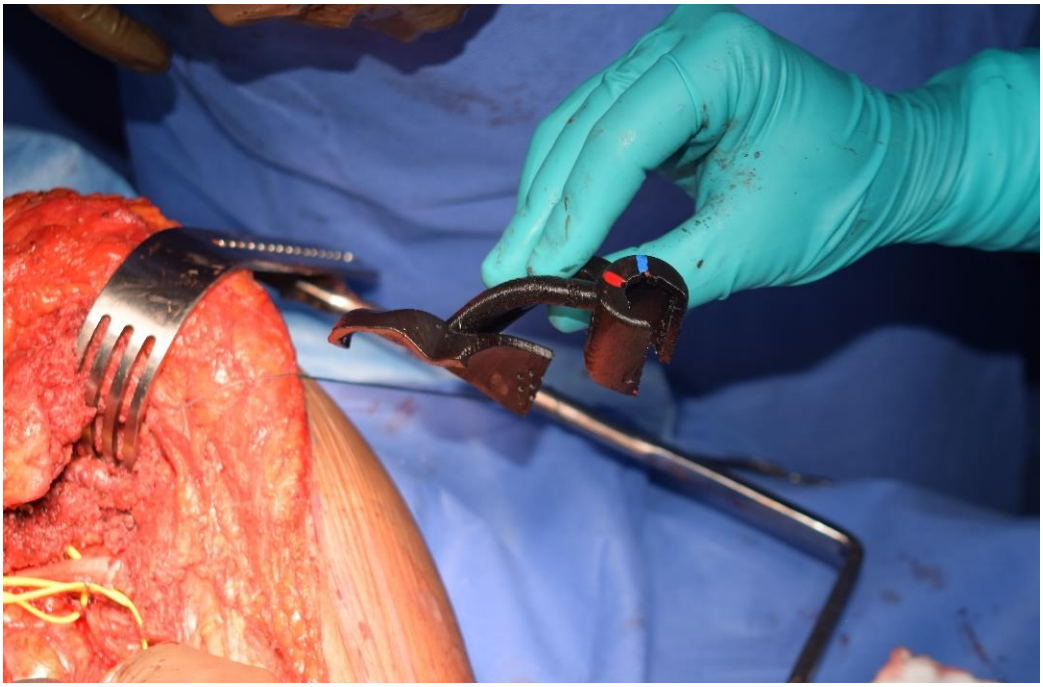
Fitment of posterior jig onto the bone (top); Resection of bone using the posterior jig (bottom)



