

MODULAR INTRAMEDULLARY KNEE ARTHRODESIS FOR CHRONIC PERIPROSTHETIC JOINT INFECTION AFTER TOTAL KNEE ARTHROPLASTY: PATIENT-REPORTED SATISFACTION AND FUNCTIONAL OUTCOMES

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INTRODUCTION

Periprosthetic joint infection (PJI) is a devastating complication after total knee arthroplasty (TKA), with an incidence of 0.4–2% after primary TKA, rising to 14-28% after revision.

Limb-salvage procedures such as knee arthrodesis (KA), and, in extreme cases, above-knee amputation (AKA). KA is a valid limb-salvage alternative to AKA in patients with multiple recurrences, failed revisions, severe bone loss, extensor mechanism deficiency, or poor soft-tissue coverage.

“Floating arthrodesis” – a modular IMN with cement interposition – where biological fusion is not feasible: it enables immediate stability, early full weight-bearing, and limb-length adaptation.

Loss of knee range of motion (ROM) may affect the patient both functionally and psychologically, yet KA still provides a stable, weight-bearing limb

AIM & HYPOTHESIS To evaluate infection control, functional outcomes, and patient satisfaction after “floating” KA with a cemented modular IMN for chronic PJI following failed TKA. Hypothesizing that patients would still choose KA over amputation, and, in hindsight, earlier.

MATERIAL & METHODS

Retrospective cohort, revision-arthroplasty referral center, 2016–2023. Chronic PJI diagnosed per 2018 ICM criteria.

Inclusion: chronic PJI after TKA, KA as 2nd stage of a two-stage protocol, follow-up > 12 months

Exclusion: KA for non-infectious indications, follow-up <12 months, incomplete documentation, death before outcome assessment.

Indication for Knee Arthrodesis: KA was considered a definitive limb-salvage procedure in patients with persistent or recurrent infection, severe bone loss precluding further reconstructive options, irreparable extensor mechanism deficiency, compromised soft-tissue envelope, and multiple failed revision attempts.

Surgical Procedure - Static Spacer

- Removal of all prosthetic components; 5–8 periprosthetic tissue samples collected.
- Medial gastrocnemius flap (MGF) was raised at spacer, when needed
- Static antibiotic-loaded cement spacer bridging the distal femur and proximal tibia, stabilized with two 6.5-mm Schanz pins; COPAL® G+V cement.

