ISAKOS CONGRESS 2025 | MUNICH GERMANY June 8–11

# Use of Patient-Specific 3D-Printed Intraoperative Spacers in Complex Revision Total Knee Arthroplasty. Surgical Technique and Preliminary Results.


G. Vittone, M. Motta, M. Adriani, A. Guizzi, A. Colosio, G. Milano

*Department of medical and surgical specialties, Radiological Sciences, and Public Health, University of Brescia, Brescia, Italy*


# Faculty Disclosure Information

## Giuseppe Milano:

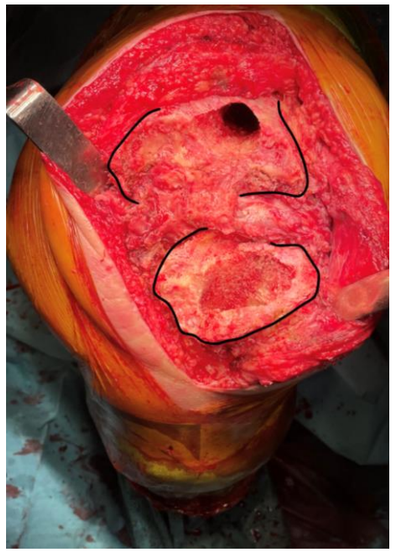
- Arthrex, Inc: Other financial or material support; Paid consultant; Paid presenter or speaker; Research support
- CONMED Linvatec: Paid presenter
- FGP srl: Other financial or material support; Research support
- Greenbone: Research support
- Medacta: Research support
- ISAKOS: Committee member
- Italian Society of Orthopaedics and Traumatology (SIOT): Board member
- Arthroscopy: Editorial board
- Joints: Governing board

The other authors have no conflict of interest to disclose

# Background

**Periprosthetic joint infections (PJIs):**

- **Bone loss**
- Loss of **anatomical landmarks**



Currently, **bone loss** and **component positioning** are evaluated using **approximate references to joint line height.**

**Poor accuracy!**

**3D-Planning** might **improve accuracy** in **restoring native articular geometries!**

**Why not take our planning into the operating field?**

ISAKOS CONGRESS 2025 | MUNICH GERMANY June 8–11



*Tarazi 2021, Rosso 2022, Balato 2024*

# Purpose

- Describe a new surgical technique based on the **3D-reconstruction of bone defects** and **creation of 3D-printed spacers to guide placement** of prosthetic components.

- Evaluate preliminary **clinical and radiographic results** of this technique in patients who underwent **two-stage RTKA for the treatment of PPJI**.

# Materials and methods

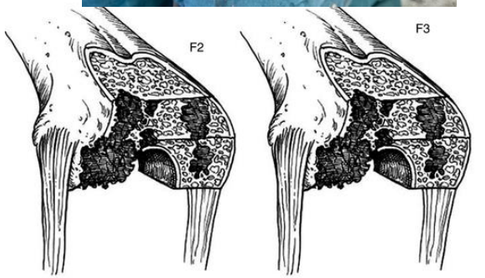
**Study design:** Technical note – Retrospective case series

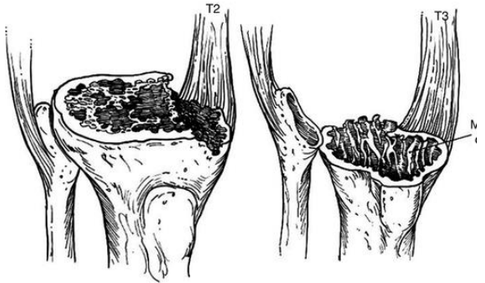
**Inclusion criteria:**

- ✓ AORI bone defects IIA or above (tibia or femur)
- ✓ Two-stage revision surgery for PJI