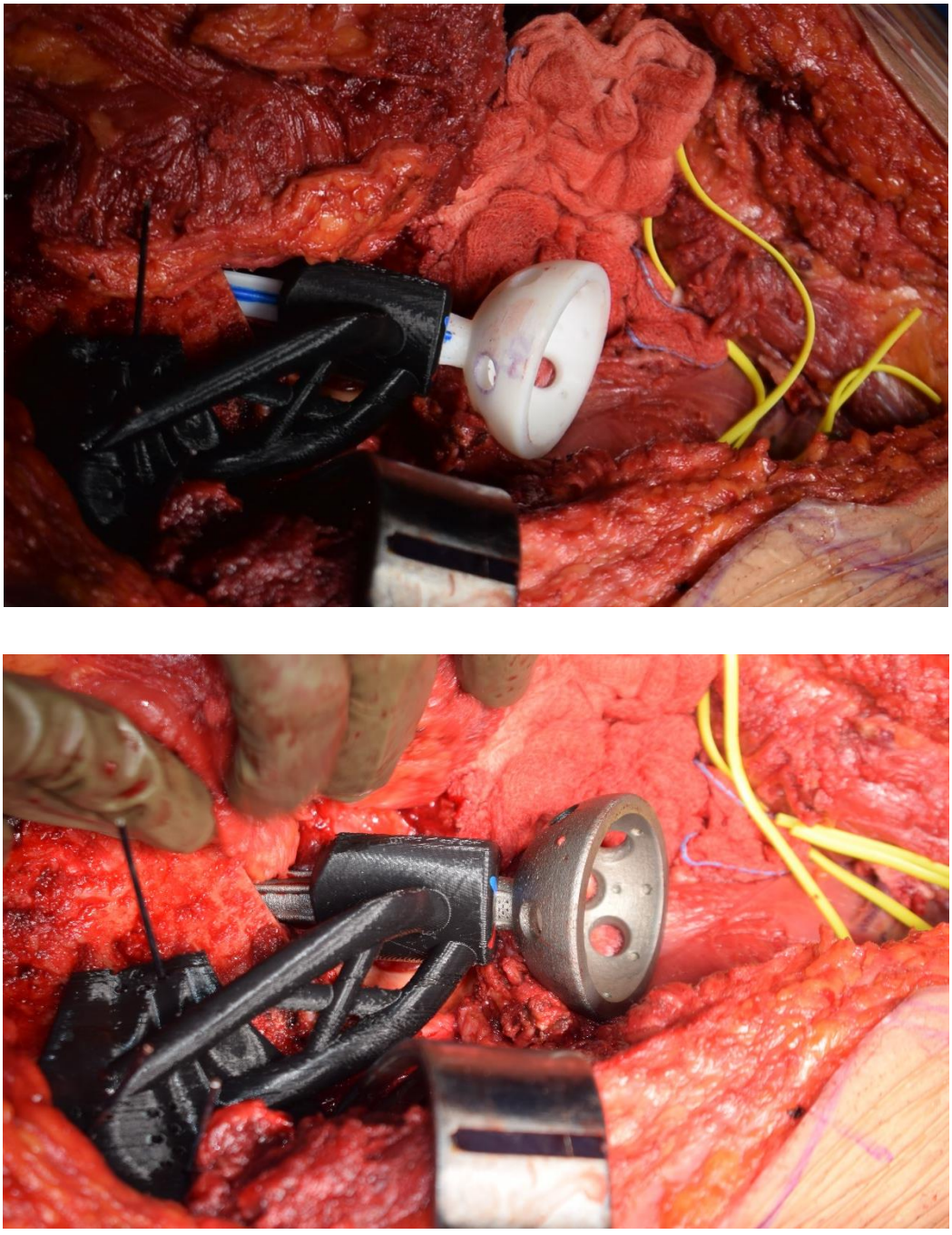


Guide wire jig fixation, with the reference of 3d model (top); Guide wire inserted (bottom)