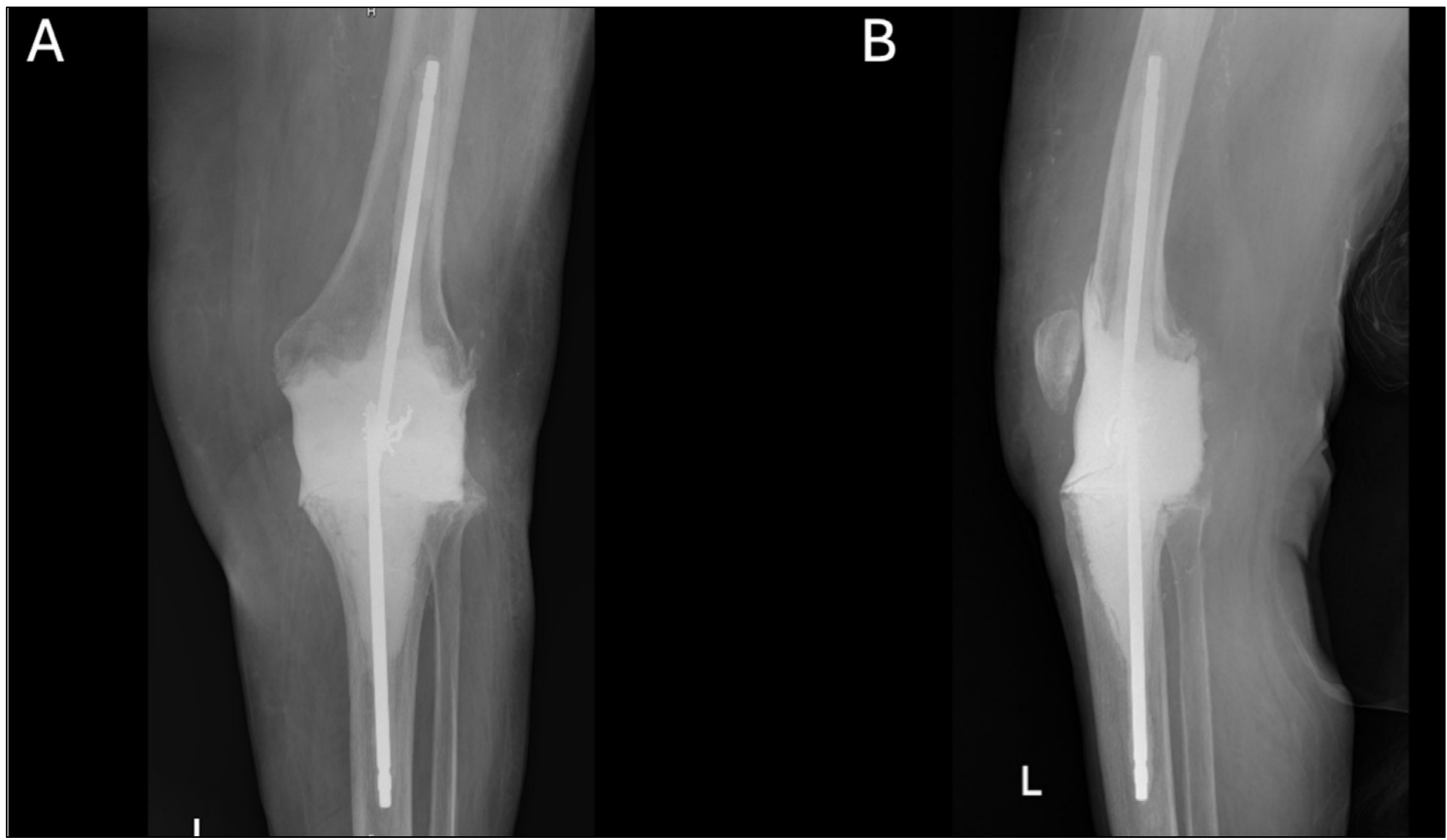


Figure: Static antibiotic-loaded cement spacer : (A) anteroposterior and (B) lateral X-ray maintaining limb length, alignment, and soft-tissue tension.

Surgical Procedure – “Floating” Knee Arthrodesis

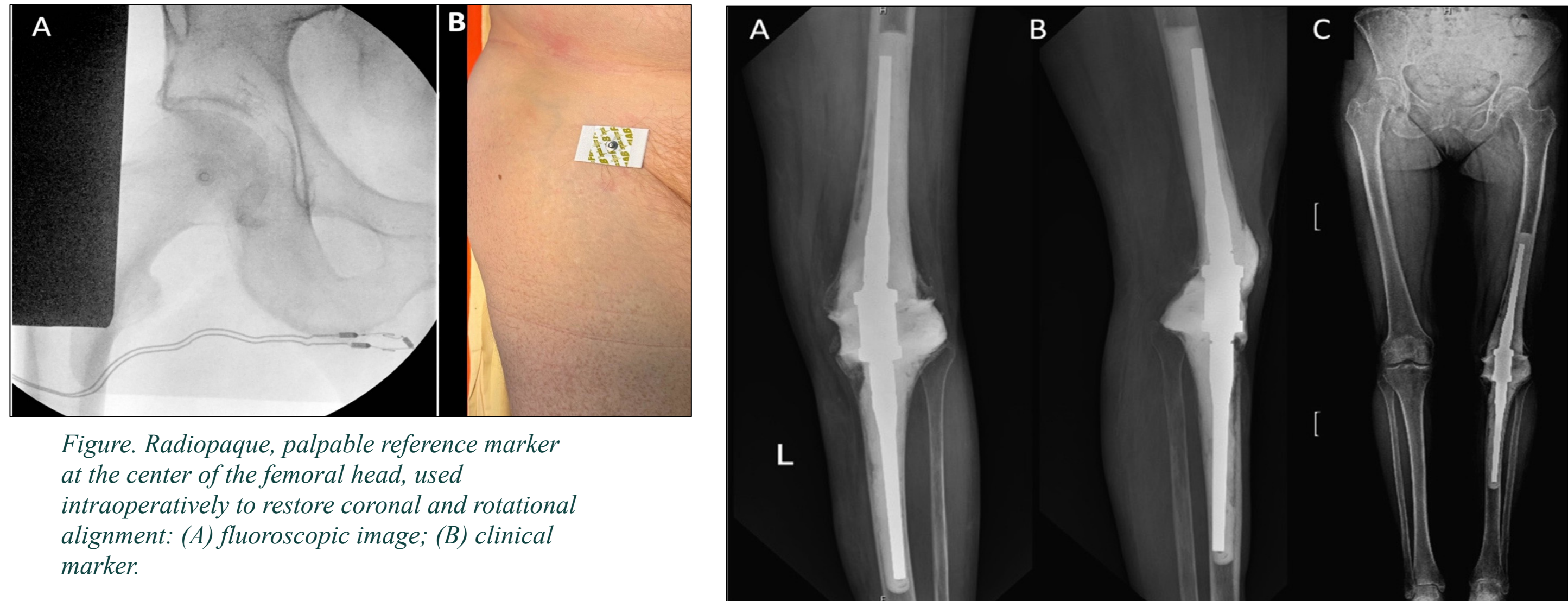
Performed 10 - 12 weeks after spacer implantation. 5-8 periprosthetic tissue samples collected. Intraoperative Alignment technique:

