



Orthopedic Oncology

Case Examples



Rapid provision of **FDA approved Personalized Virtual Surgical Planning, Surgical Guides and Models, Designed and Delivered** within a **Week***

Manufactured at our **clean-room facilities** in the **UK and USA**.



"I would now not do these procedures again without 3D planning and guides provided by Insight Surgery."

Dr Rob Pollock

British Orthopedic Oncology Society Chairman
Senior Consultant Sarcoma Surgeon
Royal National Orthopedic Hospital NHS

SPECIALITIES (ADULT & PEDIATRIC)

- Upper limb
- Lower limb
- Pelvis
- Digital Planning
- Custom Implants (UK/EU)
- Allograft guides

<https://www.insightsurgery.com/oncology-solutions/>

* Subject to complexity of surgical case and responsiveness of the clinician for review & approvals

CASE STUDY:

Ewing Sarcoma

SUMMARY

This adolescent patient presented with a tumor (showing similarities to Ewing sarcoma) in the left ilium and sacrum. Surgical resection guides were designed and manufactured to facilitate precise sacral and acetabular osteotomies that allowed the surgeon to preserve the hip joint and safely navigate the SIJ.

DESCRIPTION

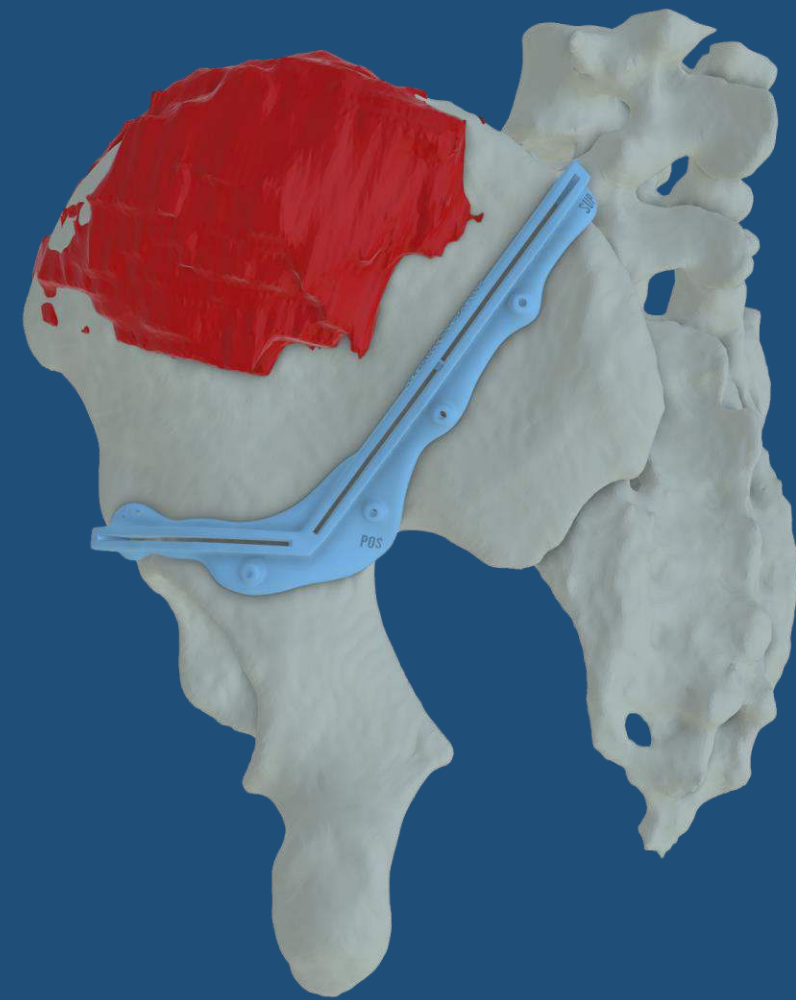
A 3D virtual model of the patient's pre-treatment anatomy was created from their CT and MRI scans.

Surgical guides were designed and manufactured to facilitate the required osteometries on the sacrum and acetabulum planes. This allowed the surgeon to mitigate the loss of both the hip joint and the SIJ.