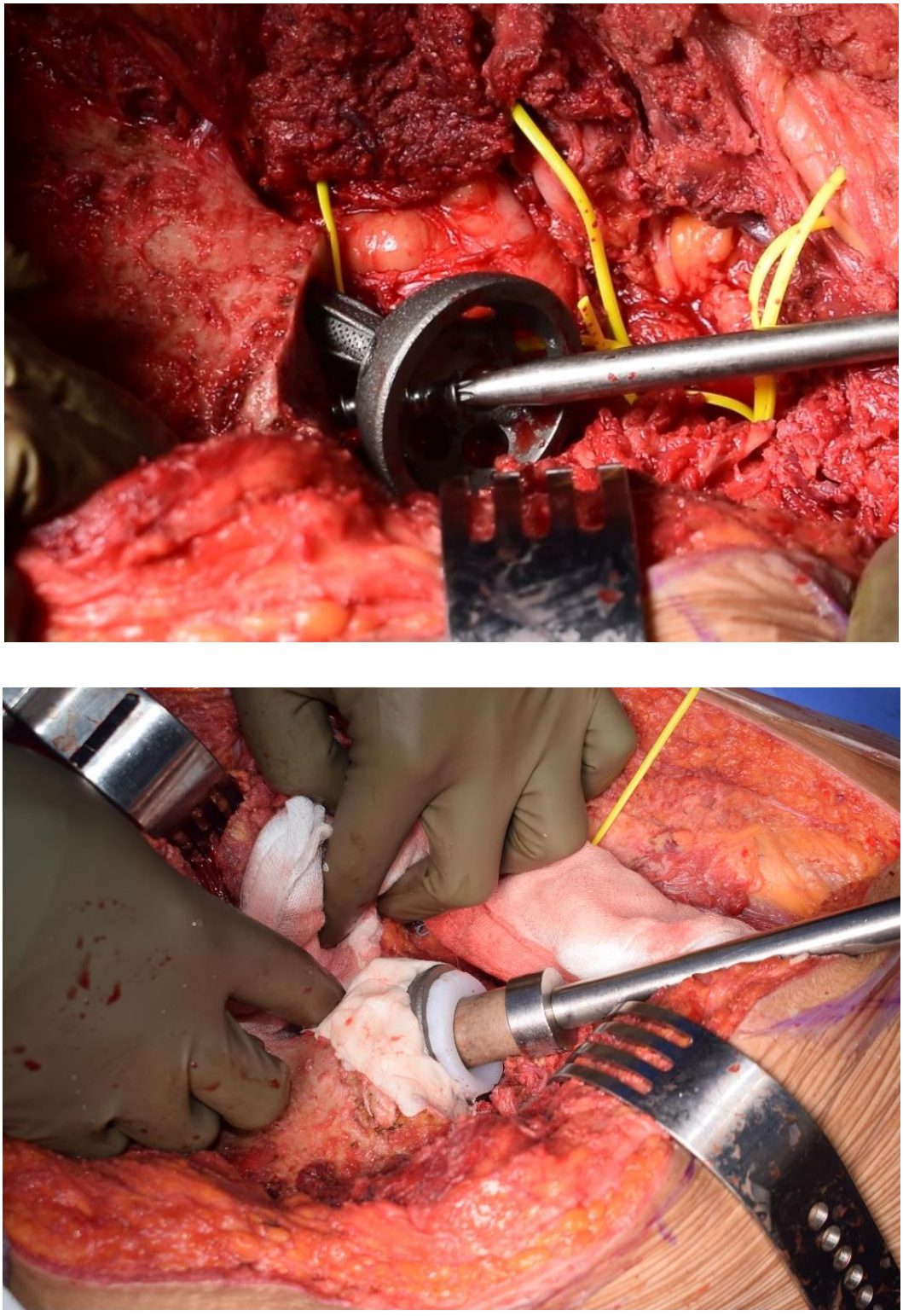




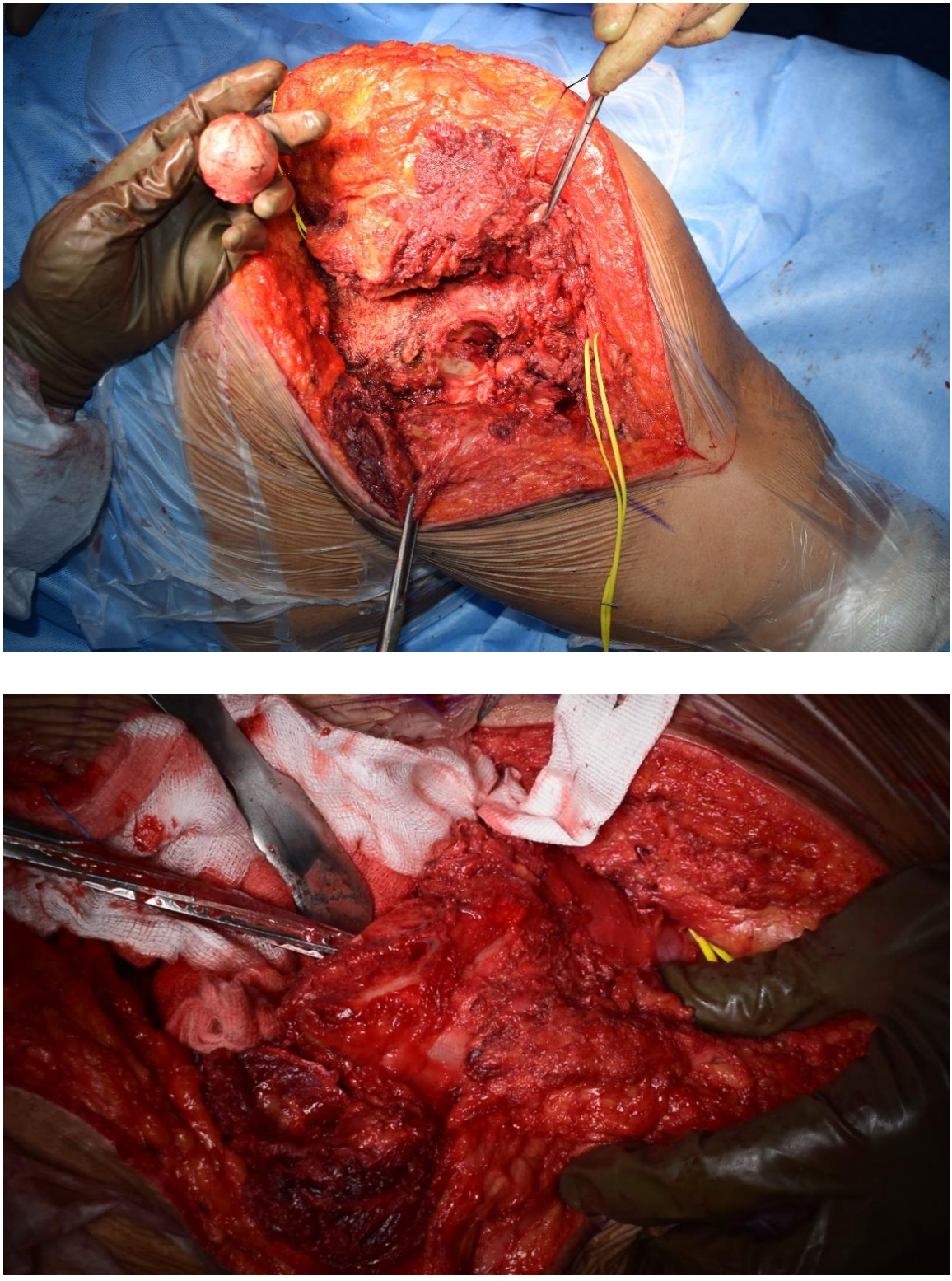
Tunnel reaming (top); Orientation jig with reference markings (bottom)



