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Outcomes of a Fixed-Bearing, Medial, Cemented Unicondylar Knee Arthroplasty Design: Survival Analysis and Functional Score of 460 Cases

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A B S T R A C T

Background: Unicompartmental knee arthroplasty (UKA) is an alternative to total knee arthroplasty in isolated medial osteoarthritis (OA). However, despite satisfactory reports on the clinical performance, UKA revision rates are still concerning. This retrospective study reports on the long-term survivorship, functional outcomes, and reasons for revision in fixed-bearing UKA implant.

Methods: Between 2005 and 2013, 460 consecutive patients were treated with medial UKA in one center using a fixed-bearing UKA system. All patients were evaluated clinically and radiographically before surgery, and postoperatively at 6 weeks and 1 year. Between February and April 2016, all patients were reevaluated using the Oxford Knee Score.

Results: Mean follow-up was 5.5 (range, 2-11) years. The mean Oxford Knee Score was 43.3 (7-48), with 94.6% patients showing excellent or good outcomes. Eleven revisions (2.4%) occurred. The survivorship was 97.2% (95% confidence interval, 96.2%-99.2%) and 94.2% (95% confidence interval, 86.8%-97.5%) at 5 and 10 years, respectively, with revision of any implant component for any reason as the end point. The causes for revision were infection (4 cases, 0.9%); lateral pain due to overload (2 cases, 0.4%); progression of OA in the lateral compartment (2 cases, 0.4%); patellar pain with patellar chondropathy (2 cases, 0.4%); and severe synovitis (1 cases, 0.2%). There were no reoperations or revisions for component loosening, instability, component wear, or periprosthetic fracture.

Conclusion: A fixed-bearing UKA system is a good treatment option for medial end-stage OA. Satisfactory functional results were achieved with low incidence of complications and revisions.

Postoperative function and patient satisfaction are becoming increasingly relevant in knee arthroplasty. Despite adequate preoperative planning and improved surgical techniques and rehabilitation protocols, only 75%-85% of patients seem satisfied after total knee arthroplasty (TKA) [1]. During a mechanically aligned TKA procedure, the knee kinematics are modified [2]. The tibia is cut perpendicular to the tibial mechanical axis [3], and the obliquity and slope of the medial and/or lateral joint lines are changed [4–6]. Furthermore, at least one of the cruciate ligaments is sacrificed during TKA.

Unicompartmental knee arthroplasty (UKA) is an alternative to TKA in isolated end-stage medial femorotibial osteoarthritis (OA). In comparison to TKA, UKA is a less invasive procedure, providing faster recovery, and less blood loss, with a lower risk of complications [7–9]. The UKA surgical technique is based upon a resurfacing procedure of the arthritic femoral condyle by restoring the joint line to its native level. On the tibial side, UKA aims at recreating the natural tibial slope and maintaining the joint line obliquity. Limb alignment is only corrected for the cartilage wear. These concepts are beneficial and instrumental to facilitate faster recovery [10–16] and long-term survivorship [17,18]. UKA enables physiological restoration of the knee kinematics [19], resulting in better postoperative function, generally observed to outperform TKA [20,21], at a lower cost

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[22]. Nevertheless, despite the excellent functional outcomes, the revision rates reported in the National Joint Registries remain concerning.

UKA designs can be divided into 2 groups—fixed-bearing and mobile-bearing. A mobile UKA design is characterized by a single-radius femoral component with a congruent but mobile polyethylene insert on a polished tibial component. Several authors have described the optimal clinical performance of a mobile-bearing UKA [15,16,23–26]. The fixed-bearing design, on the other hand, presents an anatomic femoral component. The polyethylene insert is flat, noncongruent, and fixed to the tibial baseplate. Numerous studies have reported the excellent functional recovery and long-term survivorship for this type of design [10–12,14,27].

Over the past 25 years, UKA has been performed in our orthopedic department using both fixed- and mobile-bearing prostheses. Since 2005, a fixed-bearing implant has been mainly used. In this clinical investigation, all patients who underwent surgery between 2005 and 2013 receiving this fixed-bearing implant were included in the study cohort. Primary end points of this study were implant survival and functional outcomes assessed by the Oxford Knee Score (OKS) [28], while the secondary end point was an assessment of the reason for implant revision.

