

Technical Note

ROSA™ Imageless Robotic-Assisted Conversion from Unicompartmental to Total Knee Arthroplasty: A Novel Surgical Technique and Case Report

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Highlights

What are the main findings?

- After landmark registration with the previous UKA in situ, the surgical flow starts with the tibial cut using an “inverse functional alignment” approach, followed by the distal femoral cut.
- Femoral component rotation and size is ultimately defined using the Zimmer FuZion™ tensioner (Zimmer Biomet, Warsaw, IN, USA) with the UKA femoral component in situ and after implant removal.

What are the implications of the main findings?

- This technique allows for restoration of native joint line obliquity and height, avoiding confounding factors related to posterior condylar bone loss after UKA removal.
- To our knowledge, this is the first imageless robotic-assisted technique that exploits the pre-existing femoral resurfacing performed during UKA to achieve accurate gap balancing, restoring not only native ligament tension but also the patient’s constitutional knee anatomy.

Abstract

Background: Unicompartmental knee arthroplasty (UKA) is an effective treatment for isolated compartment knee osteoarthritis, but it is associated with a higher risk of revisions. UKA-to-TKA conversions remain surgically challenging. In particular, the restoration of correct femoral rotation is difficult, mainly because of bone loss and altered anatomical landmarks. We describe a novel imageless robotic-assisted technique for UKA-to-TKA conversion using the ROSA™ robotic system and report a representative clinical case. **Methods:** After a standard medial parapatellar approach and joint exposure, the landmarks are registered with the UKA in situ, followed by the standard workflow for a robotic-assisted primary TKA according to the “inverse functional alignment” philosophy (virtual planning, tibial cut, planning adjustment, distal femoral cut and planning adjustment). At last, the femoral component rotation is defined using the FuZion® tensioner, with the UKA femoral component being left in situ to compensate for the lateral posterior condyle bone loss. **Results:** A 72-year-old female patient underwent robotic-assisted lateral UKA-to-TKA conversion due to aseptic loosening of the tibial component. Accurate bone resection, restoration of alignment, and soft tissue balancing were achieved, avoiding the use of augments. Postoperative recovery was uneventful, with satisfactory clinical and functional



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outcomes at 3-month follow-up. **Conclusions:** Imageless robotic-assisted UKA-to-TKA conversion using the ROSA™ system seems a valuable aid in these complex scenarios. To our knowledge, this is the second report describing this procedure using the ROSA™ robot and the first presenting a distinct surgical technique. Further studies on larger cohorts are needed to confirm this technique efficacy and possible limitations.

Keywords: unicompartmental knee arthroplasty; total knee arthroplasty; robotic-assisted TKA; robotic-assisted UKA-to-TKA conversion; tensioner; ROSA™; imageless; UKA revision; functional alignment; inverse functional alignment

1. Introduction

Unicompartmental knee arthroplasty (UKA) currently represents an optimal surgical option for the treatment of knee osteoarthritis when limited to a single compartment and in the absence of anterior cruciate ligament deficiency [1]. By restoring native knee biomechanics, UKA allows faster postoperative recovery, earlier return to daily activities, higher quality of life and a greater range of motion compared with primary total knee arthroplasty (TKA) [2,3].

Despite these advantages, UKA is associated with a higher risk of complications than TKA, including progression of osteoarthritis, aseptic loosening of components, infection, periprosthetic fractures, malalignment, and persistent postoperative symptoms [4–7]. In such cases, revision surgery with conversion from UKA to TKA is indicated [4]. Nevertheless, during this procedure, the restoration of native joint spaces and biomechanics remains challenging due to the partial loss of intra-articular landmarks [8–10].

The introduction of robotic-assisted arthroplasty offers a potential solution to these challenges, enabling improved bone preservation, enhanced soft tissue balancing, and more accurate limb alignment [9–11]. Despite this, most of the available studies on robotic-assisted UKA-to-TKA conversion, and particularly those involving imageless robotic platforms, do not provide a detailed description of how femoral component rotation should be determined, despite the frequent posterior femoral bone loss following the previous surgery [7,9,12–18]. The aim of the present article is to describe a novel imageless robotic-assisted conversion technique using the ROSA™ system and to report its clinical application in a representative case.