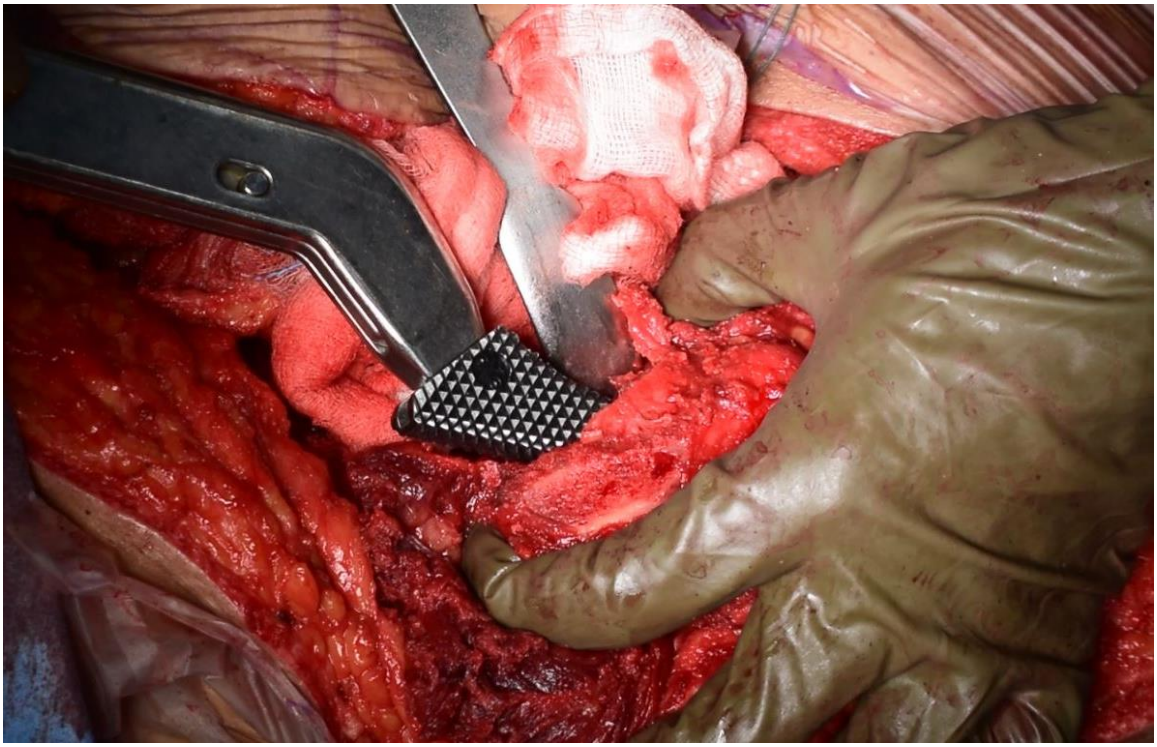
Dummy implant insertion (top); Actual implant insertion (bottom)