Materials and Methods

In this single-center, retrospective study, we reviewed 460 consecutive patients treated with a medial, fixed-bearing UKA between January 1, 2005, and December 31, 2013. The indications for surgery were debilitating knee pain in combination with isolated medial unicompartmental OA with ≥grade 3 loss of articular cartilage, according to the Kellgren and Lawrence classification [29] or spontaneous medial osteonecrosis of the femur with ≥grade 3 loss of articular cartilage or minor subchondral collapse. During the diagnostic process, magnetic resonance imaging was sometimes obtained to identify osteonecrosis. A full thickness of the articular cartilage of the lateral knee compartment and a preserved status of the patellofemoral joint were evaluated both clinically and radiographically. Standard radiographic evaluation was carried out on weight-bearing radiographs: anteroposterior, Rosenberg, lateral, and skyline views. Routine preoperative stress radiographs were not carried out. All patients' knee joints were assessed as clinically stable in both the frontal and sagittal planes by performing anterior drawer- and Lachman-tests and assessing mediolateral stability in full-extension and 30° of flexion. Patients' subjective feeling of the knee not giving way was appreciated. All surgeries were performed by 2 senior surgeons, using a mid-vastus approach. Inspection of the patellofemoral and lateral compartment was routinely done. Existing chondral lesions were recorded in the report. The anterior cruciate ligament (ACL) status was checked. Because the knee was clinically stable, an intact ACL was not a prerequisite for continuing the UKA surgery. Medial and intercondylar osteophytes were removed and an anterior tibial precut was performed to get adequate posterior, articular view and access. In all cases, the Zimmer Unicompartmental Knee (ZUK) system (Zimmer, Warsaw, IN) was implanted (Figs. 1 and 2) by using the corresponding instrumentation, extramedullary tibial guide, and femoral and tibial cutting guides. All components were cemented. The femoral component was placed as laterally as possible. Tibial coverage was maximized without any overhang, while targeting the natural tibial slope. Postoperative rehabilitation protocols included immediate full weight-bearing protected by crutches during the first 4 weeks. Exercises were focused on immediate active flexion and extension. All patients received routine prophylaxis with low-molecular-weight heparin for 4 weeks after surgery. Routine prophylactic antibiotics (cefazolin or clindamycin) were used perioperatively.

The mean age of the patient cohort at the time of surgery was 66 ± 9 (range, 36-89) years (222 [48%] women and 238 [52%] men; Table 1). According to the Kellgren and Lawrence classification [29], 159 (35%) knees were classified as grade 3 OA and 290 (63%) as grade 4 OA. Twenty-two (5%) patients had medial osteonecrosis, confirmed on magnetic resonance imaging. All patients were evaluated clinically and radiographically before surgery, and postoperatively at the 6-week and 1-year follow-up. Position of the implant, cement fixation, and bony integrity were evaluated on postoperative radiographs; postoperative joint line height, tibial slope, and overall alignment were routinely assessed. When suspecting significant changes, in a minority of the cases, full-leg radiographic evaluation was performed. Different angles (hip-knee-ankle, joint line, tibial slope) and offsets (joint line height) were measured, according to the method described by Chatellard et al [18]. Between February and April 2016, all patients were contacted telephonically and asked to visit the hospital for a checkup of their operated knee: information on their implant status and clinical conditions was then collected. To reduce the possibility of bias, a subjective OKS questionnaire was filled in by the patient before clinical evaluation by the investigator. Unless there were clinical indications of pain, reduced mobility, or any other implant-related complication, no further examination was carried out. Patients who were unable to come to the hospital were visited at home. If a revision procedure had occurred, all the relevant information on the surgery was collected. The study was approved by the local ethical committee (Clinical Trial No.: B117201629676).

Statistical Methods

Statistical analysis was carried out by an independent statistician. Continuous variables were described using arithmetic mean and range (minimum-maximum). Categorical variables were described using frequency distributions and percentages. Hypothesis testing was carried out at the alpha = 0.05 level (2-sided) when comparing treatments. For all inferential analyses, *P* value was rounded to 3 decimal places. *P* value ≤ .05 was considered to indicate statistical significance.

Time to revisions was analyzed using the Kaplan-Meier methodology according to different end points. For the follow-up time points, the number of implants at the beginning of the period, cumulative number of implants at the end of the period, and the probability of being event free at the end of the period (survivorship) with the associated 95% confidence intervals (CIs) were presented according to specific study groups: age (>65 vs <65 years), gender (male vs female), and degree of OA (grade 3 vs grade 4). Intergroup comparison was performed by means of the log-rank test.

