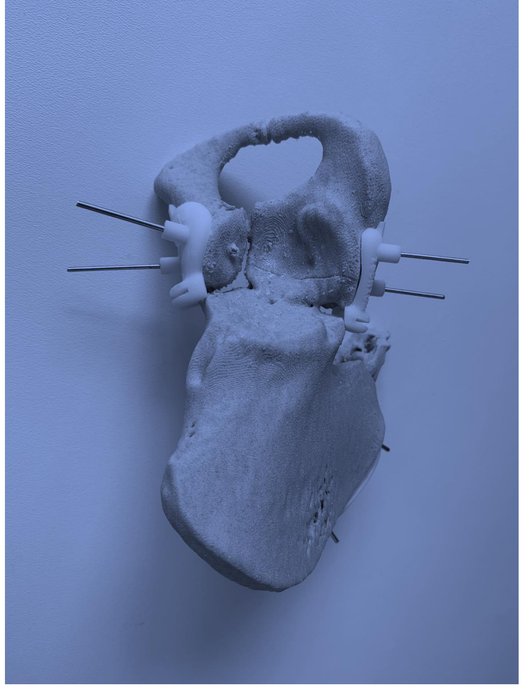
Orthopedics

Case Examples



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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.**

> “The planning and printing made [this case] the least stressful operation I've had in a long while”

Mr Stephen Ng Man Sun

Consultant Paediatric Orthopaedic Surgeon
Chelsea and Westminster Hospital NHS Foundation Trust

SPECIALITIES (ADULT & PEDIATRIC)

UPPER LIMB

- Shoulder
- Humerus
- Forearm / wrist

LOWER LIMB

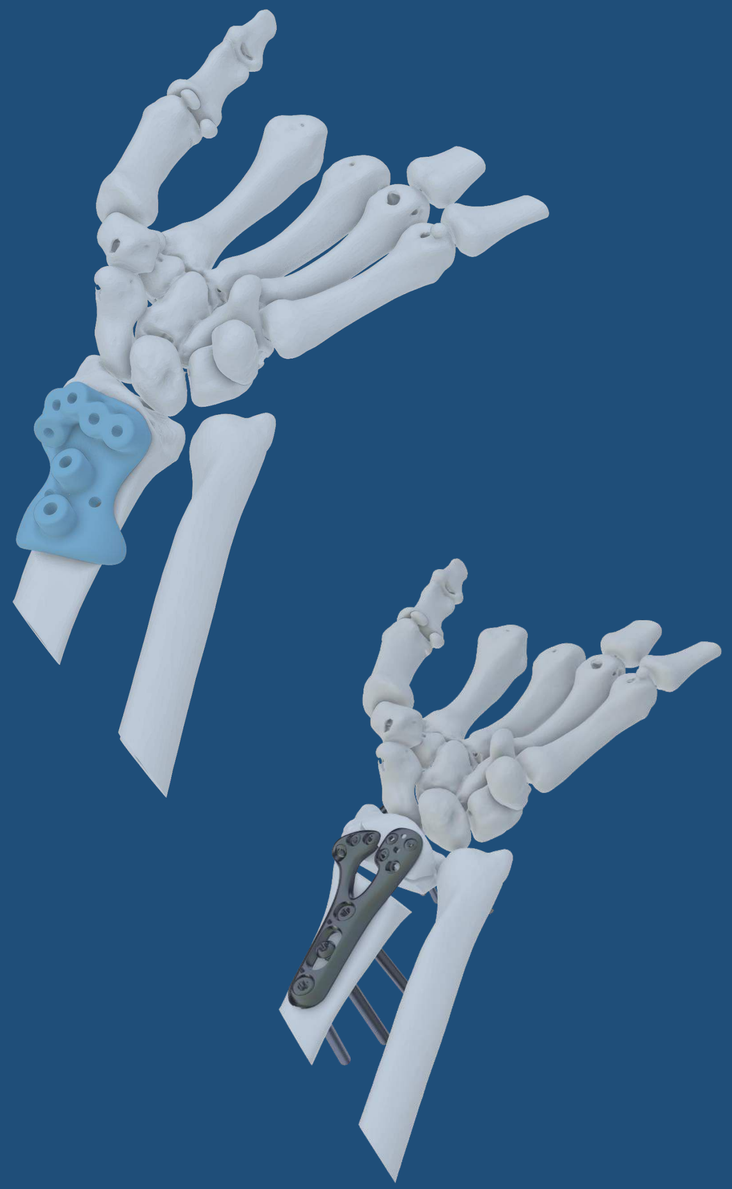
- Femur
- Tibia
- Pelvis
- Fibula
- Knee
- Ankle