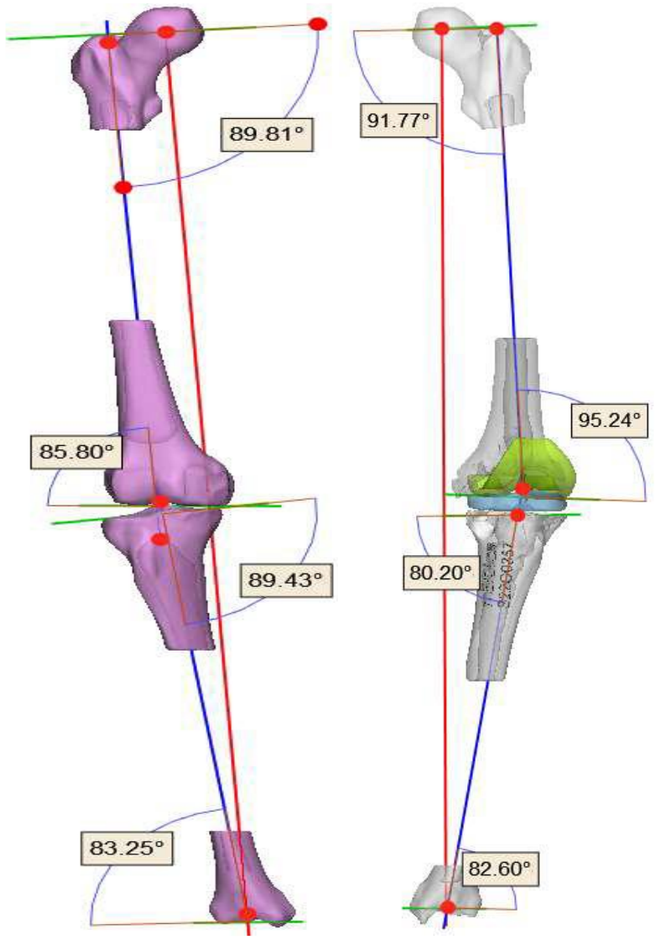
**Exclusion criteria:**

- ✓ Severe contralateral morphological alterations
- ✓ Contralateral knee arthroplasty



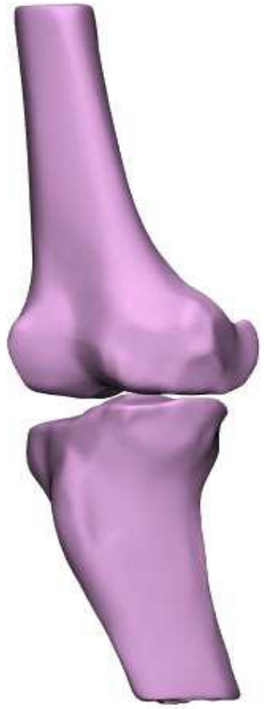



# Technical note




## 1° Step:

- Bilateral hip-knee-ankle CT-scan prior to 2° stage
- 3D-reconstruction and mirroring