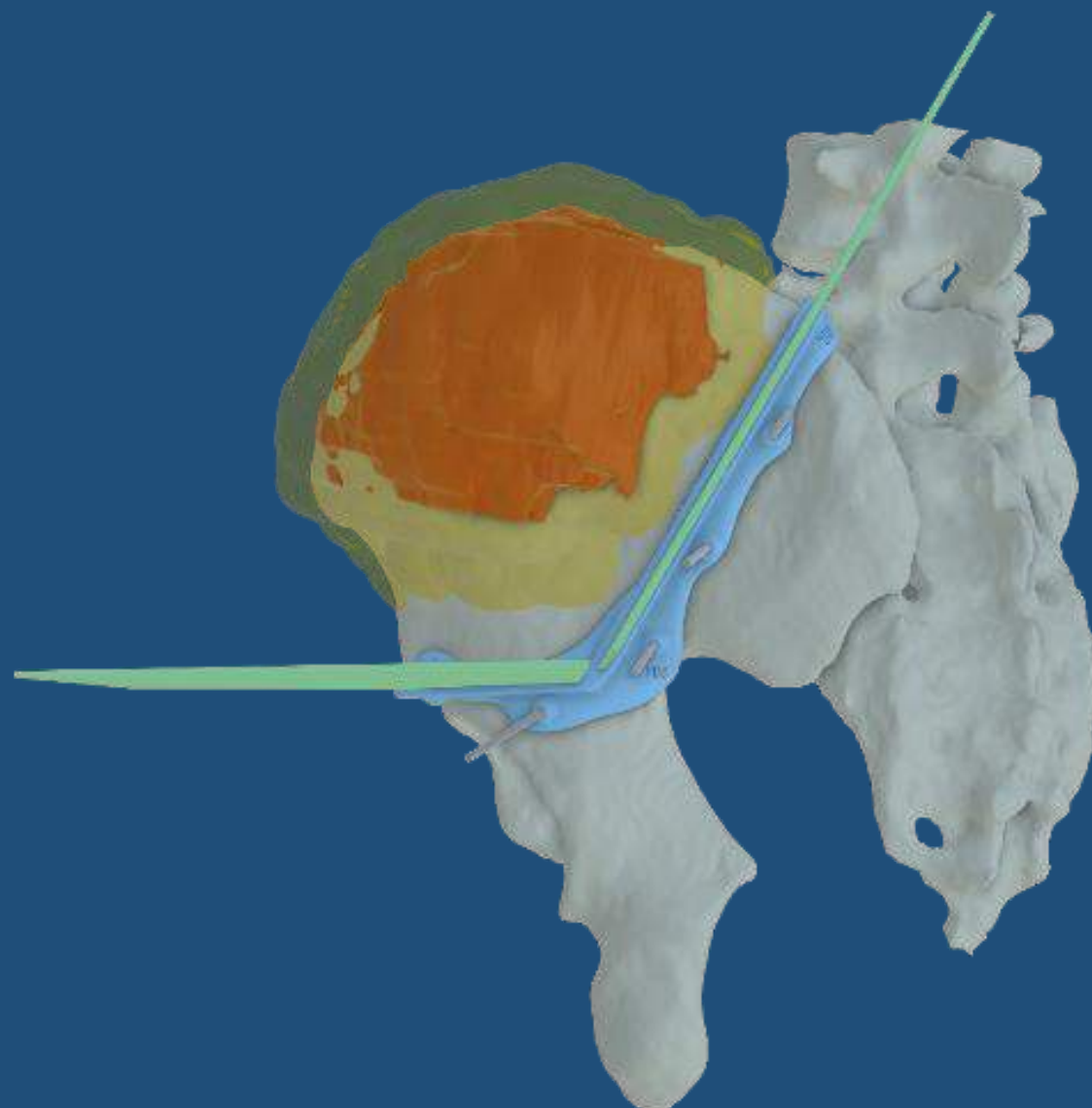
OUTCOME / BENEFITS

Although chemotherapy and radiotherapy had reduced the size of the tumor, the surgical team recommended that a procedure was still necessary.