CUSTOM IMPLANTS (UK / EU)

https://www.insightsurgery.com/orthopedic-solutions/

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

Pre-drilling Guide



Final Result

CASE STUDY:

Madelung’s Deformity of the Wrists

SUMMARY

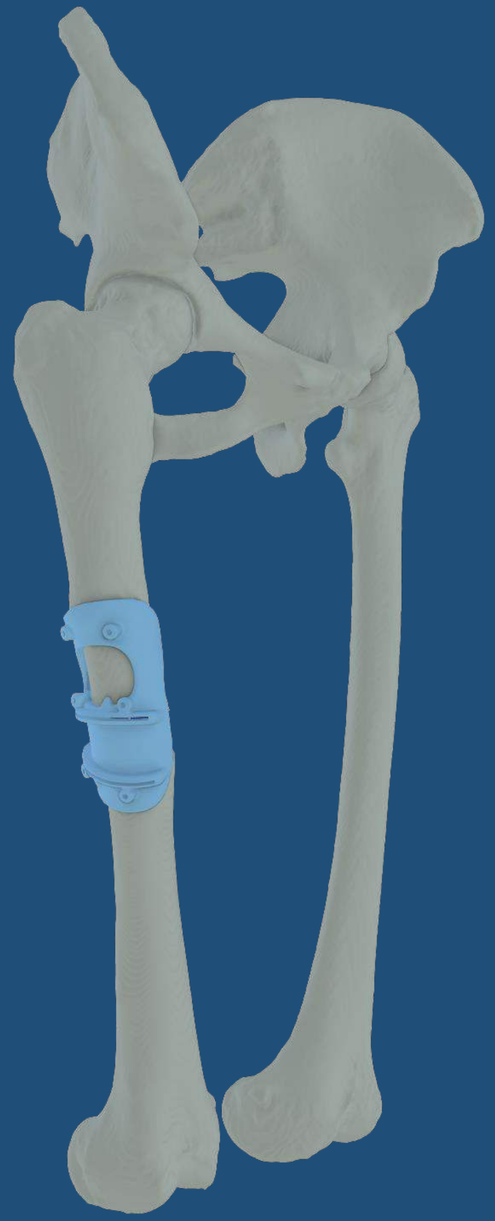
This adolescent patient presented with a bilateral Madelung's deformity of the wrists with limited range of motion and significant pain, predominantly on the left wrist. The deformity included a collapsed volar rim of the radius, that increased the likelihood of subluxation and a positive ulna variance. The surgeon requested a 3D reconstruction of the patient's anatomy and patient-specific guides for the left radius that would facilitate the restoration of the distal radial surface and correct the ulna variance to better resemble healthy anatomy.

DESCRIPTION

Due to the rarity of the condition and complexity of the deformity, the surgical team considered two approaches: a simpler bi-planar osteotomy or a dome osteotomy. The dome osteotomy plan was subsequently discounted as the surgeons saw challenges in being able to lengthen the radius. Three surgical guides were produced - for use in doing a partial osteotomy of the volar rim in order to restore the distal aspect of the radius, for doing a torsional osteotomy / for lengthening corrections of the radius and finally as a pre-drilling guide in order to aid the location of the plate.

OUTCOME / BENEFITS

The 3D virtual and physical model of the patient's anatomy provided the surgeons with enhanced planning capabilities for them to better understand the pathology of the wrist. It also allowed them to identify limitations in the proposed dome osteotomy approach. Overall, the surgery was a success and the surgical guides allowed for highly accurate osteotomies, and the Digital surgical pre-plan facilitated a correct positioning of the plate onto the patient's anatomy.