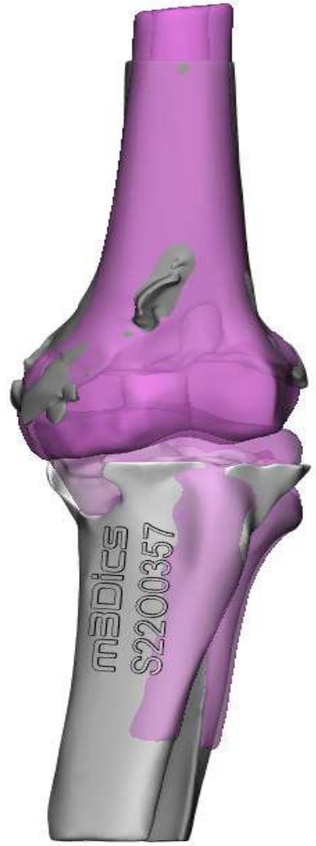


**3D-reconstruction**

**+**

**Contralateral mirroring**

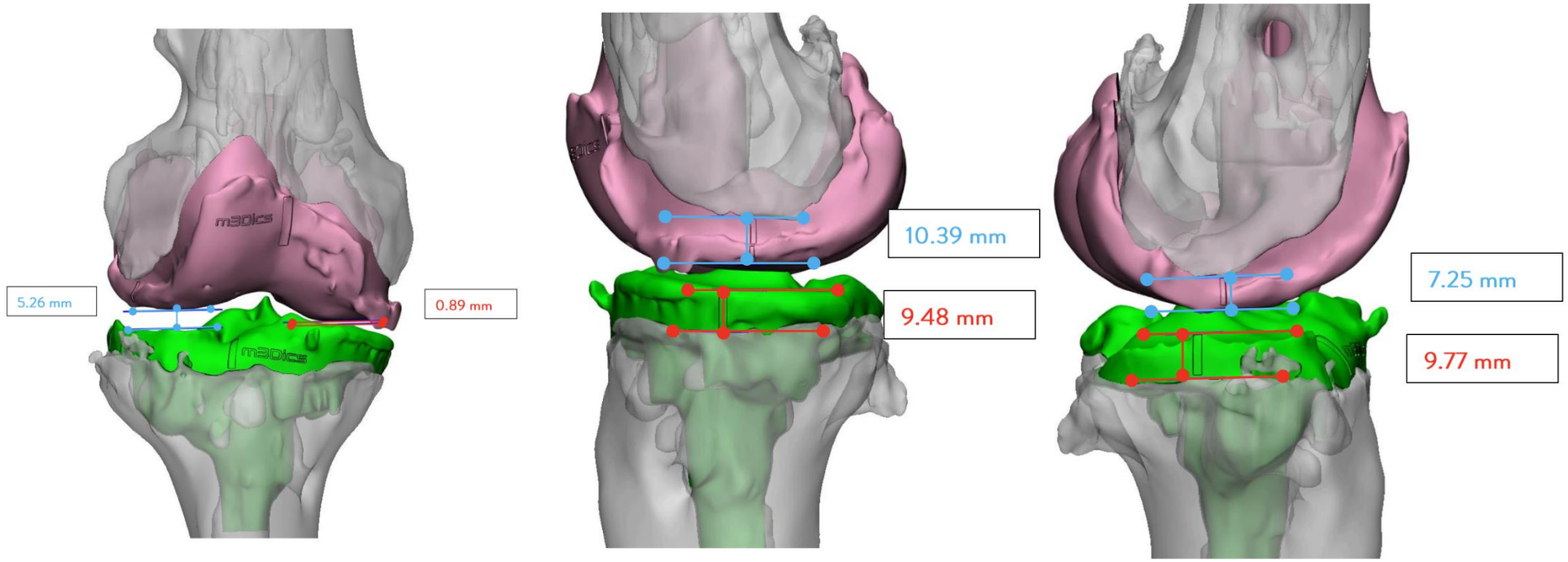
[Dedicated software]




ISAKOS CONGRESS 2025 | MUNICH GERMANY June 8–11

# Technical note

**2˚ Step**: bone loss and articular gap evaluation



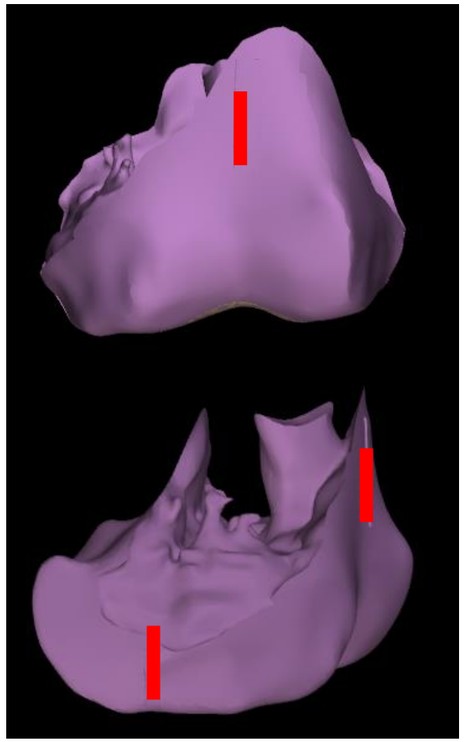

**Bone loss estimation via subtraction and articular gap evaluation**

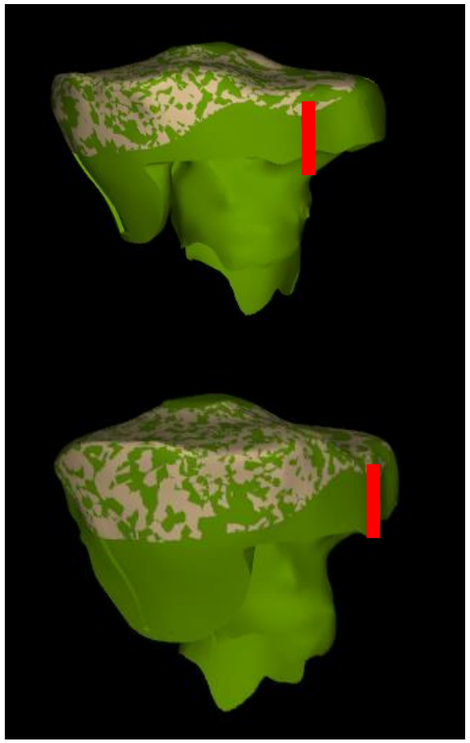
ISAKOS CONGRESS 2025 | MUNICH GERMANY June 8–11