OKS was compared between groups using a *t*-test (with or without heteroscedasticity correction) or a Wilcoxon rank sum test. The Shapiro-Wilk test was initially performed and if the *P* value was ≤.05 (non-normality), the nonparametric Wilcoxon rank sum test was used for intergroup comparison; otherwise, the *t*-test was used, with or without the Satterthwaite's correction according to the result of the heteroscedasticity test.

Results

The mean follow-up for the patient cohort was 5.5 (2-11) years. Out of the 460 patients, 25 (5.4%) had died, 11 (2.4%) underwent revision surgery, and only 2 (0.4%) were lost to follow-up (Table 2).

The mean OKS was 43.3 (7-48). At the last follow-up, 326 (77.3%) patients showed excellent outcomes (OKS, >41); 73 (17.3%) good

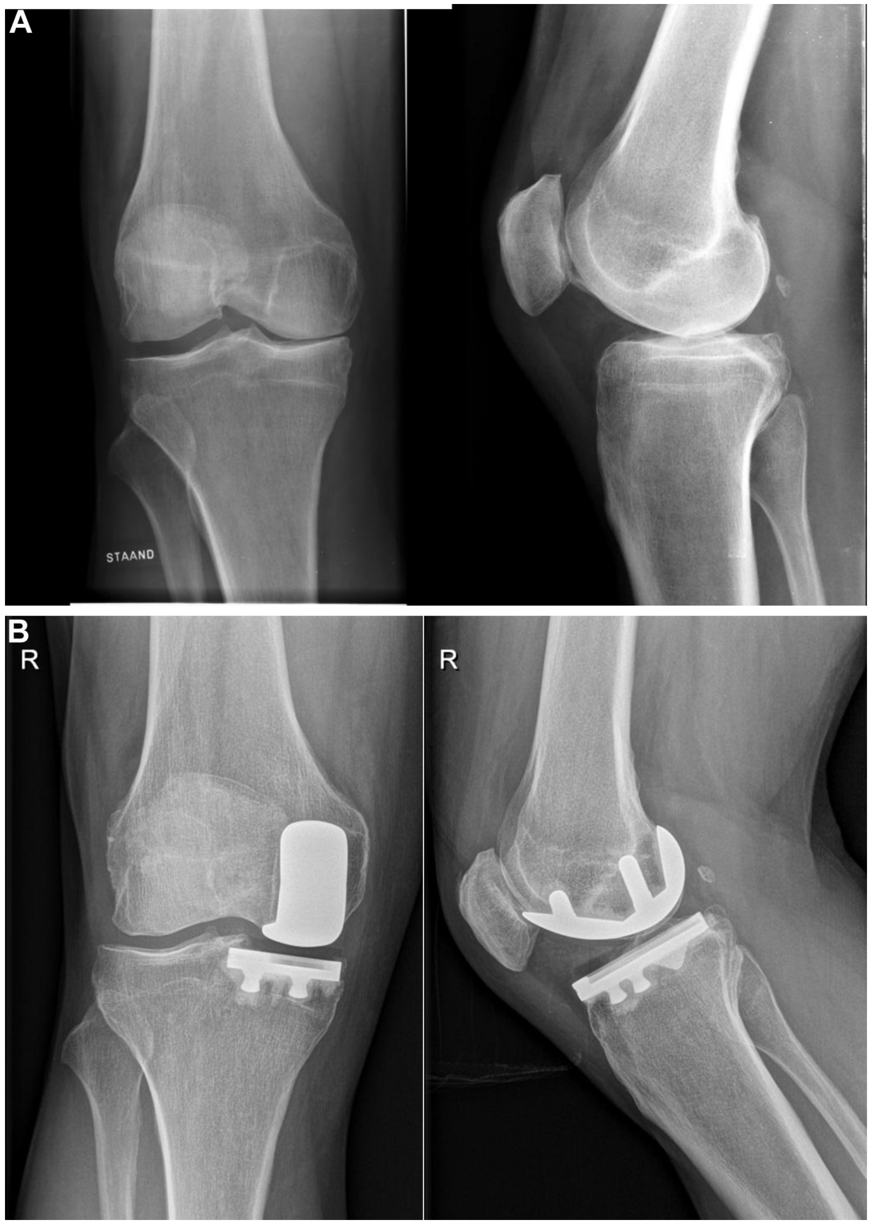

Fig. 1. Radiographs of a male patient with a ZUK implant and a metal-back tibial component. (A) Preoperative X-rays of an active 65-year-old male patient with invalidating pain on the medial side of his right knee. The patient's BMI was 25.6 kg/m^2 and the limb alignment was slightly varus before surgery. His medical history did not present any relevant comorbidities. The standing X-ray showed an osteoarthritis of grade 4. (B) X-rays at 9 years after surgery. The patient reported to be pain free with an excellent recovery of the knee functionality. The X-ray has shown a well-fixed and stable implant, without any signs of progression of the lateral or patellofemoral arthritis. ZUK, Zimmer Unicompartmental Knee; BMI, body mass index.

outcomes (OKS, 34-41); 15 (3.5%) fair outcomes (OKS, 27-33); and 8 (1.9%) poor outcomes (OKS, <27; Table 3).