Patient Anatomy and Surgical Cutting Guide

CASE STUDY:

Mid-femur Apex Anterior Deformity

SUMMARY

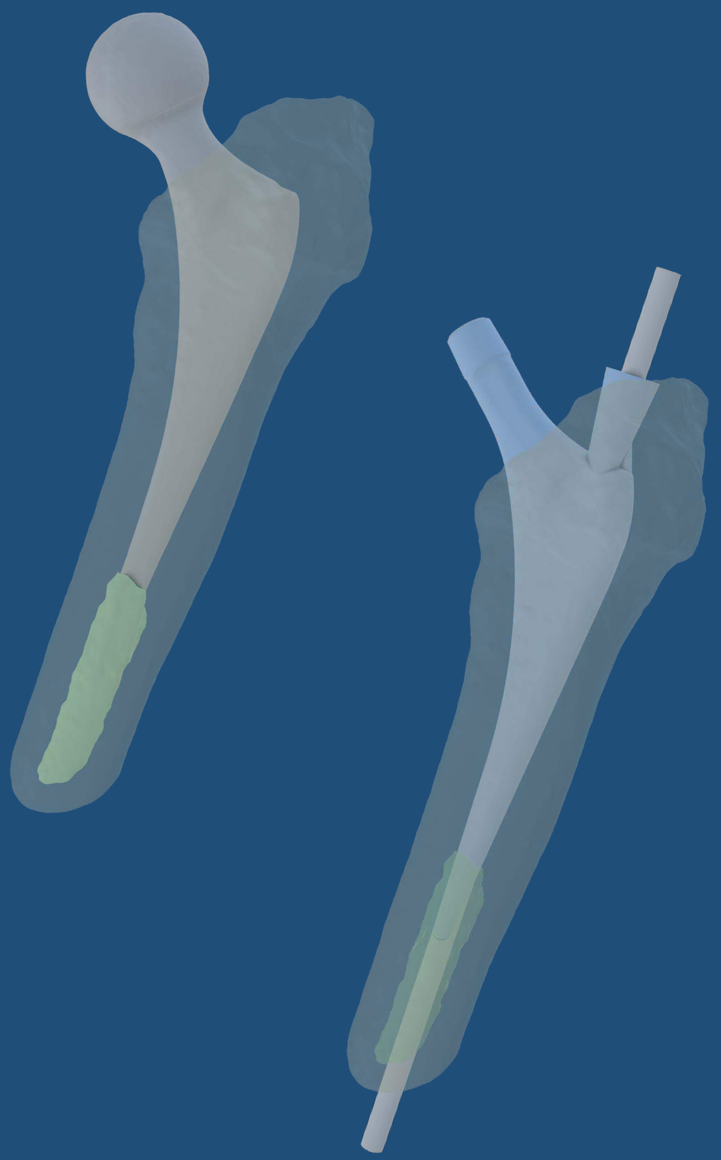
This patient required a surgical correction of their femur and a primary hip arthroplasty. The surgeon requested a 3D Virtual Surgical Plan and a patient-specific surgical cutting guide to assist him in performing the closing wedge osteotomies. CT scans of the pelvis and proximal femurs were used as the basis for the creation of the 3D digital models and guides.

DESCRIPTION

During the procedure, the surgeon mirrored the contralateral femur to establish a balanced correction of the right femur. The surgical guide was designed to fix onto the lateral aspect of the right femur, mid-shaft, reaching the posterior medially to take advantage of the Linea Aspera for anchorage. A small ridge, proximal to the osteotomy was used to anchor the guide.

OUTCOME / BENEFITS

Originally it was envisioned that two cutting guides would be required. However, Insight Surgery's Virtual Surgical Plan gave the surgeon a greater insight and subsequently the surgical plan was modified to include one surgical guide in order to achieve the desired resection in the theatre. A post-operative scan confirmed that the correction was achieved in line with the Digital Plan. The patient was discharged after 9 days with no issues reported. The lead surgeon commented that they "were very impressed with the design input, communication, intra-op support, fit of the jig, and the ease and accuracy of the resection".