Virtual Surgical Plan and surgical guides enabled the surgeon to optimise their planned resection, sparing the acetabulum and the SIJ and ensured that the cuts maintained a safe 10mm margin from the original site of the tumor. Resection accuracy and negative margins were confirmed by post-operative scans.



Patient Anatomy



Tumour Margin and Cutting Planes

CASE STUDY:

Complex Pelvic Chondrosarcoma

SUMMARY

A patient presented with a complex chondrosarcoma due to an osteochondroma that required surgery to resect a large region of the left pelvis.

The surgeon requested a Virtual Surgical Plan, with the aim of retaining some continuity of the hip and the SIJ to allow for the possibility of a future reconstruction in the patient's treatment pathway.

DESCRIPTION

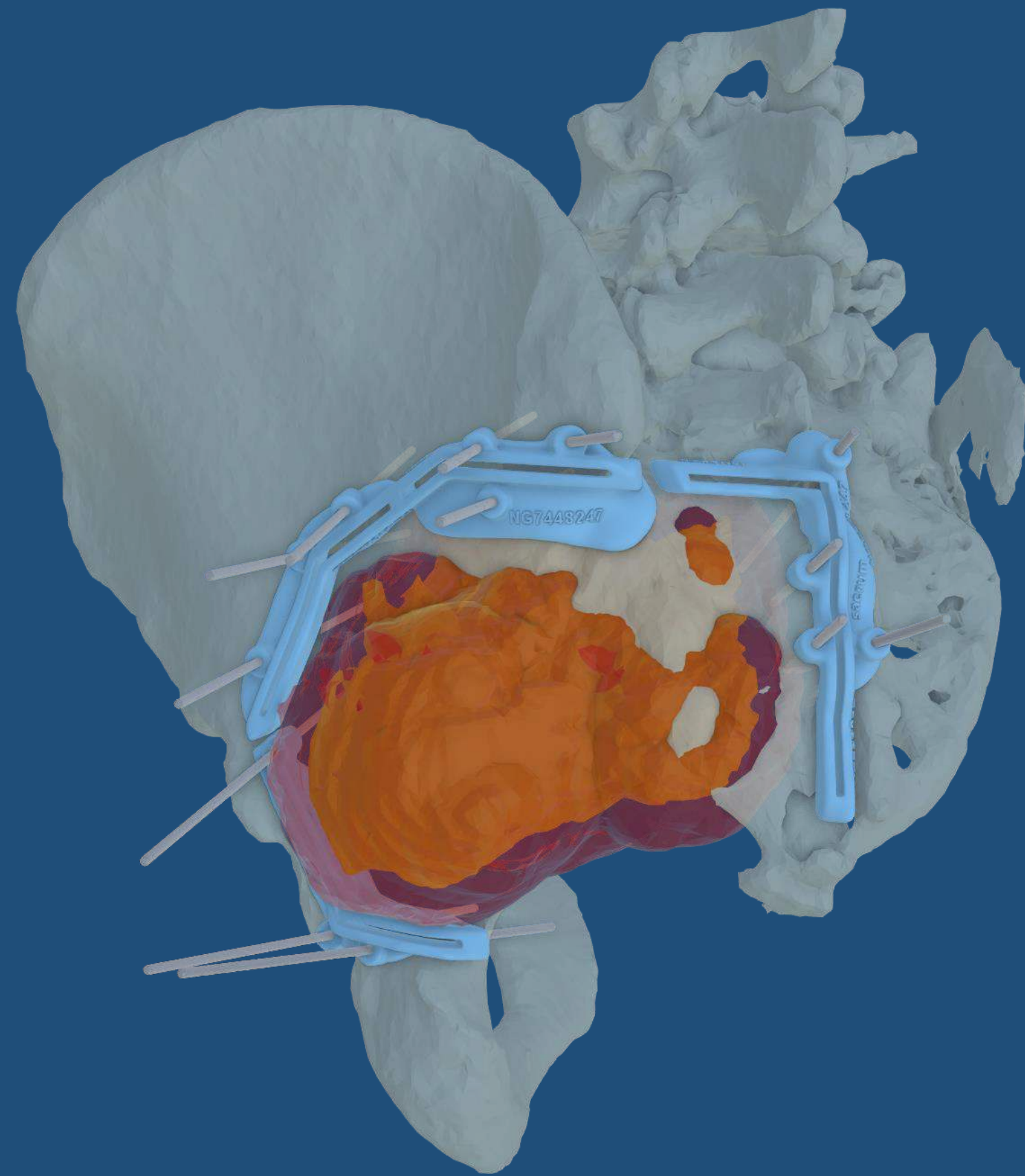
Surgical guides were designed to facilitate a safe and effective excision of the tumor and the compromised anatomy via a hemipelvectomy and hemisacrectomy.