2. Materials and Methods

2.1. Case Report

The present case report complies with the CARE guidelines. The CARE checklist is reported as Supplementary Material S1. The patient provided written informed consent for the use of anonymized data for research and publication. Ethical approval was waived for this study in accordance with national and local legislation, as this manuscript describes a single illustrative case and a surgical technique performed within routine clinical care.

A 72-year-old active female patient presented with progressive right knee pain following lateral UKA implanted in 2021. The patient was slightly obese but otherwise healthy, with no known allergies. Symptoms began after a traumatic episode.

Plain radiographs showed suspected patellar fracture sequelae, radiographic signs of tibial component loosening (Figure 1), and a 2 cm limb length discrepancy due to a shorter right tibia. Clinical examination revealed moderate joint effusion, and a valgus knee with varus–valgus laxity. Periprosthetic joint infection was excluded through blood tests and

synovial fluid analysis, including cultures and FilmArray[®] testing (Biofire[®] Joint Infection Panel, BioMérieux, Marcy-l'Étoile, France).



Figure 1. Preoperative radiograms.

Based on these findings, revision surgery with conversion to TKA was planned.

2.2. Surgical Technique

2.2.1. Inverse Functional Alignment Philosophy

The following technique describes an imageless robotic-assisted lateral UKA-to-TKA conversion adopting the “inverse functional alignment” philosophy that we currently use for robotic-assisted primary TKA. However, in our clinical practice, we also perform robotic-assisted medial UKA-to-TKA conversions applying the same technical principles described, simply translating the steps outlined for the lateral compartment to the medial side.

Like inverse kinematic alignment, this approach assumes that tibial resurfacing, within predefined boundaries, can better guide anatomical reconstruction and restoration of native ligament tension [19].

Accordingly, the tibial cut is planned first to restore the patient’s constitutional medial proximal tibial angle (target MPTA boundaries: 84–92°). The tibial resection height is defined to minimally refresh the previous UKA tibial cut. Following tibial planning, femoral cuts in extension and flexion are provisionally planned to balance the flexion and extension gaps, aiming to reproduce the native knee anatomy while respecting boundaries (LDFA 84–92°, mHKA 177–183°, femoral component flexion 0–5°) [15].

Nevertheless, tibial recuts are also allowed, when necessary, to optimize gap balancing. Femoral rotation is defined, as described below, with the aid of a tensioning device [20]. Finally, the tibial keel is prepared, followed by implantation of the trial components and then the definitive cemented components.

2.2.2. Preoperative Planning and Intraoperative Setup for Robotic-Assisted Conversion to TKA

The procedure is performed using the ROSA[™] robotic system (Zimmer Biomet, Warsaw, IN, USA) in imageless mode. Patient data are uploaded preoperatively, and planning

is performed for implantation of a Persona® total knee arthroplasty (TKA) system (Zimmer Biomet, Warsaw, IN, USA).

Preoperative digital planning is carried out on standing long-leg radiographs of the pelvis and lower limbs, including calculation of the mechanical hip–knee–ankle angle (mHKA), medial proximal tibial angle (MPTA), lateral distal femoral angle (LDFA), and Coronal Plane Alignment of the Knee (CPAK) classification, both on the operative limb and the contralateral healthy limb [21].

The robot is positioned on the affected side of the patient, with the infrared camera being placed on the contralateral side.

A medial parapatellar arthrotomy is performed, incorporating the previous surgical scar. The joint is exposed, the medial meniscus is removed, and patellar denervation and osteophyte removal are carried out. Synovial fluid and synovial tissue samples are routinely collected for microbiological and histological analyses, as in all revision procedures. Navigation tracker pins are inserted through trans-quadriceps and trans-tibial stab incisions. The hip center of rotation is identified through circumduction movements. Intra-articular landmarks are registered with the UKA components in situ, together with the ankle center and tibial tuberosity (Figure 2) [20]. Range of motion and ligament laxity are assessed at 0°, 30°, 60°, and 90° of knee flexion.



Figure 2. Intra-articular landmarks are taken on the UKA before explantation.

2.2.3. Virtual Planning and Surgical Workflow

Virtual implant planning is then performed, starting from the tibia and following the inverse functional alignment workflow (Figure 3).

