

PSI-GUIDED SURGERY

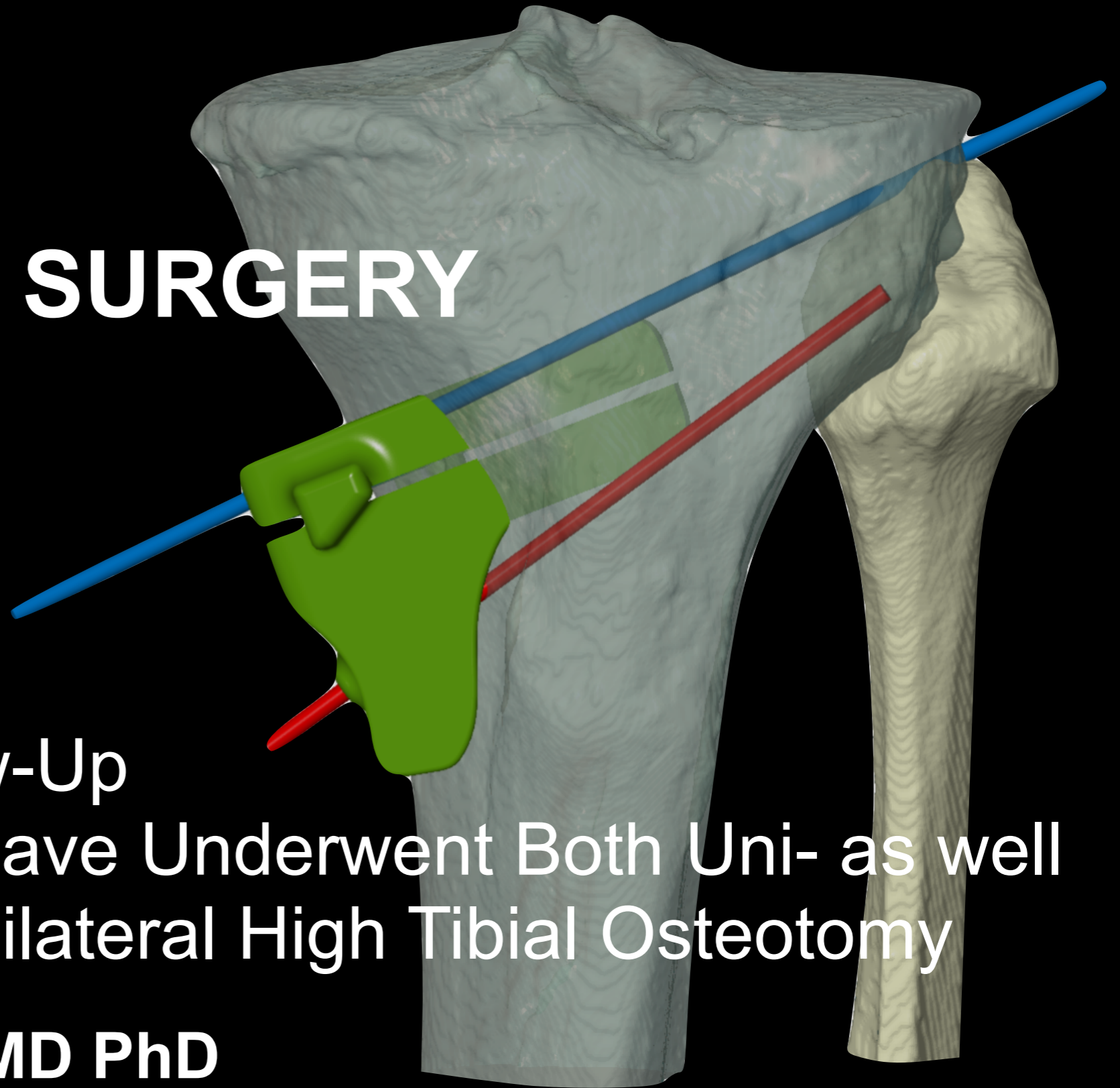
A Four-Year Follow-Up
on Patients Who Have Underwent Both Uni- as well
as Simultaneous Bilateral High Tibial Osteotomy

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**I HAVE
NO FINANCIAL CONFLICTS
TO DISCLOSE**

**I AM
A CONSULTANT
FOR
MEDACTA INTERNATIONAL
ARTHREX**

INTRODUCTION

Personalised Surgical Instruments (PSI)

- ➔ received a lot of attention throughout the last couple of years.
- ➔ 3D-print becoming **more accessible** and **less costly**,
- ➔ 3D-aided surgery has become reality in many medical fields.