Multiple surgical guides were designed and manufactured once the optimum cutting planes had been determined by the surgeon. This provided the surgical teams with flexibility during this complex operation where access to the region of interest was not guaranteed.

OUTCOME / BENEFITS

The surgical guides proved to be extremely effective as a tool for the surgeons to allow them to carry out accurate resections with clear margins.

The remaining bone stock was greater than if the team had operated using typical methods, due to the required tumor margins being less severe. This will allow for less complex surgeries in the future to reconstruct the patient's hip with custom implants.



**Patient Anatomy, Tumour Margin
and Surgical Guides**

CASE STUDY:

Osteosarcoma of the Distal Femur

SUMMARY

This young female patient presented with an unusual cartilage lesion, resembling chondrosarcoma in her posterior femur that required resection. Pre-surgical imaging showed her intra- & extra-osseous components needed to be removed, with a 5mm margin.

DESCRIPTION

The surgeon placed a request with Insight Surgery for the provision of surgical guides and a patient-matched allograft solution. A complex 6-planar osteotomy was required to remove the entire tumor, whilst preserving the continuity of the anterior, medial, and lateral cortices.

Surgical guides were designed and manufactured for the required osteotomies on both the patient and allograft. These enabled the surgeon to accurately restore a more natural anatomy for the patient.

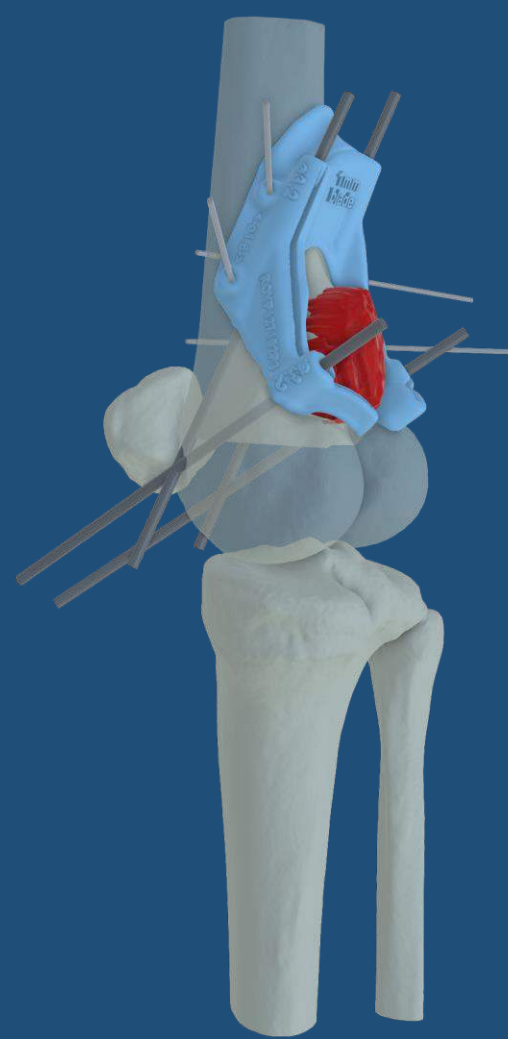
OUTCOME / BENEFITS

The main aim of this surgical procedure was to replace the affected segment of the right distal femur with an allograft bone implant. The surgical guides allowed the surgeon to make the appropriate cuts with a higher degree of accuracy than making these osteotomies freehand and increasing the likelihood of stable fixation and osteointegration.

