#2016 - Free Papers

The Use Of Contralateral Mirroring And 3D-Printed Guides To Restore Joint Line Height And Alignment In Complex Revision Total Knee Arthroplasty.

Orthopaedics / Knee & Lower Leg / Joint Replacement - Secondary

Francesco Carrera[1], Fabio Casiraghi[1], Isabella Husband[1], Luca Ogliari[1], Andrea Pratobevera[1], Emanuele Maggini[2], Alessandra Scaini[2], Giulio Vittone[1], Valerio Daffara[2], Giuseppe Milano[2]

1. University of Brescia, Brescia, Italy
2. ASST Spedali Civili di Brescia, Brescia, Italy

Keywords: Revision TKA, PJI, PSI

Background
One of the main challenges in revision total knee arthroplasty is bone loss management. This is especially true when dealing with periprosthetic joint infections (PJI). Bone loss can lead to a complete disruption of bony landmarks that would normally guide the surgeon in prosthetic components positioning.

Objectives
The aim of this work is to present the rationale and results of a newly developed surgical tool that employs contralateral joint mirroring and 3D printing to create templates that help the surgeon achieve correct prosthesis placement in complex revision total knee arthroplasty.

Study Design & Methods
Retrospective case series and technical note. A review of 33 patients undergoing two-stage revision total knee arthroplasty with 3D CT-based planning from January 2023 to June 2025 was conducted. Every patient underwent a full leg bilateral CT scan after debridement and removal of prosthetic components. A software was used to process CT images and develop a tridimensional reconstruction of the lower limbs. A dedicated algorithm was used to estimate bone loss on the explanted knee through superimposition and mirroring of the contralateral knee. Markers were digitally applied to the tridimensional reconstructions of the tibial and femoral bone defects highlighting the epicondyles, trochlear groove and tibial tuberosity. Sterile 3D printed femoral and tibial templates were produced and used intraoperatively to determine joint line height and prostethic component rotation. At every follow-up (F-U) visit, patients underwent full length weight bearing radiographs, range of motion (ROM) evaluation and were asked to answer Forgotten-Joint-Score-12 (FJS-12), Knee Injury and Osteoarthritis Outcome Score for Joint Replacement (KOOS-JR), Knee Society Score (KSS) to assess joint function and awareness.

Results
Mean age was 71.3 ± 8.21 years and mean follow-up was 8.7 ± 6.2 months. All patients underwent two-stage revision total knee arthroplasty following PJI and presented with Anderson Orthopedic Research Institute (AORI) classification type 2 or higher femoral bone defects and type 2 or higher tibial defects. Neutral alignment was restored in all cases. On average, the difference in femoral joint line height (FJLH) between the contralateral knee and the postoperative X-Rays was 3.4±3.5 mm. No major complications were registered during follow-up. Lag extension was observed in 2 patients, all other patients regained full knee extension. The mean postoperative ROM in flexion was 111.50°±14.3°. Postoperative patient reported outcomes showed a mean FJS-12 53.98±29.82, KOOS-JR 67,07±18.37, KSS-KneeScore 82.94±15.49 and KSS-FunctionScore 53.47±23.73.

Conclusions

The use of contralateral mirroring and 3D-printed guides in complex revision total knee arthroplasty allows accurate depiction of the bone defect and facilitates restoration of joint line height and limb alignment. This tool can help the surgeon identify bony landmarks, determine the correct size and rotation of the prosthetic components, and restore joint line height while minimizing the need for extensive soft-tissue releases.

Updated on 17.11.2025 21:56:00