# Technical note

**Identification of anatomical landmarks on 3D models:**

- Medial epicondyle
- Lateral epicondyle
- Troclear sulcus
- Anterior tibial tuberosity



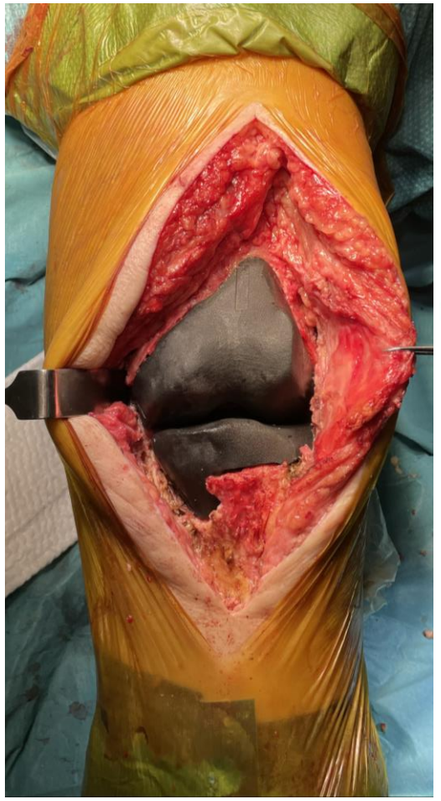


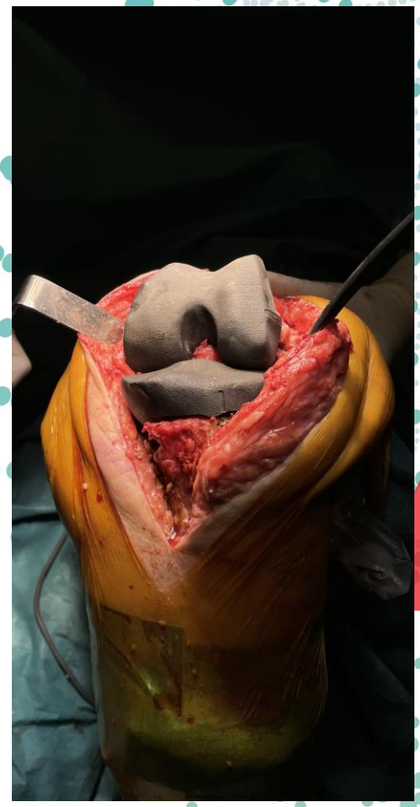
**3˚ Step**: Landmarks

# Surgical technique

## Step 1 - Debridement:

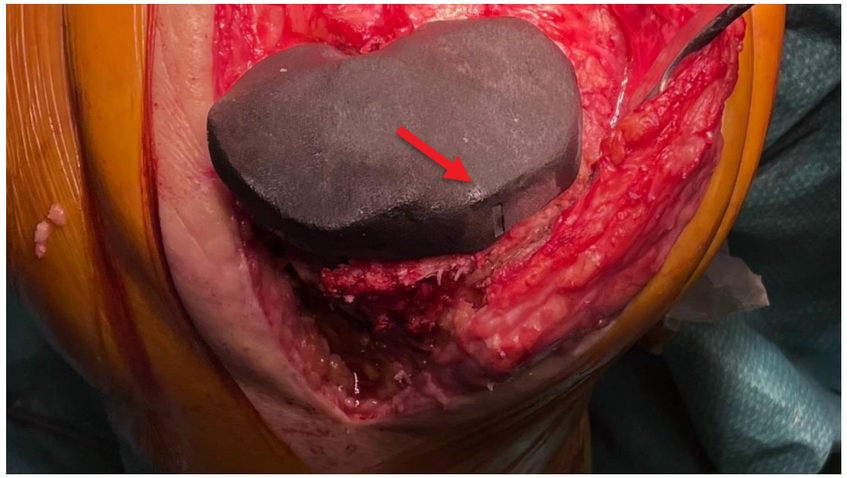
- Accurate removal of cement and soft tissues
- The surgeon must preserve all bone stock