Orthopaedic surgeons have employed 3D-printed surgical guides and simulations in:

- ✓ treating **complex fractures**
- ✓ **limb alignment correction** - an alternative to the early total knee replacement (TKA) that has become popular with the today's society preferring to keep a more active lifestyle than in the past.

MATERIAL & METHODS

- **88 patients (35 men 33 women), mean age: 53 years old**
- **117 3D-guided HTOs between 2018 and 2022 with the mean follow-up of 38 weeks (12 months)**
 - 84 unilateral procedures
 - 17 single-stage bilateral procedures (advanced OA cases)
 - 14 two-stage bilateral procedures
 - 2 hybrid procedure: partial knee replacement + osteotomy
- **2 surgeons** at two different levels of experience using PSI HTO solution
- **in a number of cases there were concomitant injuries, incl.:**
 - meniscal lesions; meniscal root tears
 - chondral lesions (grades II - IV)

MATERIAL & METHODS

DIAGNOSTICS

STEP 1: PHYSICAL EXAMINATION

- **all patients** had pre- and post-op consults
 - follow-up consults were recommended at 3-4 (ultrasound-guided PDGF injection), 6, and 12 weeks, then every 3 months up to 2 years

STEP 2: IMAGING DIAGNOSTICS

- **all patients** did pre-op CT scans for 3D joint rendering and correction simulation
- **all patients** did pre- and post-op X-Rays (long limb axis AP, knee joint AP and LAT images)
 - follow-up X-Rays were ordered at 4, 6 and 12 weeks, and later at **6, 9, 12,** and **18** months
- in the majority of cases patients did pre- and post-op MRI scans