Using the Virtual Surgical Plan that was created prior to the surgery, it was possible for the surgeon to effectively determine the size and positioning of the required cuts. Overall, this meant less time was spent in the surgery for the procedure due to enhanced pre-surgical plans defined by the surgical team.



Patient Anatomy



Patient Guide



Allograft Guide



Final Result

Patient Anatomy

LUMIC Implant



CASE STUDY:

Acetabular Osteosarcoma

SUMMARY

In this exemplar case, the patient presented with an osteosarcoma that had invaded the acetabulum. Insight Surgery provided personalized surgical guides to safely resect the compromised bone whilst maximising bone conservation, and then to optimally position the ImplantCast LUMiC® endoprosthesis that was used to reconstruct the joint.

DESCRIPTION

Within 5 days of receiving the surgeon's instruction, Insight Surgery was able to rapidly design and manufacture multiple medical devices; patient-specific anatomical models for pre-surgical planning and surgical guides for optimizing the resections.

OUTCOME / BENEFITS

The surgeon commented:

“The patient had an unfortunate and significant progression of disease despite chemotherapy that necessitated a change of surgical plans with a tight window. With the expert help and a true collaborative effort from the teams at Insight and ImplantCast, we were able to implement a precise and patient-specific plan for the patient that made our surgery more efficient and optimized the outcome for the patient. I am thankful for the support and the efficiency with which this was delivered.”



Postoperative X-Ray

CASE STUDY:

Distal Ulna Resection & Allograft Reconstruction

SUMMARY

This patient presented with a post denosumab giant cell tumor of their distal right ulna bone. The treatment plan included an allograft transplant and reconstruction of the distal ulna. Insight Surgery were instructed to provide a Virtual Surgical Plan. Patient-specific anatomical models and sterilizable guides for cuts on both the patient bone and allograft.

DESCRIPTION

Insight Surgery's engineer utilised the contralateral scan and the healthy anatomy as a foundation for the creation of a Virtual Surgical Plan for the reconstruction of the affected ulna area.