After removal of the polyethylene insert and the macroscopically loosened tibial component (sent for sonication), the tibial cutting guide is positioned using the robotic arm, and the cut is executed and validated. The virtual planning is then adjusted based on the actual tibial resection. The femoral component, also macroscopically loosened, is subsequently removed. A distal medial femoral cut and refreshing of the distal lateral femoral cut are performed using a robotic-guided cutting block and validated.



Figure 3. Virtual planning with ROSA™.

2.2.4. Femoral Component Rotation Management

In UKA-to-TKA conversion, posterior femoral bone loss on the previously resurfaced side is a common challenge, resulting from the prior posterior femoral cut and possible osteolysis. The management of femoral component rotation with imageless robotics remains poorly addressed in the literature.

The novelty of this technique lies in the temporary repositioning of the femoral component to compensate for posterior lateral femoral bone loss, allowing a more reliable assessment of femoral rotation using the FuZion™ tensioner system (Zimmer Biomet, Warsaw, IN, USA) (Figure 4).

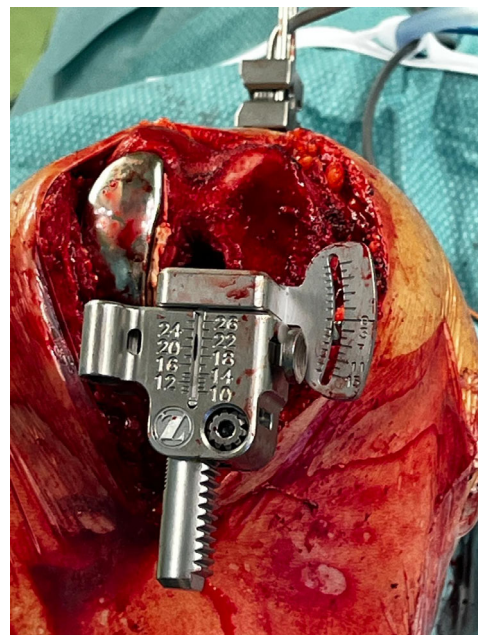


Figure 4. The FuZion™ tensioner is used to assess the femoral rotation with the UKA femoral component in place.

Femoral component rotation can be further confirmed after implant removal by combining the FuZion™ tensioner with a trial insert matching the posterior thickness of the removed component, as described by Andriollo et al. [15] (Figures 5–7). Femoral sizing with posterior referencing can also be confirmed using the FuZion™ system, either with the UKA femoral component in situ or combined with the trial insert, as described above. Once femoral component rotation is defined, the guiding holes for 4-in-1 cutting block positioning are drilled using the robotic arm, and the femoral cuts are completed.



Figure 5. The posterior thickness of the removed implant is measured with a caliper.



Figure 6. A trial insert matching the femoral component posterior thickness is chosen.



Figure 7. The trial insert is secured to the FuZion™ tensioner using a sterile adhesive dressing.

Trial components are implanted, and knee stability, alignment, and range of motion are assessed. If these are not satisfactory, the technique allows additional femoral and tibial recuts until balanced flexion and extension gaps are achieved. After tibial preparation, final components are cemented using antibiotic-loaded cement (Copal® GV). The joint is irrigated with an antiseptic solution, and the wound is closed in layers.

3. Results

The total surgical time was 150 min, corresponding to the upper range reported in the literature (Table 1) but acceptable considering that this was our first robotic-assisted UKA-to-TKA conversion using the femoral component repositioning technique. Measurements were in fact subsequently validated as well, using also the technique described by Andriollo et al. [15]. In the reported case, the implanted components included a Persona® right tibial baseplate size C with a 14 × 30 mm short stem (consistently with our standard approach in primary TKA in obese patients, to improve implant stability and metaphyseal load transfer), a femoral component size 3, and a CPS (constrained posterior stabilized) polyethylene insert (14 mm) (Figure 8).