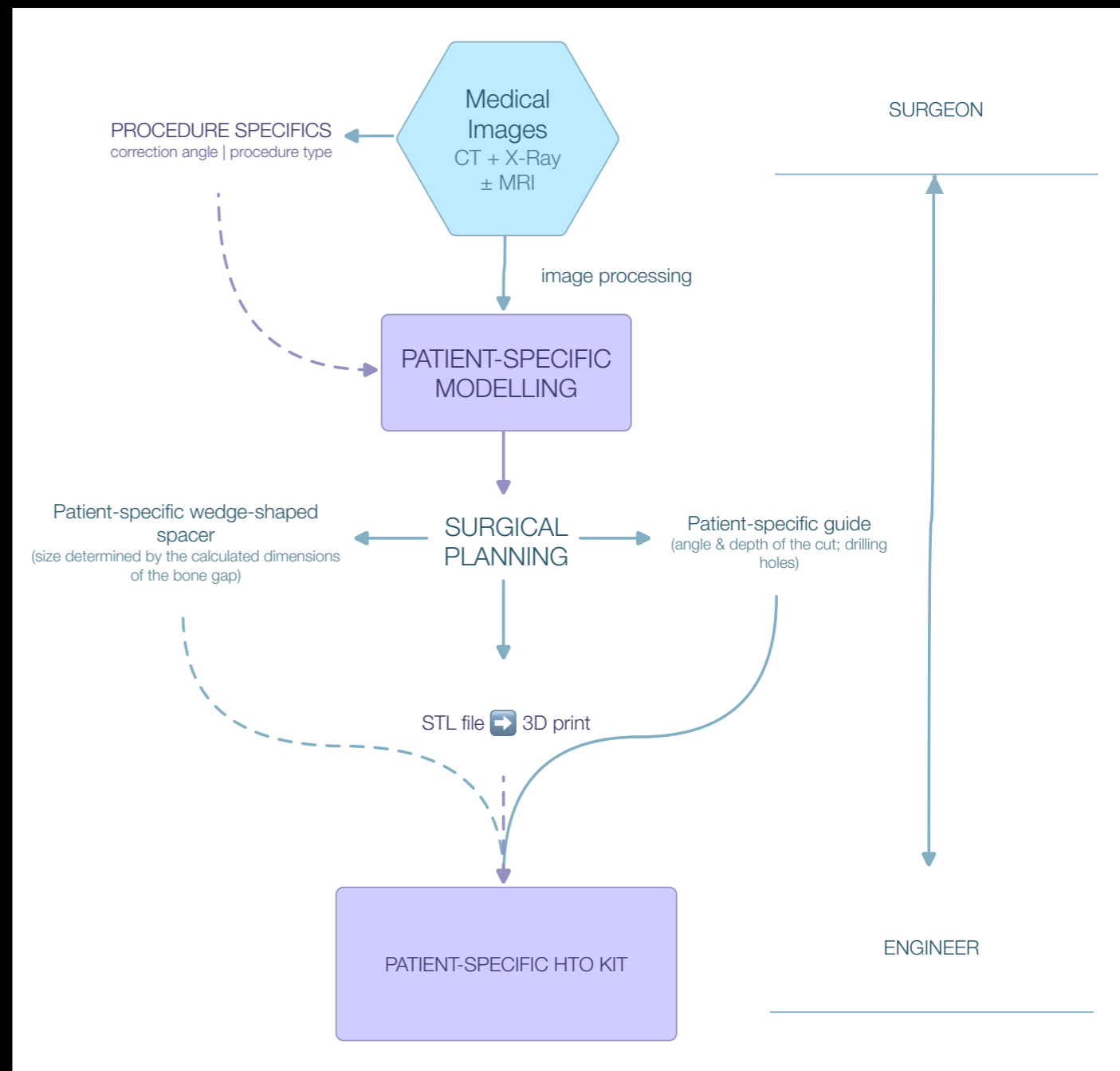
3D-AIDED HTO: **STAGE I**

PROCEDURE PLANNING & MEDICAL IMAGES PROCESSING

REQUIRED IMAGING DIAGNOSTICS:

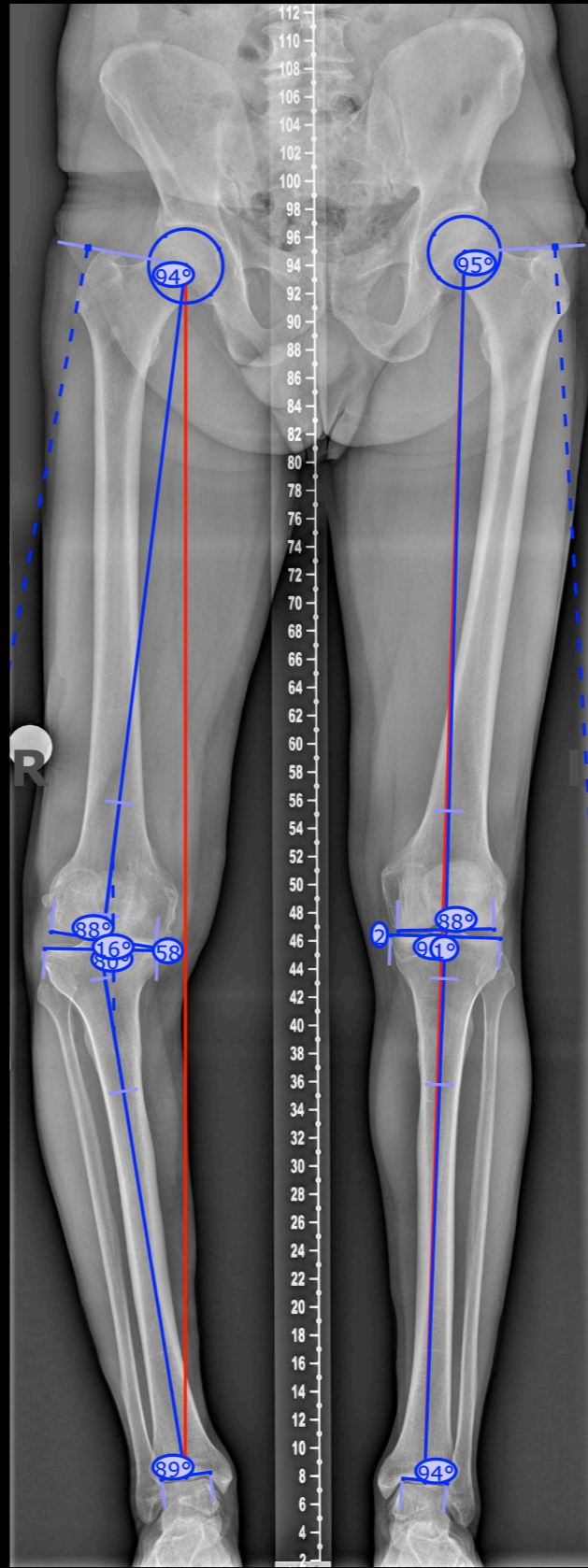
- **limb long axis X-Ray** (patellas directed forward) to **determine the correction angle**
- **MRI scan to locate vessels** and plan the procedure that would best **protect** them
- **CT scan (1/3 distal femur to 1/3 proximal tibia)** to comprehensively **simulate** the procedure and **produce** project files for 3D-print

