



## COMPLEX PRIMARY SURGERY: PATIENT-SPECIFIC ACETABULAR IMPLANT

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### 1 - PREOPERATIVE DATA

#### PATIENT HISTORY

- » 87-year-old female patient in good general condition.
- » Comorbidities include arterial hypertension.
- » In 2010, treatment of a femoral shaft fracture with a retrograde nail.
- » Presentation to the outpatient clinic with pain and immobility.
- » Findings show destructive coxarthrosis with interruption of the Köhler line and pelvic discontinuity, classified as Paprosky type 3B.
- » Removal of the intramedullary nail and planning for hip prosthesis implantation. The proximal femur presents with a defect classified as Paprosky type 3A.



Fig. 1 Preoperative CT image, frontal view

#### ACETABULAR DATA

- » Large complex bone defect and extensive soft tissue disruption.
- » Preoperative acetabular inclination: 52°
- » Preoperative acetabular anteversion: 22°

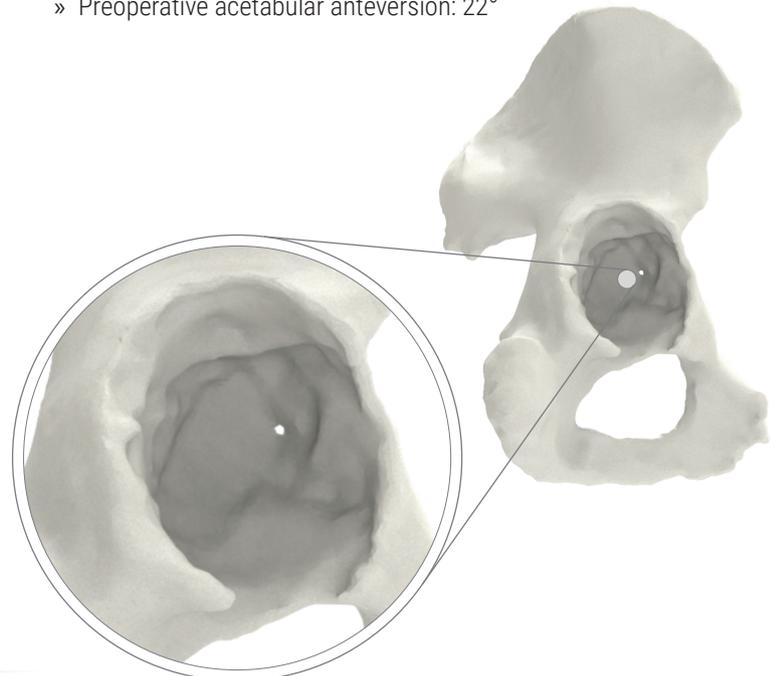


Fig. 2 Pelvic 3D reconstruction

### 2 - PREOPERATIVE PLANNING

- » Manual segmentation of the CT images was performed to generate a 3D bilateral reconstruction of the pelvis and femur.
- » A custom-made 3D-printed tri-flange implant was designed, specifically engineered to restore the acetabular defect caused by coxarthrosis.
- » The planned postoperative orientation includes an acetabular inclination of 48° and an anteversion of 15°.
- » The implant position was carefully planned to minimize bone resection and try to maximize the surface contact, aiming to achieve satisfactory implant integration.
- » Implant positioning was defined to restore the joint center of rotation relative to the contralateral side. Specifically, a lateralization of 3.5 mm and a distalization of 3.5 mm were introduced. This configuration helps achieve reliable restoration of joint biomechanics and provides a suitable theoretical range of motion for the patient.
- » On the Femoral side, an M-Vision modular stem (Distal Component Ø12mm and Length 180mm, Proximal Component Ø20mm and Length 40mm) was planned.