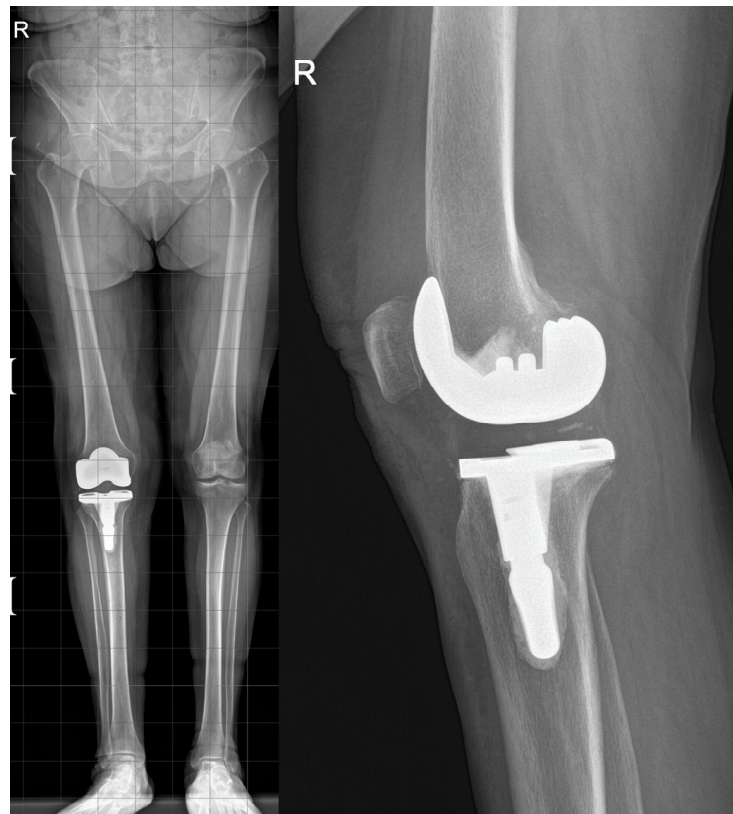


Figure 8. Follow-up radiograms 3 months after surgery.

All intraoperative cultures were negative for infection. Failure of the previous UKA, associated with pain and recurrent sero-haematic effusions, was explained by the intraoperative histology being positive for pigmented villonodular synovitis.

Table 1. Review of the existing literature on robotic-assisted UKA-to-TKA conversion.

Article	Study Type	Robot and Mode	Patients Treated	Cause of Revision	UKA Site	Technique	Revision Surgery Duration (Minutes)	Level of Constraint/Need of Revision Component	Postoperative Complications	Functional Results (Mean)	TKA Implant Survival and Follow-Up
Salmons et al., 2025 [12]	Surgical technique and case report	MAKO™ Stryker, CT-based	1	Pain and stiffness due to UKA malpositioning	Medial	Landmarks taken on the existing implant, femoral and tibial cuts with implant in place, positioning based on ligament tensioning	-	PS	No	ROM 0–120°, no pain	Survived at 1 year
Mahlouly et al., 2025 [14]	Surgical technique	MAKO™ Stryker, CT-based	-	-	-	Landmarks taken on the existing implant, bone cuts after TKA removal, positioning based on ligament tensioning	-	CR/PS based on PCL integrity	-	-	-
Raja et al., 2025 [13]	Surgical technique and case series	ROSA™ Zimmer, Imageless	3	Aseptic loosening 66.7%, OA progression 33.3%	Medial 100%	Landmarks taken on the existing implant; flexion space planned to match the extension gap	-	-	Mild stiffness solved after 1 year in two cases	Extension 0–5° Flexion 90–120°, no or minimal pain, 1 patient using cane at last follow-up	1 year
Andriollo et al., 2024 [15]	Prospective study	ROSA™ Zimmer, Imageless	35	OA progression 80%, UKA failure 20%	Medial 71.4%; lateral 25.7%; lateral + PFJ 2.9%	Landmarks taken on the existing implant; femoral component rotation defined using a tensioner with trial insert of the same thickness of the removed implant	116.1 ± 19.6	PS 74.3% CPS 14.3% CCK 11.4% Augment 11.4%	Intra-articular hemarthrosis requiring embolization 2.9%, persistently elevated inflammatory markers 2.9%, joint stiffness requiring liner exchange and anterior tibial tuberosity transposition 2.9%	Flexion 119.4° ± 13.4 Extension loss 0.9° ± 1.1 WOMAC 17.8 ± 8.7 FJS-12 80.7 ± 8.9 OKS 41.5 ± 4.3 NRS (0–100) 9.1 ± 3.4	97.14%, 31 months
Magruder et al., 2024 [16]	Retrospective study	MAKO™ Stryker, CT-based	41 (44 procedures)	OA progression 75%, aseptic loosening 16%, painful UKA 4.5%, polyethylene wear 2.3%, PJI 2.3%	Medial 84%; lateral 4.5%; PFJ 11.4%	Landmarks taken on the existing implant; mechanical alignment (gap balancing) in the first cases, functional in the last cases	-	CR (38 cementless, 6 cemented) Augments 18%	PJI 6.8%, aseptic femoral loosening 2.3%	KOOS 68.7, WOMAC 10.6.	93.2%, 1.8 years (1–6.6)
Mancino et al., 2024 [17]	Prospective comparative study (RA-UKA-to-TKA conversion vs. primary TKA)	MAKO™ Stryker, CT-based	16 robotic-assisted UKA-to-TKA conversions (+35 primary TKA)	-	-	Landmarks taken on the existing implant; flexion gap planned to match the extension gap	127 ± 18 (UKA-to-TKA conversion)	-	No complications in the RA-UKA-to-TKA conversion arm	OKS and flexion improvement; mean FJS 84.1 ± 4.9	100%, 21 months (6–36)