Note: *pre-operative planning ensures less decision making during surgery thus improving chances of success for less experienced surgeons*

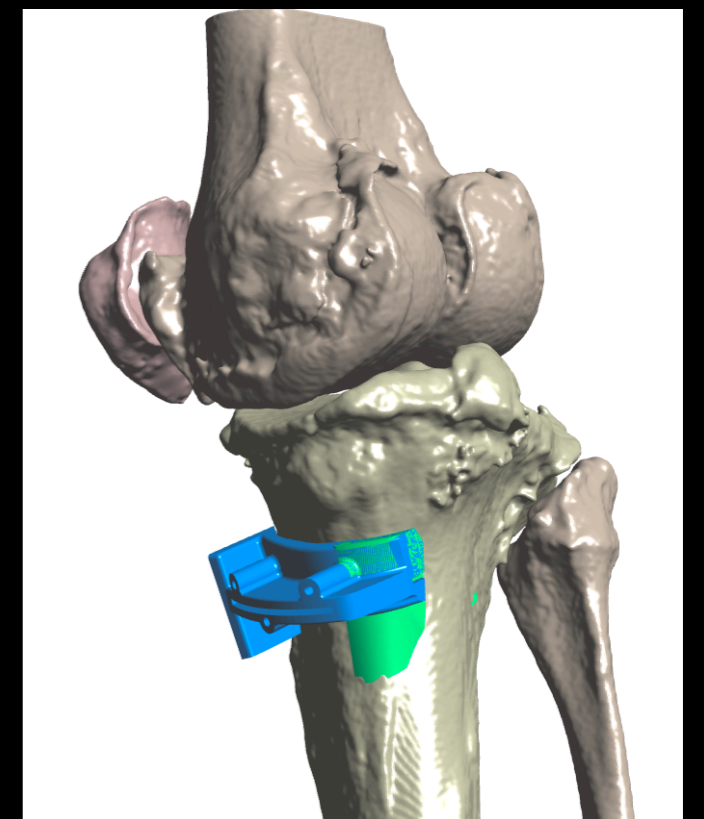
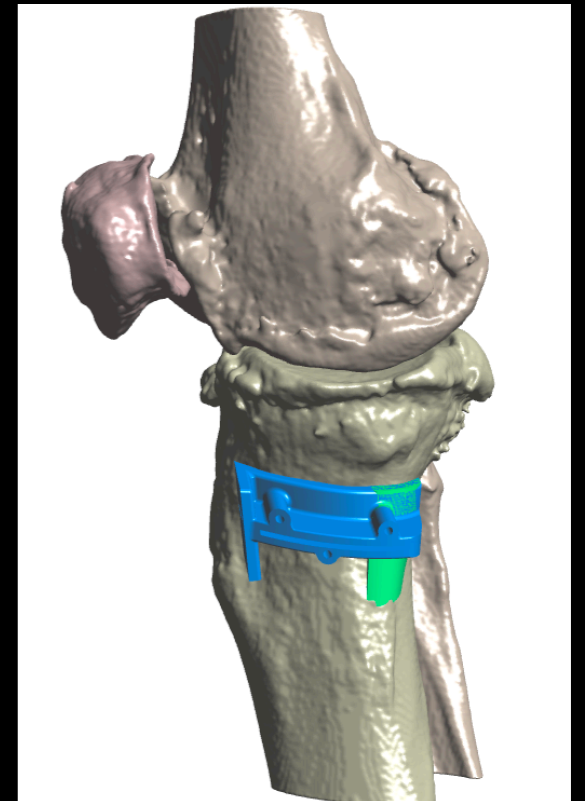