Fig. 3 3D preoperative planning



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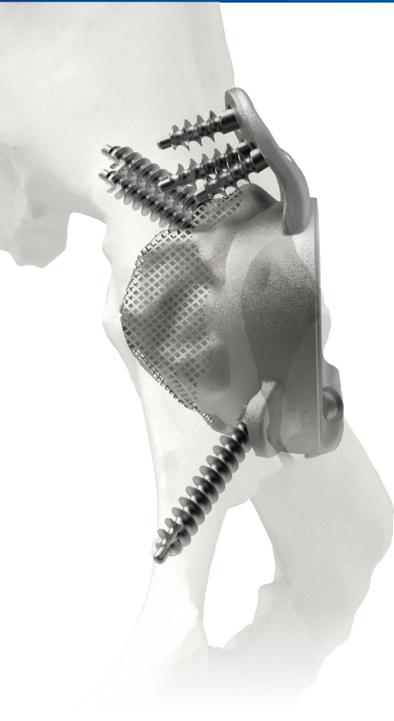




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### 3 - SOLUTION



**Fig. 4** Patient-specific acetabular implant 3D model

#### IMPLANT DESIGN

- » The custom-made implant is produced in 3D Metal, an advanced biomaterial structure obtained using 3D printing technology, our in-house additive manufacturing process. The result is a porous outer surface engineered to replicate the natural properties of bone. This structure provides high intrinsic friction and a scratch-fit with the surrounding bone, contributing to maximized primary stability<sup>1</sup>.
- » Eight screw holes are strategically planned to accommodate cancellous bone screws. Both the screw orientation and length are carefully designed to maximize bone stock and try to achieve satisfactory implant fixation.



**Fig. 5** Patient-specific acetabular implant

#### INSTRUMENT DESIGN

To facilitate bone preparation and implant positioning, the following custom-made instruments are provided:

- » Reamed bone model: used intraoperatively, to help achieving the correct bone preparation.
- » Trial implant: allows for verification of the bone bed preparation prior to final implant placement
- » Patient-specific drilling guides: ensure accurate drilling of screw holes in the preoperative planned directions and depths, enabling optimized screw placement.



**Fig. 6** Patient-specific drilling guide

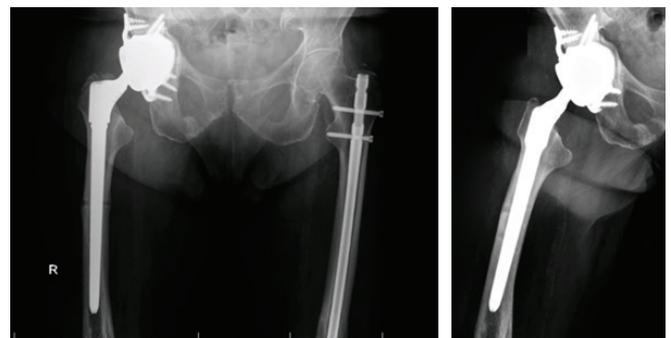
### 4 - RESULTS

The surgery resulted in excellent filling of the acetabular bone loss and positive correction of the bone deformity, restoring the proper joint center of rotation and range of motion. The patient-specific guides ensured accurate and safe screw placement, guaranteeing satisfactory acetabular implant fixation.

The custom-made implant was coupled with a Double Mobility cemented cup and a ceramic femoral head.

On the femoral side, the planned components of the M-Vizion Modular stem system were implanted.

Postoperatively, the patient has demonstrated significant improvement in terms of range of motion and pain reduction.



**Fig. 7** 6-week postoperative x-rays

*The entire planning process was carried out without complications. At all times, the progress of the planning was transparent. Regular meetings were held to make potential adjustments to the implant, tailored both to the surgeon's individual requirements and to the specific needs of the surgical approach.*

*Support during the operation, including preparation of the 3D model and planning, ensured a smooth surgical workflow.*

*An extremely satisfactory outcome for both the patient and the surgeon.*

**Dr. Andrej Matthies**



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1- [www.medacta.com/EN/3d-metal](http://www.medacta.com/EN/3d-metal)

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