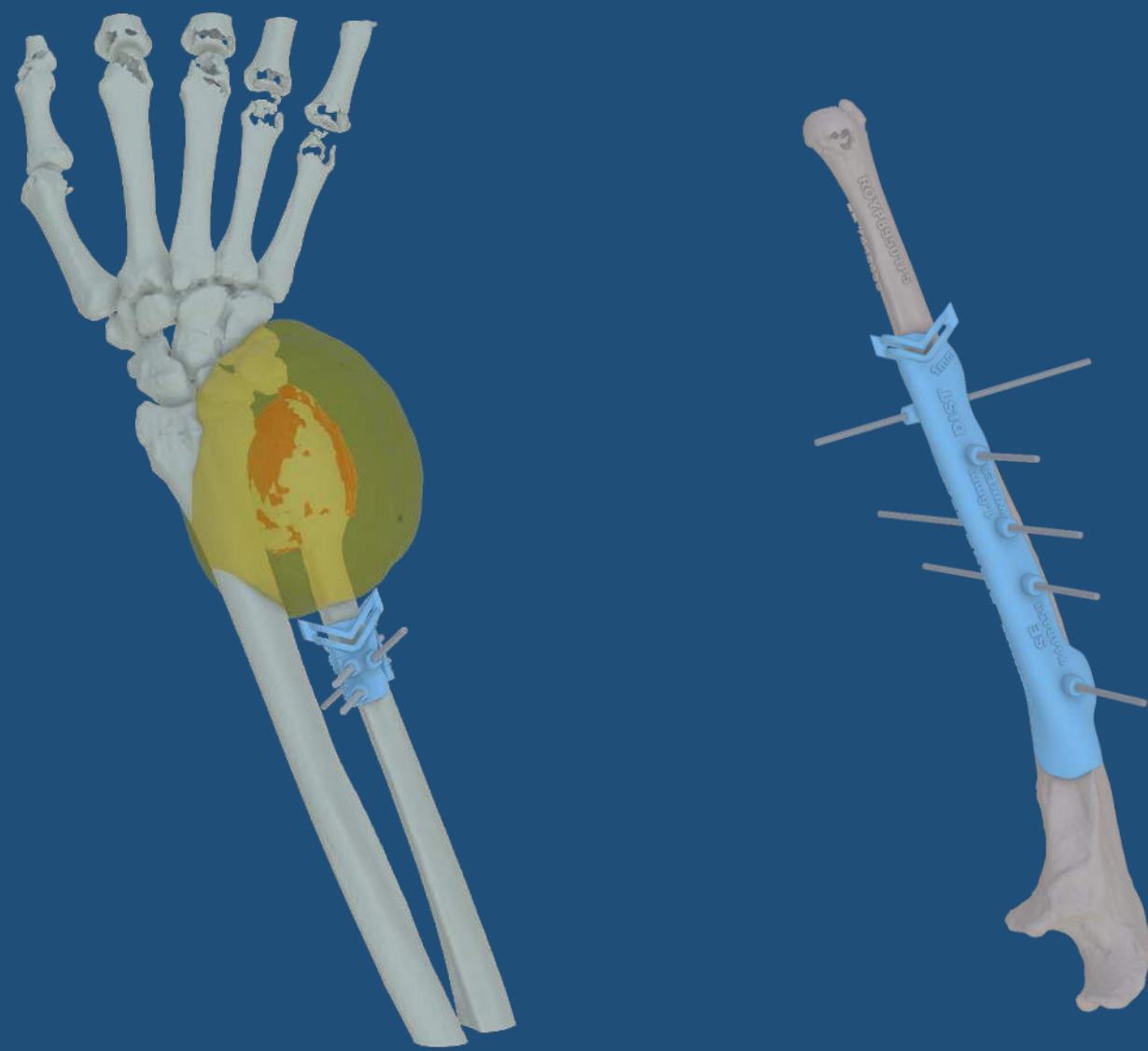
The boundary of the tumor was extended by 2cm to produce a cutting edge for the design of the guides. Patient-specific guides were produced for dorsal and palmar approaches of the ulna resection. As well as a freehand and fixed option for the allograft.

Along with the sterilisable guides, models and demo guides were printed to allow pre-surgical planning and familiarisation with the devices ahead of the operation.

OUTCOME / BENEFITS

A chevron cut was used for both the patient anatomy and the allograft for several reasons. It has benefits when locating the allograft accurately and can give added multiplanar and torsional stability.

However, the primary benefit is that this configuration provides an increased contact surface area between the native anatomy and the allograft, promoting osseointegration postoperatively, leading to greater stability. This service from start to finish was completed within the patient's 28 day treatment window.



Patient Anatomy

Guide / Allograft



Final Result

FASTER RECOVERY

Less time in ICU, faster rehabilitation. On average patients stayed 3 less days overall and 1.5 days less in ICU.

FEWER POSITIVE MARGINS

In our study with the UK NHS over 26 real world cases, 13 of the cases that did not use guides had 3 positive margins as opposed to 0 positive margins where guides were used.

INCREASED SURGICAL LISTS

Significant time savings in surgery by using digital planning and guides means more procedures can be added to future surgical lists.

FEWER MAJOR ISSUES

By the use of surgical guides in complex orthopedic oncology cases, an ~18% reduction in major complications during and after was observed.