BEFORE



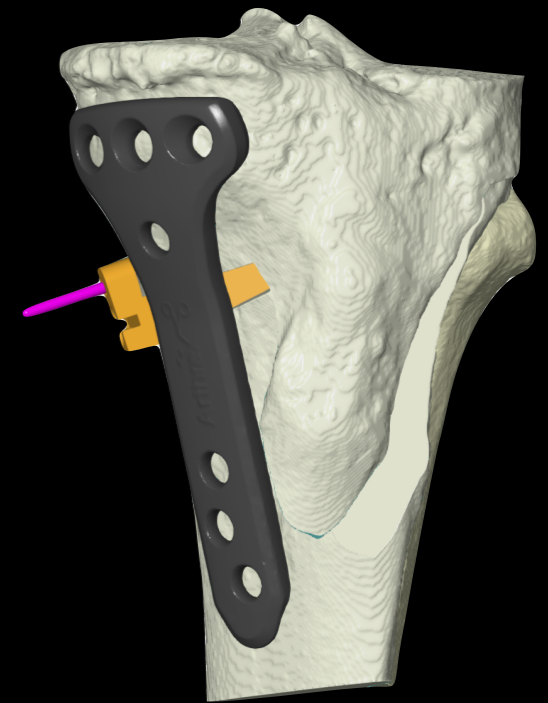
**PRELIMINARY
MEASUREMENTS**



**GUIDE
VISUALISATION**

THE TECHNIQUE

KEY POINTS



FOR SURGEON

AN ORIGINAL SURGICAL APPROACH
CONCEPT THAT

- **does not** require a surgeon to **cut the pes anserinus**
- assumes the **MCL and popliteus muscle** are peeled of as **ONE flap**

AND **WHEN PLANNED PROPERLY** ALLOWS FOR:

- a quick (from 27 to 41 minutes, excl. arthroscopy) & easy-to-perform procedure
- reduction of the need for “on the go” decision-making in the OR