Table 1. Cont.

Article	Study Type	Robot and Mode	Patients Treated	Cause of Revision	UKA Site	Technique	Revision Surgery Duration (Minutes)	Level of Constraint/Need of Revision Component	Postoperative Complications	Functional Results (Mean)	TKA Implant Survival and Follow-Up
Lachance et al., 2023 [18]	Retrospective comparative study (RA vs. manual UKA-to-TKA conversion)	MAKO™ Stryker, CT-based	27 (robotic revision) vs. 22 (manual revision)	Aseptic loosening 60%, instability 10%, OA progression 10%, polyethylene dislocation 4%, infection 2%, other causes 14%	-	-	-	1 CCK (manual revision arm); revision components 14 (manual) vs. 16 (robotic); augments 7 (manual vs. 11 (robotic).	3 cases of stiffness requiring manipulation (1 manual vs. 2 robotic), 1 PJI (manual)	No differences in ROM, complications leading to need for revision components between the two arms	1 year
Tuecking et al., 2021 [9]	Retrospective comparative study (UKA-to-TKA conversion vs. primary TKA)	NAVIO™ Smith & Nephew, imageless	20 robotic-assisted UKA-to-TKA conversions (+20 primary TKA)	Aseptic loosening 40%, instability 25%, OA progression 20%, valgus overstuffing 15%	-	Landmarks and bone tracking taken on the existing implant; 3D planning of PCA and PCO based on the previous implant	76.2 ± 11.2	Conversion arm: 90% BCS, 10% CCK	-	-	-
Yun et al., 2020 [7]	Retrospective comparative study (RA vs. manual UKA-to-TKA conversion)	MAKO™ Stryker, CT-based	34 (17 manual vs. 17 RA)	OA progression 52.9%, aseptic loosening 2.9%, PJI 2.9%, instability 14.7%	-	Landmarks taken on the existing implant, re-mapping after implant removal; 3D intraoperative virtual positioning and augment planning to restore neutral mechanical alignment and symmetric flexion and extension gaps	RA: 83 min (64–96) Manual: 85 min (873–95)	RA: CS 100% Manual: PS 100% No need of augments in the RA group vs. 29% in the manual group. RA: lower insert thickness	-	-	1 year (1–2)

Legend: BCS = bi-cruciate stabilizing; CCK = Condylar Constrained Knee; CPS = Condylar Posterior Stabilized; CR = cruciate retaining; CS = cruciate substituting; CT = computed tomography; FJS = Forgotten Joint Score; KOOS = Knee injury and Osteoarthritis Outcome Score; NRS = Numeric (Pain) Rating Scale; OA = osteoarthritis; OKS = Oxford Knee Score; PCA = posterior condylar axis; PCL = posterior cruciate ligament; PCO = posterior condylar offset; PFJ = patellofemoral joint; PJI = Periprosthetic Joint Infection; PS = Posterior Stabilized; RA = robotic-assisted; ROM = Range of motion; TKA = Total knee arthroplasty; UKA = Unicondylar Knee Arthroplasty; WOMAC = Western Ontario and McMaster Universities Osteoarthritis Index.

The patient was mobilized on the day of surgery with weight bearing as tolerated using two crutches and began assisted physiotherapy on postoperative day one. She was discharged from the orthopedic ward after 5 days, with hemoglobin levels decreasing from 12.7 g/dL preoperatively to 10.6 g/dL at discharge, without blood transfusions. The patient subsequently underwent inpatient rehabilitation for 20 days.