CASE STUDY:

Revision of a Cemented Femoral Stem

SUMMARY

Conventional cement removal techniques for femoral stem revision can result in complications or prolonged surgical procedures. After removing a previously implanted femoral stem, it is necessary to clear the cement to achieve a good fixation of a new stem. The cement found distally to the implant is released by drilling and inserting a drill tap that is reverse-hammered using a slap-hammer. Problems arise when the drill diverts from the cement and can breach the femoral cortex. The surgical team approached Insight Surgery to plan and print a sterile guide that allowed them to control the drilling direction and depth, and reduce the risk of perforation of the patient's femur.

DESCRIPTION

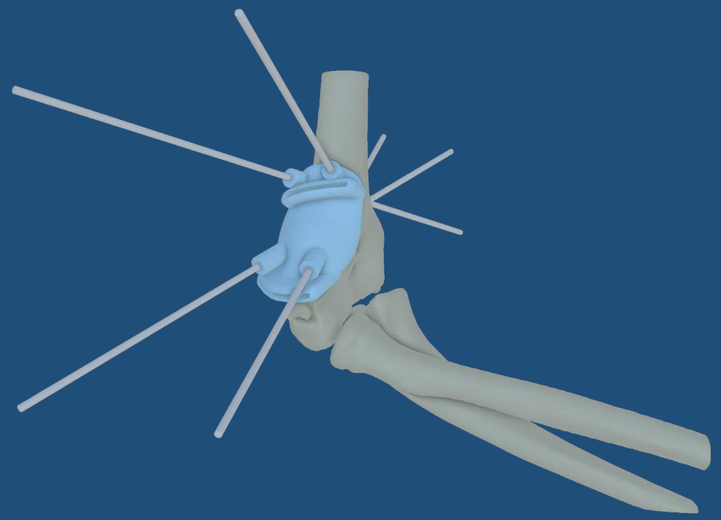
A virtual model of the patient's anatomy and the cement vault within was created from CT scans. These were then 3D printed in an operable material for simulation.

Insight Surgery designed a novel drilling guide, using the geometry of the removed femoral stem with a cannulation through the length of the guide directed towards the cement vault at the base of the implant.

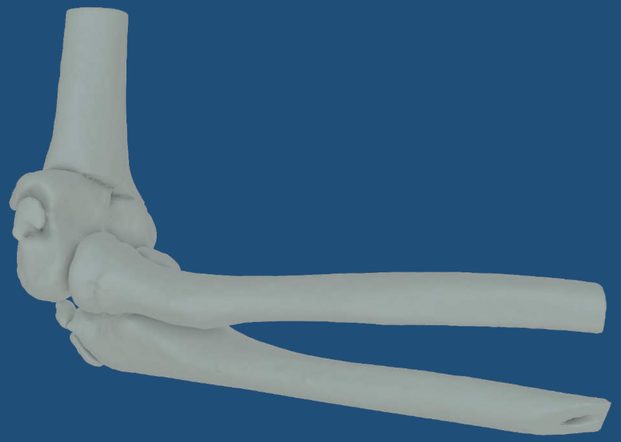
OUTCOME / BENEFITS

The use of the patient-specific drilling guide allowed the surgeons to effectively and efficiently remove the cement from the patient's femur. Damage to the femur was kept to a minimum and no splitting occurred, which had been a serious consideration prior to surgery.

Access to the simulation lab allowed the surgeon to consider the appropriate access, with the greater trochanter of particular focus, ensuring the guide could be used effectively on the day of surgery. These factors led to reduced surgery time, directly benefiting the patient and hospital.



Surgical Guide



Final Result

CASE STUDY:

Distal Humeral Osteotomy for Malunion Correction

SUMMARY

This adolescent patient suffered a supracondylar fracture of their right elbow that in an initial surgery was fixed with K-wires. The affected area was later re-fractured and a cast was provided. This led to a deformity of the distal humerus that required surgical correction in order to alleviate pain and to restore the general aesthetics.

DESCRIPTION

The surgeon requested a 3D modelling of the entire elbow to assess the relationship of the humerus with the proximal radius and ulna.