FOR PATIENT

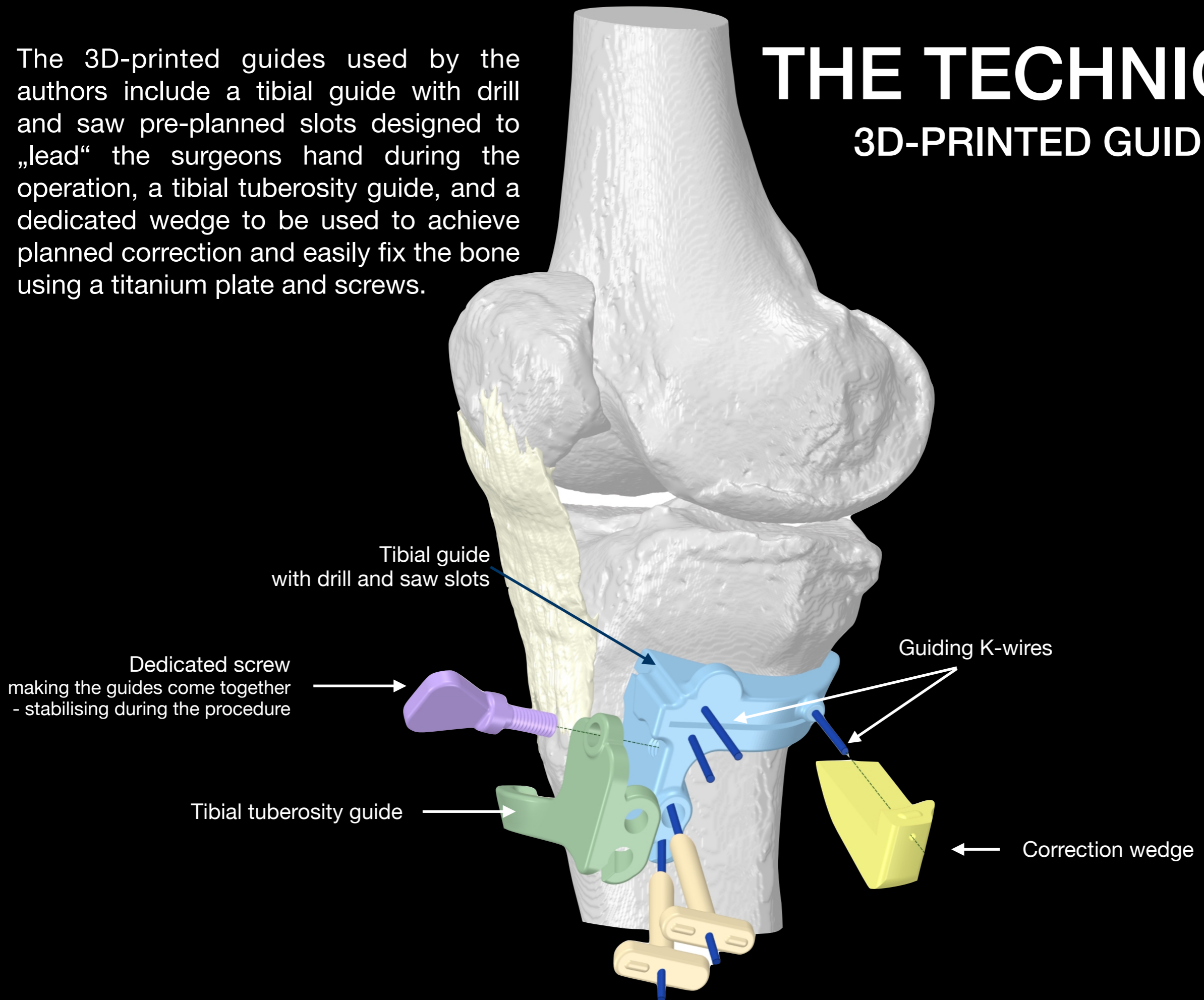
AN ORIGINAL SURGICAL APPROACH
CONCEPT THAT **WHEN PLANNED
PROPERLY PROVIDES:**

- better protection of blood supply for the proximal tibia = **shorter healing time & less blood loss**
- smaller incision = **less trauma for soft tissues**
- less intra-operative X-ray monitoring = **less radiation**

The 3D-printed guides used by the authors include a tibial guide with drill and saw pre-planned slots designed to „lead“ the surgeons hand during the operation, a tibial tuberosity guide, and a dedicated wedge to be used to achieve planned correction and easily fix the bone using a titanium plate and screws.