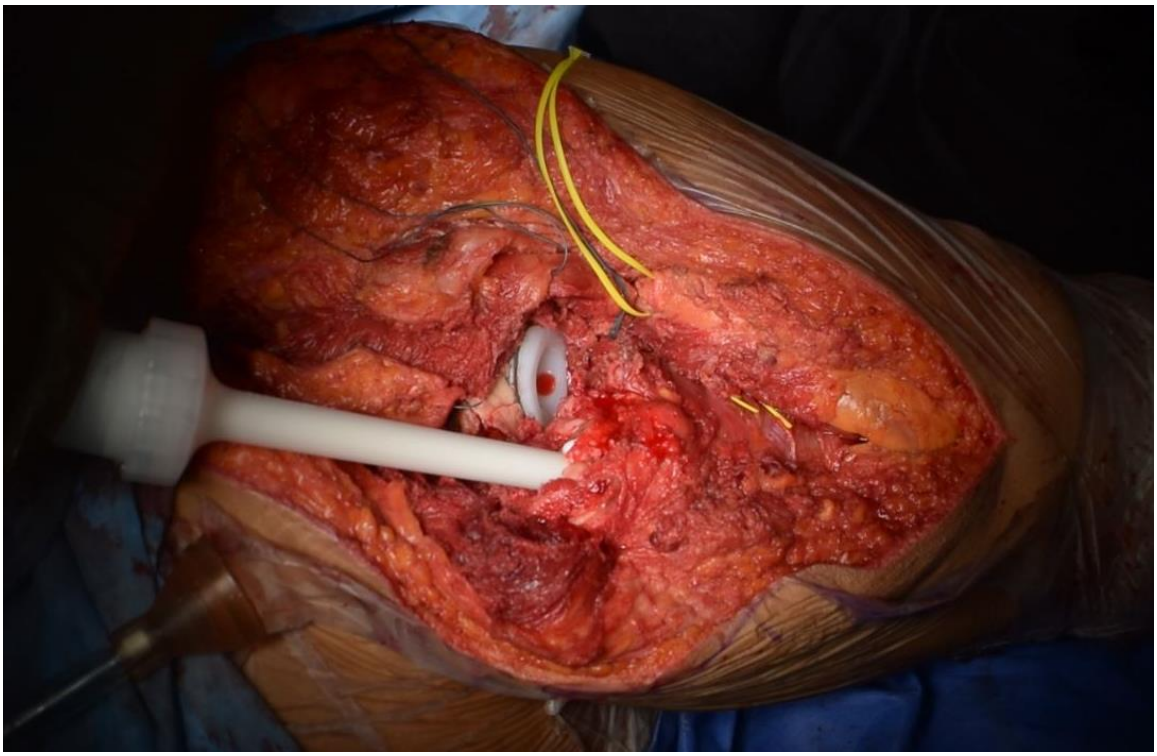


Fixation of implant with screw (top); Application of cement layer between implant & bone, and fixation of poly-liner inside the implant (bottom)