At the three-month follow-up, the patient presented with a VAS pain score of 0, a range of motion of 0–110°, and good joint stability, ambulated without crutches, and expressed a high level of satisfaction. This confirms the early favorable outcomes typically observed in primary TKA using the inverse functional alignment philosophy, as well as good flexion gap balancing, achieved by employing the tensioner on the previous femoral component.

4. Discussion

4.1. Robotic-Assisted UKA-to-TKA Conversion: The Current Landscape

Conversion from UKA to TKA remains technically demanding, mainly due to bone loss, altered anatomical landmarks, and the challenge of restoring native alignment and soft tissue balance [8–10].

Over the last decade, robotic-assisted surgery has emerged as a promising strategy to address these issues, as reflected by a growing body of research reporting different robotic platforms, navigation modalities, and alignment philosophies. Most published studies on robotic-assisted UKA-to-TKA conversion involve CT-based systems—particularly MAKOTM (Stryker, Weston, FL, USA)—which have been extensively investigated in surgical technique papers, case series, and comparative studies [7,12,14,16–18]. These reports consistently demonstrate satisfactory functional outcomes and short- to mid-term implant survivorship. However, CT-based systems require preoperative imaging, increase radiation exposure, and rely on preoperative planning that may not fully reflect intraoperative findings after implant removal, especially in the presence of unanticipated bone loss. In contrast, imageless robotic-assisted techniques have been far less frequently described. Systems such as ROSATM (Zimmer Biomet) and NAVIOTM (Smith & Nephew, Watford, UK) allow real-time intraoperative planning and dynamic adaptation based on actual anatomy and soft tissue behavior. Tuecking et al. and Yun et al. showed that imageless robotic-assisted UKA-to-TKA conversion achieves alignment accuracy, operative time, and early clinical outcomes comparable to CT-based or manual techniques, while potentially reducing bone resection, polyethylene insert thickness, and the need for augments [7,9]. Nevertheless, the available literature provides limited detail on reproducible strategies to reliably define femoral rotation and balance the flexion gap, particularly in the frequent scenario of posterior femoral bone loss on the revision side. Across robotic-assisted techniques, a shared principle is landmark acquisition on the existing UKA components, as described by Salmons et al., Mahloully et al., Magruder et al., and Yun et al. [7,12,14,16]. This step is followed by femoral and tibial cuts, performed either with the component in situ or after its removal [7,12,14,16]. Raja et al. and Andriollo et al. extended this concept to imageless ROSATM-assisted conversion, confirming the feasibility and accuracy of this workflow [13,15].

4.2. Restoring Femoral Rotation: Innovations and Limitations

Relevant differences emerge when analyzing how femoral component rotation is determined. Raja et al. primarily relied on gap balancing by planning for the flexion gap to match the extension gap. In this setting, femoral rotation is indirectly inferred from gap symmetry and ligament isometric tensioning, but may be influenced by posterior bone defects or ligament attenuation [13]. Andriollo et al. introduced an important advancement by defining femoral rotation using the FuZionTM tensioner combined with a trial insert

matching the thickness of the removed UKA component [15]. Although this method is also considered in the present work as a confirmation step of the measurement obtained with the femoral component in situ, in our experience, mounting the trial insert onto the tensioner may be time-consuming, technically cumbersome, and prone to disengagement during insertion into the flexed joint. Alternative strategies—such as the use of a flexion spacer block or applying the tensioner directly onto the posterior bone defect with arithmetic correction of the missing bone stock (approximately 1 mm corresponding to 1° of rotation)—are possible but remain more empirical and less precise.

The originality of the present technique lies in the systematic exploitation of the existing UKA femoral resurfacing as an active intraoperative reference. By temporarily repositioning the explanted femoral component and using it in conjunction with the FuZion™ tensioner, femoral rotation, gap balancing, and femoral component sizing can be less influenced by posterior condylar bone loss. This approach preserves the flexion space geometry and ligament tension originally established by the UKA resurfacing, allowing restoration of the patient's constitutional knee anatomy.