THE TECHNIQUE

3D-PRINTED GUIDES

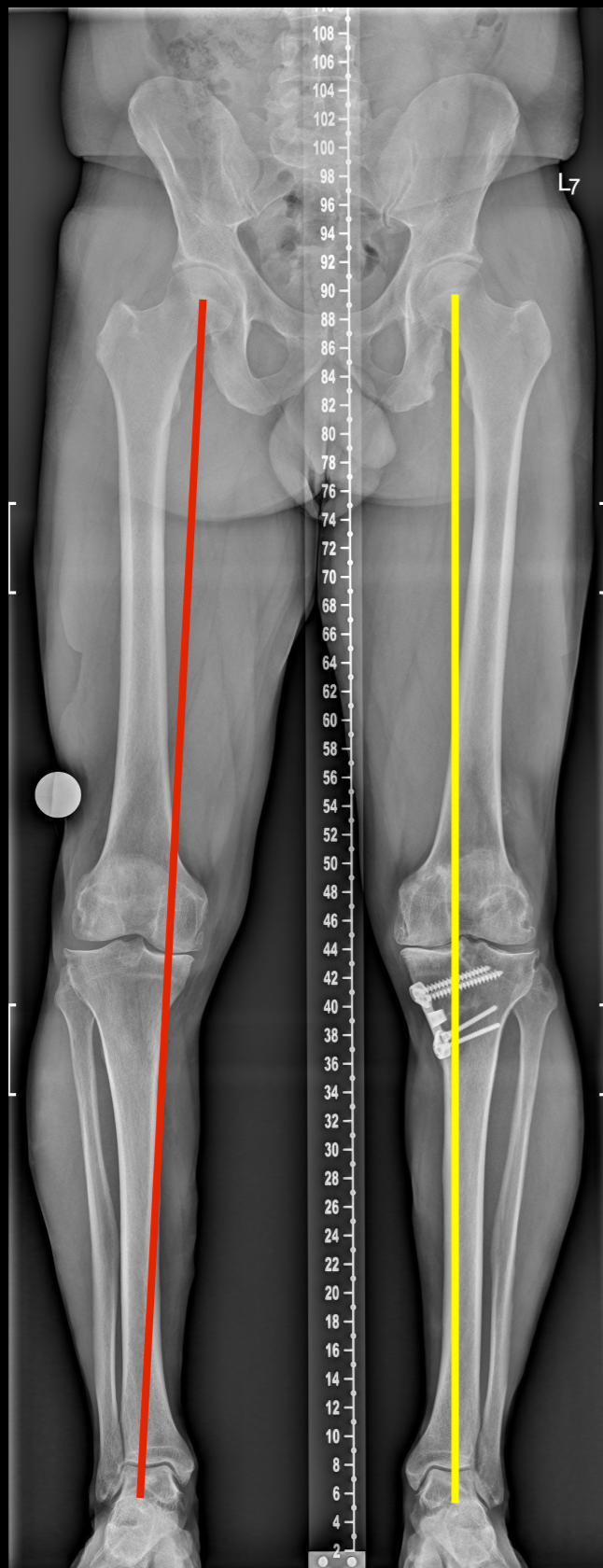


All patients reported significant improvement in their everyday functioning compared to the time before the surgery.

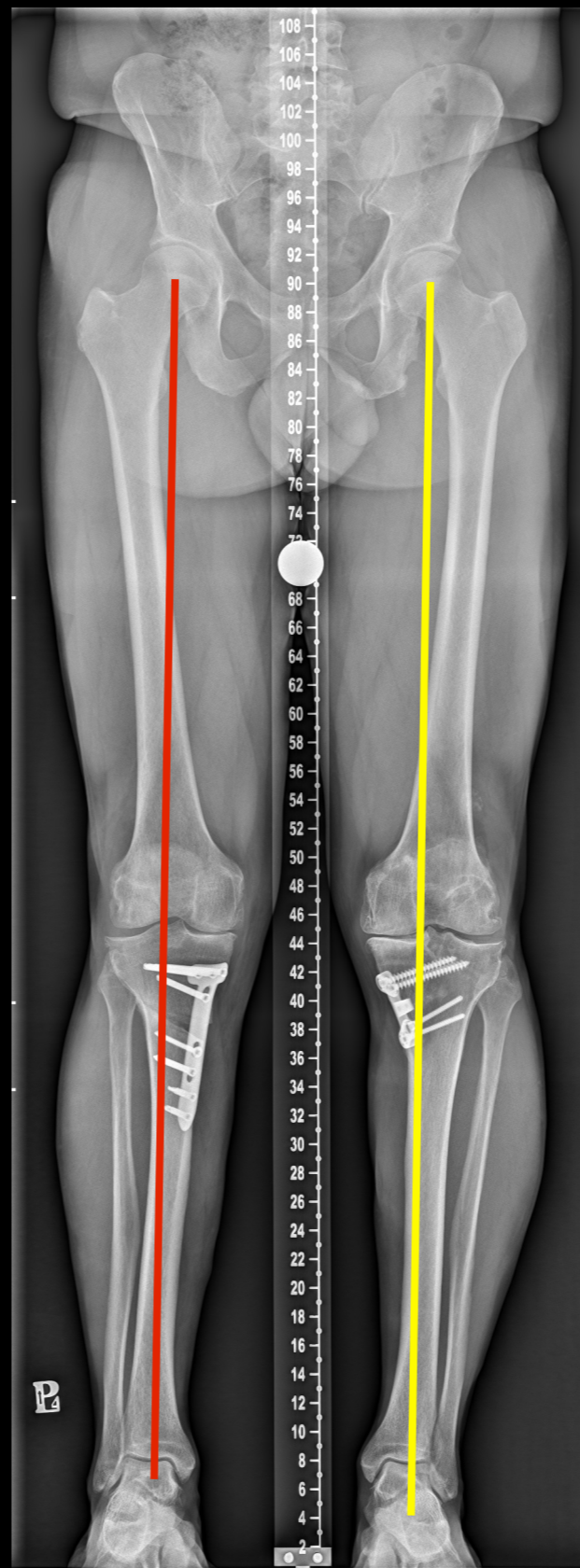
RESULTS

- **117 procedures** performed so far without any major complications on the record
- correction angle range: 5° to 16° (mean correction angle at 10,41°)
- planned correction angle achieved with +/- 1 deg. **accuracy**
- less swelling and discomfort post-op; less blood loss during the surgery
- patient **ambulatory** at discharge (**>120kgs**) (crutches, full weight-bearing allowed), physical therapy starting at discharge
- **excellent** soft tissues healing rate - between 4 and 8 weeks post-op
- **excellent** bone healing progress - between 6 and 12 weeks post-op