Radiopaque, palpable reference marker was placed at the center of the femoral head to guide restoration of the mechanical axis, together with the knee and ankle centers.

Rotational reference: tibial tubercle (mid/medial-third junction); femoral side - linea aspera (major defect) or Whiteside line (minor defect), confirmed fluoroscopically using an electrosurgical wire stretched from the femoral-head marker to the ankle center.

Floating KA used the Waldemar Link Endo-Model Cemented Knee Fusion Nail. Two packages of COPAL® G+V were use to cement tibial side, femoral side and to fill the intra-articular space.

The limb was left slightly shorter (<1 cm) than the contralateral side to favor gait adaptation.



Post-operative Management & Evaluation

- Antibiotics ≥ 6 weeks, tailored to intraoperative cultures
- Early weight-bearing as tolerated, quadriceps/hip strengthening and gait re-education
- Infection eradication defined per Delphi-based consensus criteria
- Last Follow Up Walking ability, aids, residential status, QoL (SF-12: PCS/MCS)\

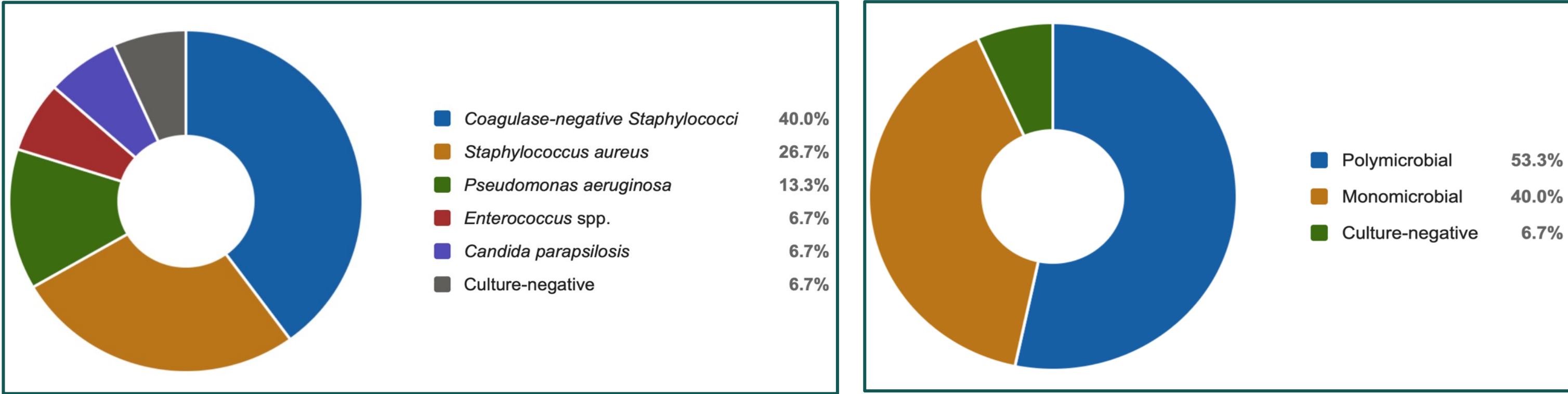
CONCLUSION

“Floating” KA with a cemented modular IMN is a reliable limb-salvage strategy for chronic TKA PJI, achieving PJI control and mechanical stability, preserving acceptable quality of life. Psychological and factors such as height warrant consideration during preoperative counseling.