REDUCED THEATER TIME

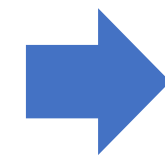
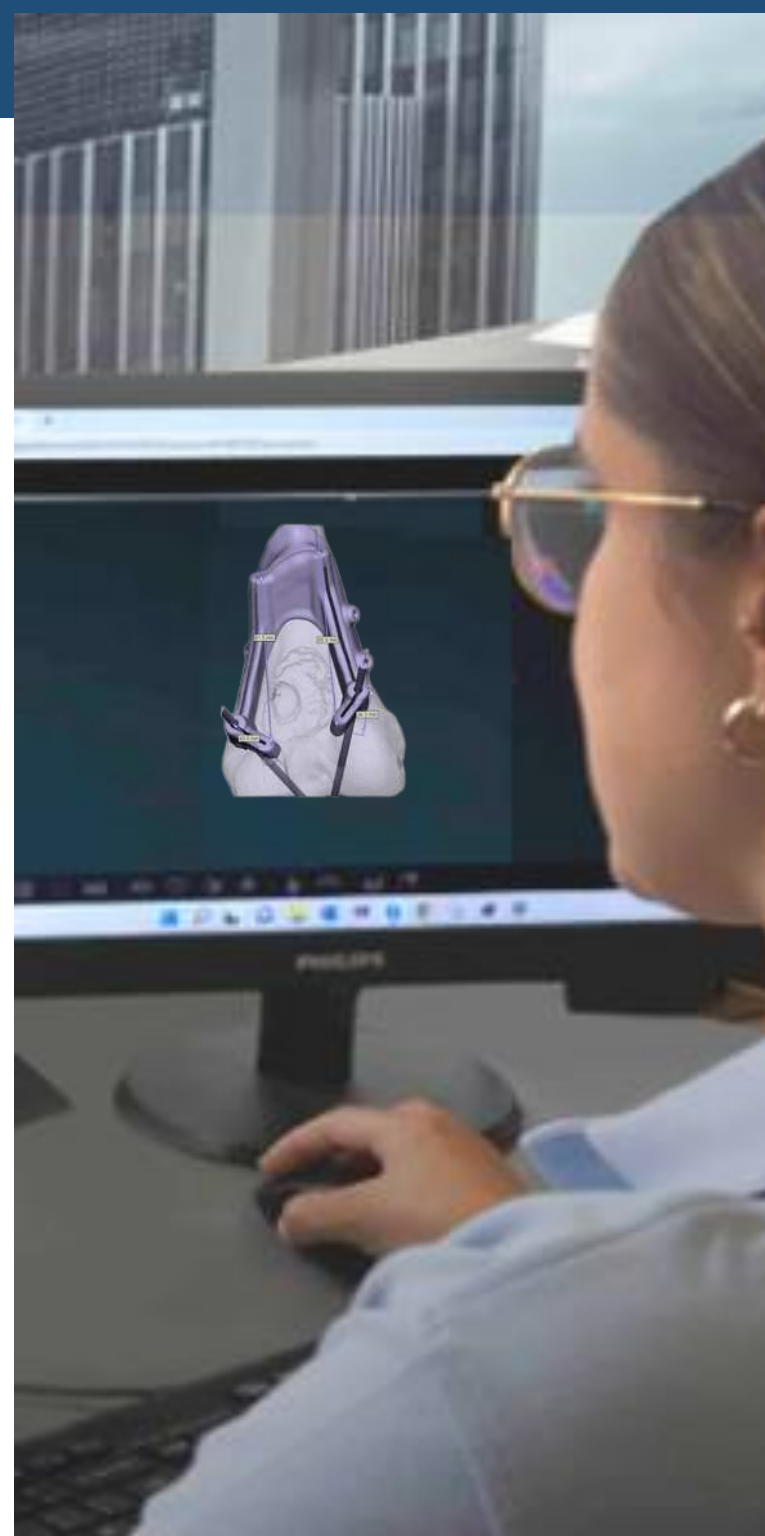
Overall, between a 10% to 30% reduction in theater time was observed brought about by the use of digital planning and surgical guides.

REDUCED BLOOD LOSS

In our studies with the NHS, an overall decrease of ~13% in blood loss was seen which improved the patient outcomes and lowered operational theater costs.

Benefits of Personalized Surgical Solutions

Workflow for Posterior Femoral Allograft Reconstruction



Patient scan &
surgeon case
instructions
received

Virtual Surgical
Plan (VSP)
defined with 3D
model and
Surgical Guide

Final review &
approval of VSP
and devices by
surgeon

3D printing of
medical devices
in our in-house
cleanrooms

Surgery is
performed