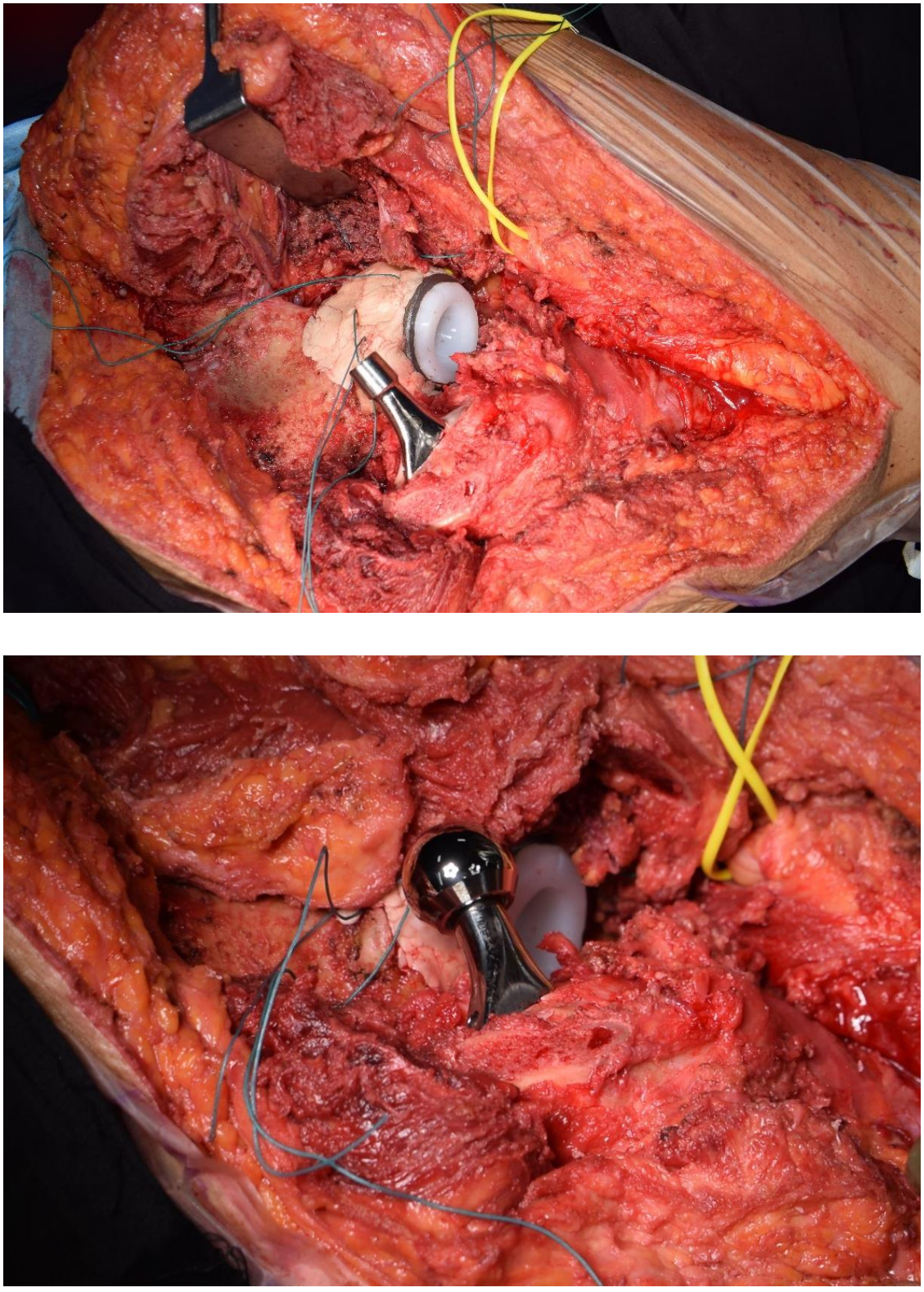


Removal of femoral head (top); femoral reaming (bottom)