RESULTS

Patients identified between 2016 and 2023 (n = 18)	
Died Before KA surgery (n=1)	
< 12 months of Follow Up (n=1)	
Incomplete Clinical and PROM data (n=1)	
Final Study Cohort (n=15)	
Final Cohort	15
First Surgery	15 TKA
Age (years)	74.4 ± 9.5 (56 to 87)
Male / Female	5 / 10
Body Mass Index	24.46 ± 6.5 (21.8 to 42.8)
Height (Meter)	1.67
Charlson Comorbidity Score	3.67
American Society Of Anesthesiologists	III (8 of 15), II (7 of 15)
Time Between TKA & KA (Months)	70.15 ± 70.2 (12 to 240)
N° Surgeries Between TKA & The KA	2.93 (1 to 7)
Medial Gastrocnemius Flap Procedures	5 / 15 (33%)
Follow Up (Months)	36 ± 19.0 (21 to 98)

Microbiology



Pre- And Post-arthrodesis Functional Status

Before KA, 1 patient was unable to walk at all and 11/15 (73.3%) lived independently; of the 14 ambulatory patients, 11 used a gait aid and only 3 could walk outside the home (1 unlimited distance, 2 within five blocks). **After KA**, outdoor walking capacity improved to 7 patients (2 unlimited, 5 within five blocks); all 15 patients continued to live at home.

Status	Before KA	After KA
Unable to walk	1/15 (6.7%)	0/15 (0.0%)
Transfers only	3/15 (20.0%)	1/15 (6.7%)
Ambulates within home only	8/15 (53.3%)	7/15 (46.7%)
Ambulates outside home	3/15 (20.0%)	7/15 (46.7%)
No ambulatory aid needed	3/15 (20.0%)	1/15 (6.7%)
Living independently (no assistance)	11/15 (73.3%)	9/15 (60.0%)

Table: Functional status, ambulatory ability, and residential status before and after knee arthrodesis.

Post-arthrodesis Satisfaction

73.3% of patients satisfied with KA (11/15)	100% preferred KA over AKA	0 septic or mechanical failures
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14/15 patients would choose KA again; 12/15 would have proceeded with KA earlier; Mean SF-12 PCS 38.16 ± 8.62 (26.35–53.18); mean SF-12 MCS 46.43 ± 11.67 (28.61-70.42); A single patient would, in retrospect, have chosen reimplantation - an option contraindicated by bone loss and infection risk

Patients who would have proceeded with KA earlier had undergone more antibiotic-spacer procedures on average (2 vs 1.33), though this did not reach significance (P = 0.585).

Comparative Analysis

Younger age correlated with higher SF-12 PCS (Pearson r = −0.604, P = 0.02); More prior surgeries correlated with lower SF-12 MCS (Spearman ρ = −0.52, P = 0.046) SF-12 MCS was significantly higher in satisfied vs unsatisfied patients (P = 0.027); Taller patients were significantly less satisfied (P = 0.005), independent of sex after partial correlation (p = - 0.42); one female patient (height 1.80 m) was unsatisfied, supporting a height-specific contribution beyond sex.

A significantly longer time between TKA and KA was observed in unsatisfied group (p = 0.03)

Variable	Satisfied (n=11)	Unsatisfied (n=4)	P
SF-12 PCS	38.95 ± 9.11	35.75 ± 5.4	0.499
SF-12 MCS	49.63 ± 10.55	37.51 ± 5.36	0.027
Height (meter)	1.59 ± 0.09	1.74 ± 0.05	0.005
Time TKA→KA (months)	50.4 ± 41.9	136 ± 115.3	0.030

Table. Comparison of clinical and demographic variables between satisfied and unsatisfied patients.

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