Nevertheless, a limitation of both this technique and that described by Andriollo et al. [15] is their reliance on the accuracy of the initial UKA resurfacing; if the original UKA did not truly reproduce the native femoral anatomy, rotational assessment may be biased. Gross sizing errors or excessive posterior bone resection from the previous UKA should be carefully considered during virtual resection planning. However, robotic-assisted UKA-to-TKA conversion allows precise quantification of residual flexion and extension gaps in millimeters. In cases of severe posterior bone loss, this defect may be preoperatively assessed using CT imaging and quantified by comparison with prior radiographs of the native knee, when available. The measured bone loss can then be subtracted from the gaps recorded by the robotic system, using the previous resection level as a landmark during virtual planning. This approach helps prevent excessive refresh resection and preserves bone stock. Substantial residual bone loss can subsequently be compensated with femoral augments to accurately restore femoral component rotation.

Furthermore, a common limitation of most current robotic-assisted systems is the impossibility to quantify the distraction force that is applied intraoperatively. A recent systematic review and meta-analysis reported mean distraction forces of approximately 150 N in extension and 140 N at 90° of flexion during tension-controlled ligament-balanced TKA, providing quantitative reference benchmarks for soft tissue balancing [22]. In this context, the use of a dedicated tensioning device such as the FuZion™ system may help improve reproducibility by providing a more controlled and standardized method of ligament stress application during femoral rotation assessment and flexion gap balancing. Nevertheless, with the ROSA™ system, gap measurements are expressed in millimeters, but the force generating such displacement remains surgeon-dependent, potentially introducing intra- and interoperator variability, even in robotic procedures. This is a major issue that should be addressed by robotic platforms in the future, both in primary and conversion TKA.

4.3. Personalized Alignments and Clinical Implications

Another relevant aspect emerging from the recent literature is the shift from strict mechanical alignment toward personalized alignment philosophies in robotic-assisted revision surgery. Magruder et al. reported a progressive transition from mechanical to functional alignment in their series [16]. The present technique adopts an inverse functional alignment philosophy, starting from tibial resurfacing within predefined constitutional boundaries. Controlled tibial recuts allow the optimization of gap balancing while preserving bone stock. This strategy supports restoration of native joint line obliquity and height and aligns with previous findings demonstrating reduced insert thickness, lower need for augments,

and improved bone preservation with robotic assistance, as reported by Yun et al. and Tuecking et al. [7,9].

The reviewed studies highlight considerable variability in the required level of implant constraint, reflecting the heterogeneity of UKA failure mechanisms. While cruciate-retaining or posterior-stabilized implants are often sufficient, higher levels of constraint (CPS or CCK) may be necessary in cases of instability or extensive bone loss. Importantly, robotic-assisted techniques appear to reduce the need for revision components compared with manual conversion, as shown by Lachance et al. and Yun et al. [7,18].

Postoperative complications are generally infrequent and mostly limited to joint stiffness or transient issues, with functional outcomes consistently favorable across studies. Short- to mid-term implant survivorship exceeds 90% in most series, approaching that of primary TKA in selected cohorts. A review of the available literature on UKA-to-TKA conversion is reported in Table 1.

5. Conclusions

Within this evolving landscape, the present case illustrates how imageless robotic-assisted UKA-to-TKA conversion can effectively address one of the most critical challenges of revision surgery: reliable definition of femoral rotation and flexion gap balancing in the presence of posterior femoral bone loss. By leveraging the retained UKA femoral resurfacing as a functional intraoperative reference, this technique enables restoration of native ligament tension and constitutional knee anatomy without the need for preoperative CT imaging. Further studies are needed to validate these results on larger cohorts at long-term follow-up.

Supplementary Materials: The following supporting information can be downloaded at: <https://www.mdpi.com/article/10.3390/std15010013/s1>, Supplementary Material S1: CARE Checklist.

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Data Availability Statement: All available data have been reported in this paper. Future data will be available upon request.

Conflicts of Interest: The authors declare no conflicts of interest.

Abbreviations

The following abbreviations are used in this manuscript:

UKA	Unicompartmental Knee Arthroplasty
TKA	Total Knee Arthroplasty
mHKA	Mechanic Hip–Knee Angle
LDFA	Lateral Distal Femoral Angle
MPTA	Medial Proximal Tibial Angle

CPAK	Coronal Plane Alignment of the Knee
CR	Cruciate retaining
PS	Posterior Stabilized
CPS	Constrained posterior stabilized
CCK	Constrained Condylar Knee

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