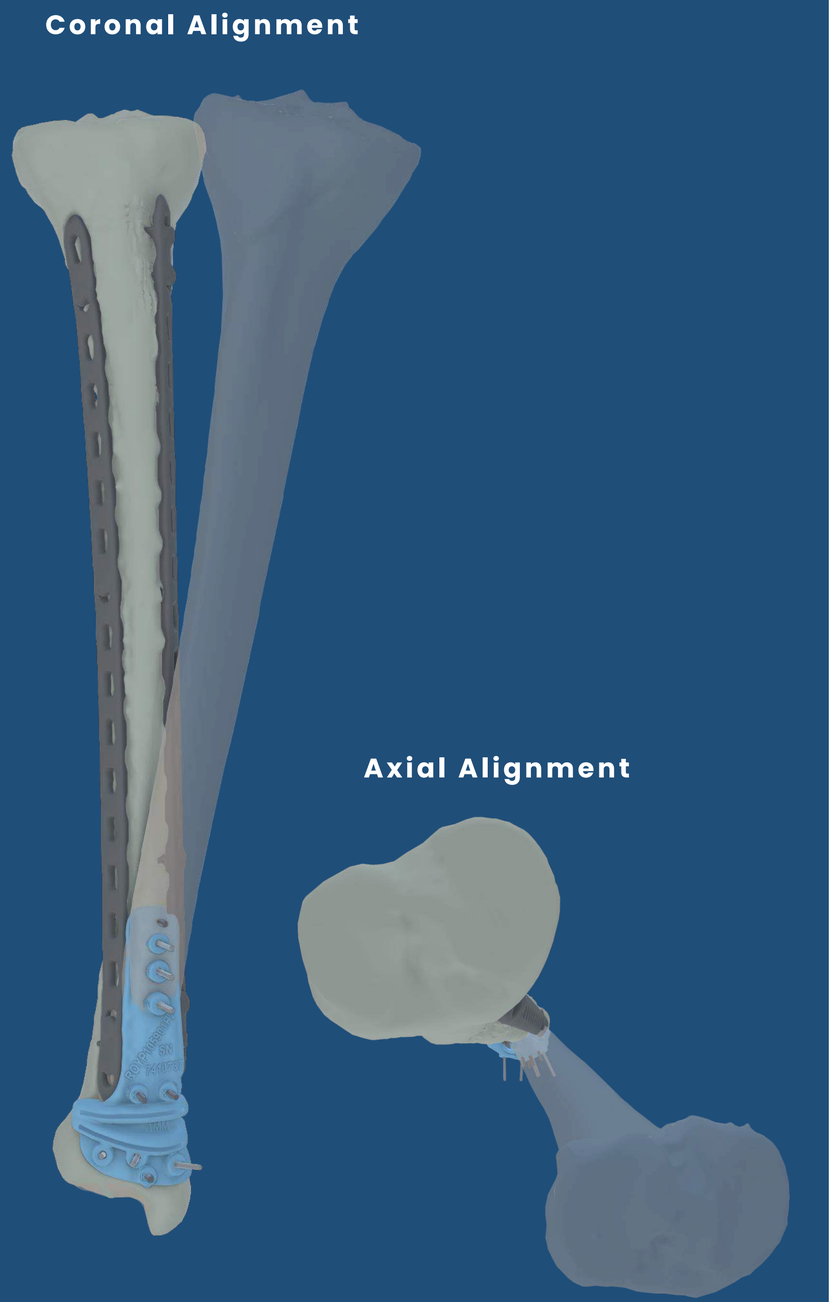
The contralateral anatomy was mirrored to provide a guide for the correction and a virtual plan was produced in line with the surgeon's medial approach.

In this case, the surgeon elected to fix the correction via the introduction of wires, rather than more typical plating solutions.

OUTCOME / BENEFITS

The guides helped the surgeon to accurately find the preplanned location for the osteotomy when the access and field of view of the surgical site were restricted.

The surgeon confirmed that the Virtual Surgical Plan and models helped to alleviate stress in the operating theatre for the surgical team as they had a greater understanding of the complex multiplanar and torsional deformity.



CASE STUDY:

Distal Tibial Osteotomy Following Allograft Reconstruction

SUMMARY

The patient previously suffered from a tumor in the midshaft of their tibia. To treat this, the surgeon reconstructed the tibia using an allograft and medial and lateral plates.

However, over time, a malunion of the distal end of the bone developed meaning a further surgical procedure would be required. A surgical guide was requested to correct this malunion with the distal end going through the native tibia in order to preserve the reconstruction.