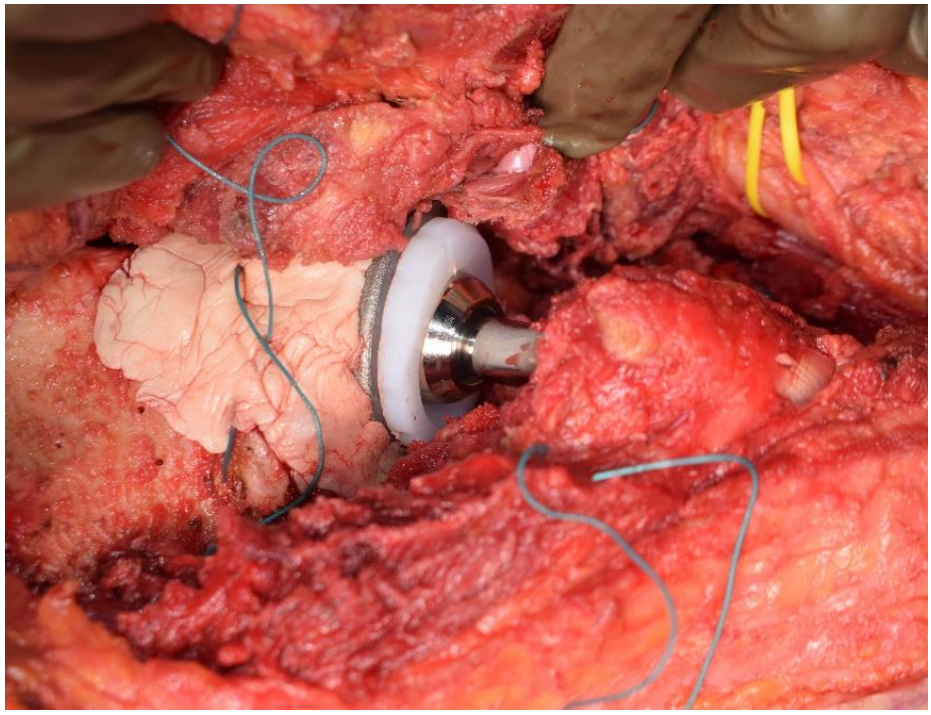




Trial stem insertion in the femur (top); Filling up the reamed femur with cement (bottom)



Femoral stem prosthetic inserted (top); Femoral head prosthetic attached to the femoral stem (bottom)



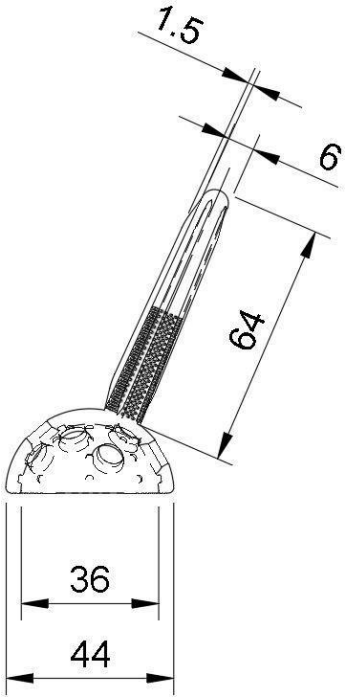
Femoral head placed inside the poly-liner (top); Tumor vs 3D model comparison - lateral (bottom)

Tumor vs 3D model comparison – anterolateral (top); 3D models and the resected bone section with tumor (bottom)

MEASUREMENTS

CONED ACETABULAR IMPLANT MEASUREMENTS

Implant image



General measurements

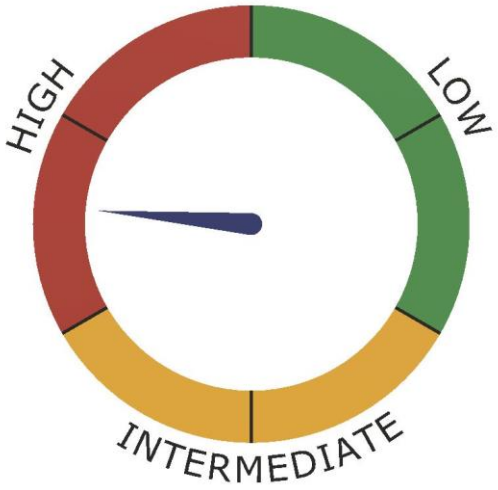
- Outer diameter: **44 mm**
- Inner diameter: **36 mm**
- Stem length: **64 mm**
- Stem fins height: **1.5 mm**

ANALYTICS

No. of Hours	Plan discussion	Segmentation	Design & Development	3D Printing (models, jigs, guides)	**Cumulative Hours**
3D Process Engineer	16	14	78	62	**≈180**

No. of Hours	Image Correlation	Plan Discussion	Implant Fusion & Finalization	Dry-Run (Mock Surgery with 3DP models)	Approximate Surgery Hours	**Cumulative Hours**
Clinician	2	16	27	3	13	**≈70**

CASE DIFFICULTY & COMPLICATION LEVEL



Signature

Design Engineer-Medical
The Yellow Ribbon

Signature

Clinician In-charge
The Yellow Ribbon