The 11 (2.4%) revisions (Table 4) occurred at a mean follow-up of 3.9 (0.1-9.0) years. The indications for revisions were infection (4 cases, 0.9%); lateral pain due to overload/overcorrection (2 cases, 0.4%); progression of OA in the lateral knee compartment (2 cases, 0.4%); patellar pain with patellar chondropathy (2 cases, 0.4%); and severe synovitis (1 cases, 0.2%). There were no reoperations or revisions for component loosening, instability, component wear, or periprosthetic fracture.

Regarding the 2 (0.4%) cases of revision due to lateral overload/overcorrection with lateral pain, a medial joint line elevation with respect to the lateral joint line was observed in both cases after reviewing preoperative and postoperative radiographs. Both cases were revised to a primary TKA, at a mean follow-up of 3.9 (3.6-4.2) years (Table 4). Patient no. 7 showed on the postoperative X-ray a valgus tibial cut in combination with an 11-mm polyethylene resulting in a joint line raise of 2 mm and overcorrection of the limb alignment from 6° varus to 1° varus (Fig. 3).

Regarding the 2 (0.4%) cases of revision due progression of OA in the lateral knee compartment, a medial joint line elevation with respect to the lateral joint line was observed in 1 case. Both cases were revised to a primary TKA, at a mean follow-up of 7.6 (6.2-9.0) years (Table 4).

Infections occurred in 4 (0.9%) cases at a mean follow-up of 3.6 (0.1-7.6) years. One infection (patient no. 10 in Table 4) occurred almost 8 years after surgery following a traumatic fall with a deep wound at the operated knee. All infections were treated with 2-stage revision procedures—3 with primary TKA and 1 with a more constrained TKA implant.

Patellar pain with chondropathy was the cause of revision in 2 (0.9%) cases (Table 4) at a mean follow-up of 1.9 (1.1-2.8) years. In