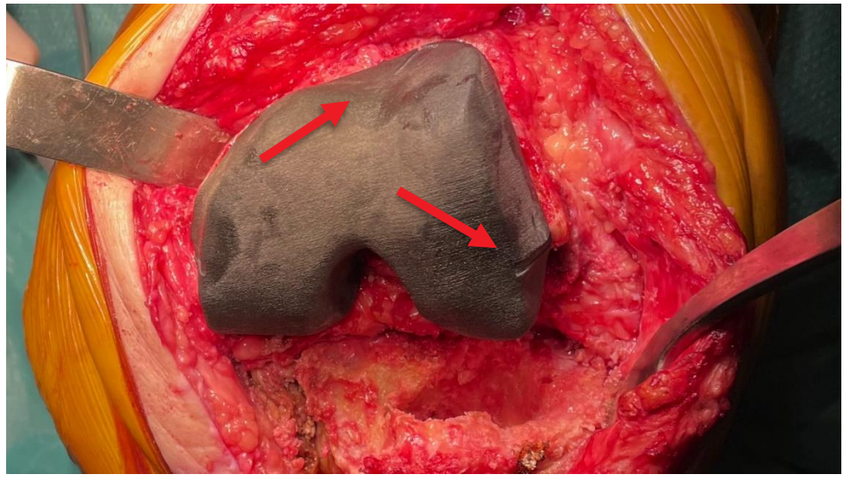




## Step 2 - Guide positioning

# Surgical technique





**Step 3 - Landmarks**

- The marks are used to determine rotational alignment
- The guides are used as reference to determine joint line height

ISAKOS CONGRESS 2025 | MUNICH GERMANY June 8–11

# Results

**Two-stage revision TKA for PJI:**

- **Population:** 10 patients (8M – 2F)
- January 2023 – September 2024
- **Mean age:** 72 ± 8.1 y/o
- **Mean F-U:** 13.7 ± 1.5 months

**Clinical and radiographic evaluation:** 6 months after surgery

| PROMs: | Mean ± SD |
|---|---|
| KSS | 85.8 ± 9.7 |
| KSS Function | 52.0 ± 22.3 |
| KOOS-JR | 78.2 ± 11.2 |
| FJS-12 | 70.1 ± 17.8 |
| ROM (°) | 108.9 ± 9.6 |

| Measurements: | Mean ± SD |
|---|---|
| HKA(°) | 179.9 ± 2.8 |
| mLDFA(°) | 90.3 ± 1.9 |
| mMPTA(°) | 90.7 ± 1.2 |
| PTS(°) | 1.1 ± 0.7 |
| Δ FJLH(mm) | -2 ± 2.1 |

Δ **FJLH**: femoral joint line height difference compared to contralateral side

ISAKOS CONGRESS 2025 | MUNICH GERMANY June 8–11

# Conclusions

The use of patient-specific guides obtained through contralateral mirroring and 3D printing allows the surgeon to:

- **Improve the accuracy** in restoring joint line height
- Fully evaluate bone loss and facilitate **intraoperative identification of anatomical landmarks**
- **Define the correct rotation of the components**, especially in septic revision TKA with major bone loss

# References:


- Tarazi JM, Chen Z, Scuderi GR, Mont MA. The Epidemiology of Revision Total Knee Arthroplasty. J Knee Surg. 2021 Nov;34(13):1396-1401. doi: 10.1055/s-0041-1735282. Epub 2021 Sep 10. PMID: 34507367.

- Zhang, R., Lin, J., Chen, F. et al. Clinical and radiological outcomes in three-dimensional printing assisted revision total hip and knee arthroplasty: a systematic review. J Orthop Surg Res 16, 495 (2021). https://doi.org/10.1186/s13018-021-02646-5

- Rosso, F.; Rossi, R.; Cottino, U.; Dettoni, F.; Bruzzone, M.; Bonasia, D.E. Three-Dimensional Printed Models in Pre-Operative Planning of Complex Primary and Revision Total Knee Arthroplasty. Appl. Sci. 2022, 12, 9618. https://doi.org/10.3390/app12199618

- Balato G, De Matteo V, Guarino A, De Mauro D, Baldi D, Cavaliere C, Salvatore M, Citak M, Mariconda M. A comparison between 3D printed models and standard 2D planning in the use of metal block augments in revision knee arthroplasty. Jt Dis Relat Surg. 2024 Aug 14;35(3):473-482. doi: 10.52312/jdrs.2024.1591. Epub 2024 Aug 14. PMID: 39189555