DESCRIPTION

A 3D model of both of the patient's tibias was constructed from CT data. The healthy contralateral was mirrored and aligned to the pathological anatomy based on the distal articular surface (as shown in the image).

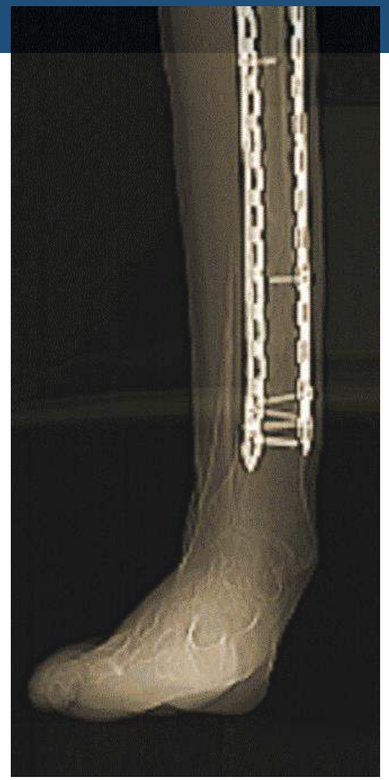
A surgical guide designed by Insight Surgery referenced the existing plating positioning to ensure that any changes in the allograft location would not affect the osteotomy site.

OUTCOME / BENEFITS

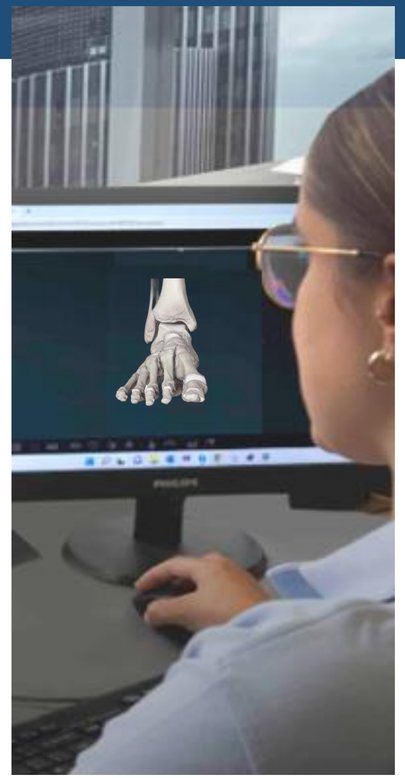
The presence of the allograft and existing plates left only a small site where the osteotomy could be planned. Many added risks that have been associated with this operation if it had been completed freehand were avoided through the use of guides.

From the x-rays taken both intra- and postoperatively it was shown that the final correction closely mirrored that of the plan. The use of these guides and achieving this correction first time helped to somewhat simplify a highly complex operation, benefiting all parties.

Example Workflow for a Distal Tibia Surgical Guide

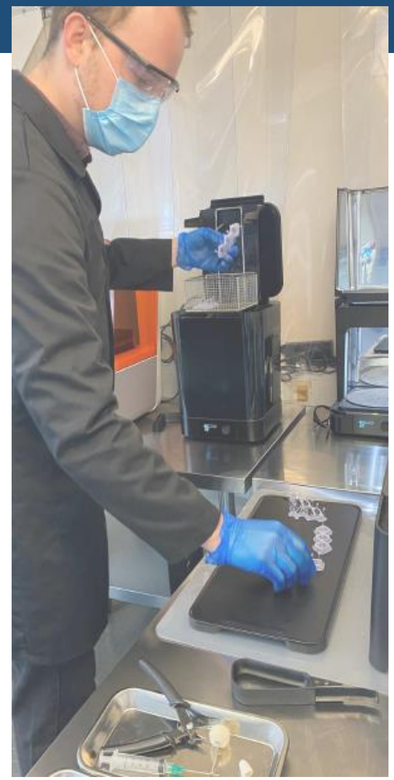


Patient scan & surgeon case instructions received



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

Final review & approval of VSP and devices by surgeon



3D printing of Surgical Guide in our in-house cleanrooms

Surgery is performed using Surgical Guide