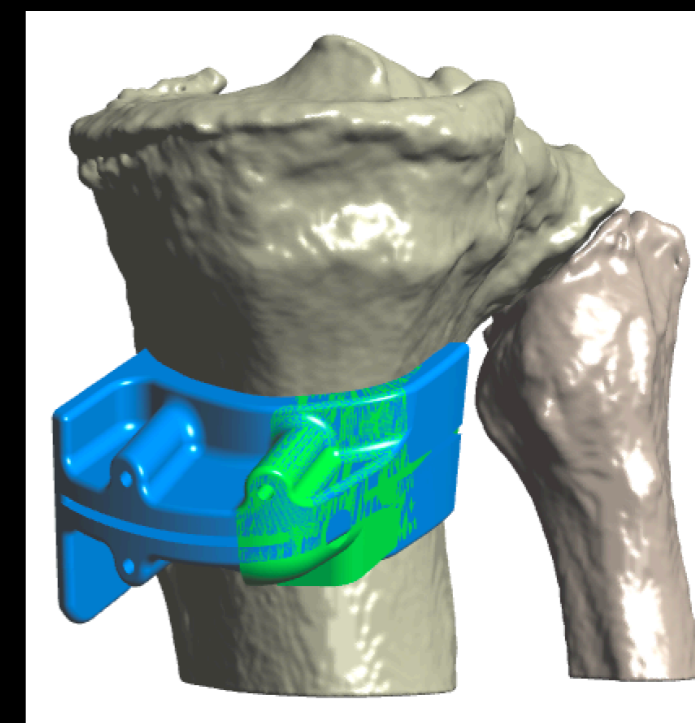
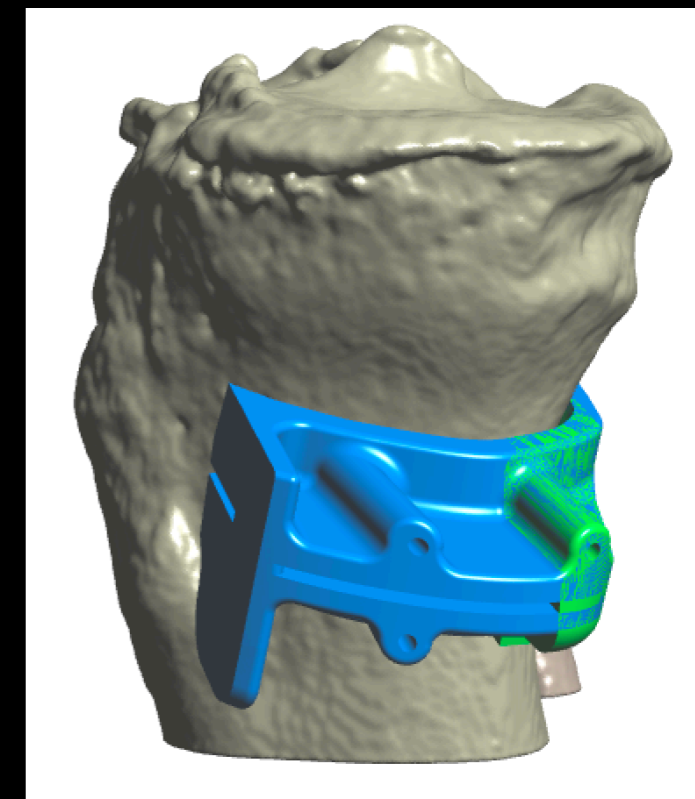




BEFORE



**3 MONTHS
POST-OP**



**GUIDE
VISUALISATION**

PSI-aided surgery allows for significant reduction of time and effort required for lower extremity alignment correction.

CONCLUSIONS

- tailor-made to the needs of the patient
- simple methodology: easy to **plan**, easy to **produce** and easy to **perform** even for less experienced surgeons
- they offer more safety for the patient (less intra-operative blood loss, less chance of destruction of blood vessels, less decision-making and chances of errors or complications during the surgery, less radiation - little to none intra-operative X-ray exposure)
- **quicker recovery** for the patient (immediately ambulatory, improved healing rates)
- surgery executed with **higher precision**
- recommended **treatment option** in cases of prMM lesions even if only a small (3-4°) correction is required

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