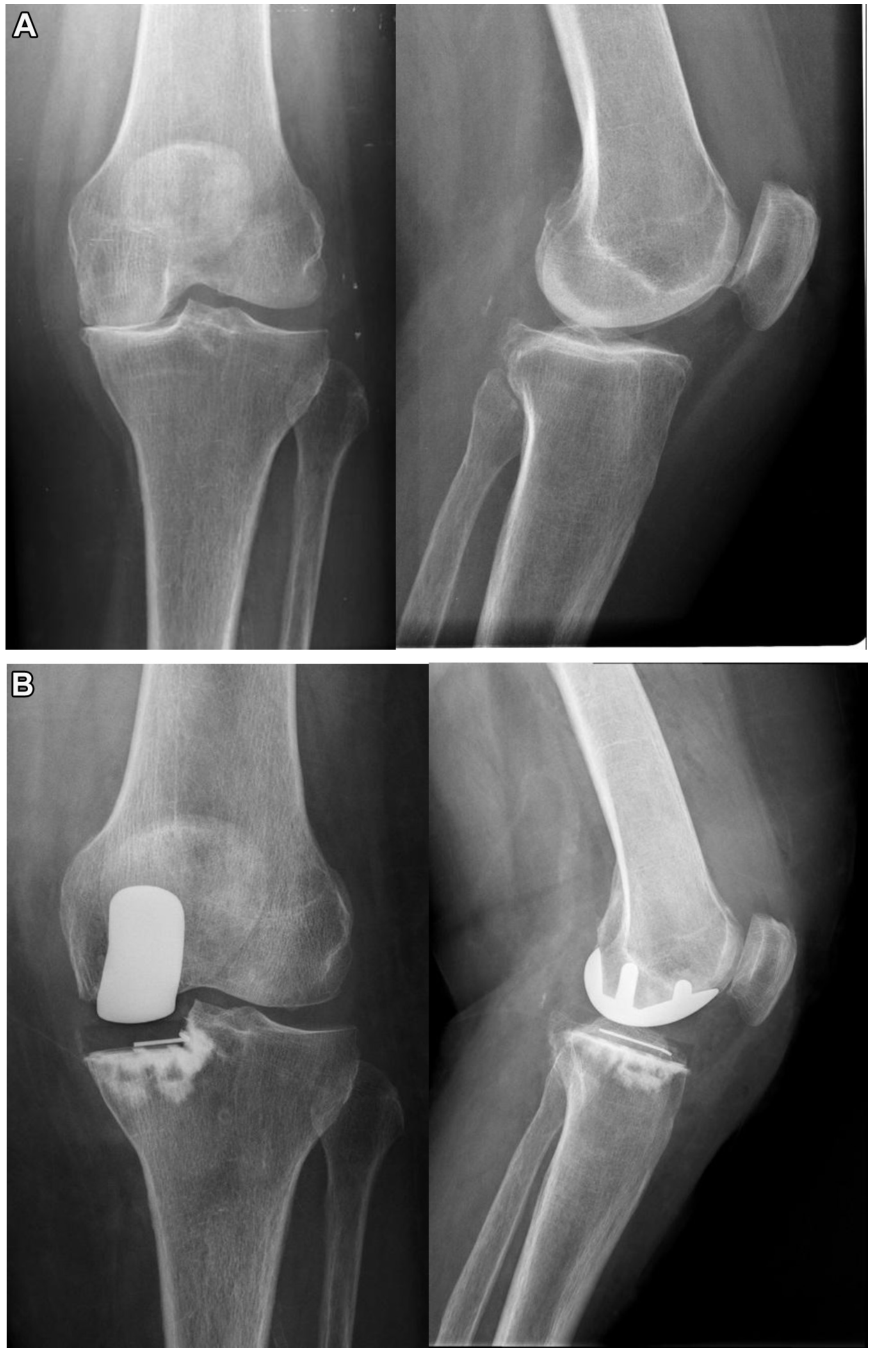

Fig. 2. Radiographs of a female patient with a ZUK implant and an all-poly tibial component. (A) Preoperative X-rays of a 72-year-old female patient with severe pain on the medial side of her left knee. Her BMI was of 31.4 kg/m^2 before surgery. The patient reported a medical history of diabetes (NIDDM) and hypertension. The standing X-ray showed a medial grade 4 osteoarthritis; the patient's limb alignment was slightly varus. (B) X-rays at 6 years after surgery. The patient did not report any complaints about her knee. She can climb the stairs without any pain. The standing X-ray has shown a well-fixed implant without any progression of the lateral or patellofemoral arthritis. NIDDM, non–insulin-dependent diabetes mellitus.

both cases, chondral lesions were observed on the lateral patellar facet during surgery.

One revision occurred due to severe synovitis (Table 4). Synovitis was already present since before the UKA procedure but the patient's symptoms got worse over time after surgery. The cause of the synovitis could not be elucidated among rheumatic disease, extensive chondral lesions, synovial disorder, or instability. The patient was revised 2 years postoperatively to a primary TKA with synovectomy.

The Kaplan-Meier survivorship was estimated to be 97.2% (95% CI, 96.2-99.2) and 94.2% (95% CI, 86.8%-97.5%), respectively, at 5 and 10 years after surgery, with revision of any implant component for any reason as the end point (Fig. 4). When the revision for infections were excluded, the survivorship of the implant was 98.7% (95% CI, 96.7%-99.4%) and 95.9% (95% CI, 87.9%-98.7%), at 5 and 10 years of follow-up, respectively.

The 5-year and 10-year survival rate of the metal-back tibial components using revision of the implant for any reason was respectively 97.7% (95% CI, 94.2%-99.0%) and 93.2% (95% CI, 85.5%-96.9%). The 5-year survivorship of the all-poly tibial component was 99.0% (95% CI, 96.0%-99.8%). Because the use of the all-poly plateau was initiated only in 2008, no 10-year survivorship data were available.

Table 1
Characteristics of the Patient Population Assessed During This Study.

Patient Population (N, %)		
Total No.	460	100%
Gender		
Male	238	52%
Female	222	48%
Age at surgery (y)		
Mean ± standard deviation	66 ± 9.4	
Minimum	36	
Maximum	89	
Indication		
Arthritis	438	95%
Osteonecrosis	22	5%
Degree of medial osteoarthritis [29]		
Osteonecrosis	10	2.2%
Grade 3	159	34.6%
Grade 4	291	63.2%
Knee side		
Right	247	54%
Left	213	46%

A statistically significant correlation ($P < .05$, log-rank test) was observed in terms of survival rate according to patients' subgroups of different age, with patients >65 years showing a 5-year survival rate of 99.4% (95% CI, 96.1%-99.9%) while patients <65 years a survival rate of 94.7% (95% CI, 89.3%-97.4%; $P = .024$). No statistically significant correlations ($P > .05$, log-rank test) were observed in terms of survivorship between patients' subgroups according to gender and degree of OA. The OKS of patients showed a significant correlation ($P < .05$, Wilcoxon rank sum test) with respect to gender and degree of OA with male patients ($P < .001$) and OA of grade 4 ($P = .013$) showing higher functional outcomes. Mean OKS in male patients was 44.4 (14-48), while the mean OKS in female patients was 42.2 (7-48). Mean OKS in OA grade 4 was 43.7 (7-48) and mean OKS in OA grade 3 was 42.5 (14-48). Patients' age did not correlate with OKS ($P > .05$, Wilcoxon rank sum test).

Discussion

A Kaplan-Meier survivorship at 10 years of 94.2% of the fixed-bearing UKA design was assessed in this study (mean follow-up: 5.5 years). Out of 460 patients, 11 patients underwent revision surgery and only 2 were lost to follow-up. A mean OKS of 43.3 points was recorded at the last follow-up, with 94.6% patients showing excellent or good outcomes.

The results of this study are comparable with the outcomes reported in literature on fixed-bearing UKA series [21,30,31]. Cartier and Cheaib [10] reported 9 revisions out of 108 cases at a mean follow-up of 4.5 years with the Mod II-design. Argenson et al [11] studied the long-term survivorship of the Miller-Galante UKA design: at a mean follow-up of 20 years, clinical and functional Knee Society Scores were very satisfactory with an average of 91 and 88 points, respectively. Vasso et al [27] reported on a series of 136 UKAs with the ZUK design at a mean follow-up of 7.5 years; the International Knee Score was also excellent, with an average of 89.1 points.

Table 2
Outcomes of the UKA Surgery at Last Follow-Up.

Patient Population (N, %)		
Total No.	460	100%
Available at last follow-up	422	91.8%
Dead patients	25	5.4%
Lost to follow-up	2	0.4%
Causes of revision	11	2.4%
Infection	4	0.9%
Lateral pain and overload	2	0.4%
Lateral compartment OA	2	0.4%
Pain and patellar chondropathy	2	0.4%
Severe synovitis	1	0.2%

UKA, unicompartmental knee arthroplasty; OA, osteoarthritis.

Table 3
Quality Assessment of the Oxford Knee Score (OKS) at the Last Follow-Up.

Quality Score	OKS	No. of Cases Available	%
Total no. of patients	0-48	422	100
Excellent	>41 (/48)	326	77.3
Good	34-41 (/48)	73	17.3
Fair	27-33 (/48)	15	3.5
Poor	<27 (/48)	8	1.9

In medial OA, mobile-bearing UKA series have shown excellent results in the literature. In 2011, Price and Svard [16] published their study on a cohort of 682 Oxford (Biomet, Warsaw, IN) UKAs at a mean follow-up of 5.1 years; they reported a 10- and 16-year survivorship of 94% and 91%, respectively; functional scores were not available. In 2011 and 2015, the Oxford group evaluated a 1000 UKA series at a mean follow-up of respectively 5.6 and 10.3 years; a survivorship of 94% and 91% was calculated at 10 and 15 years. At 10 years, a mean OKS of 40 was reported [24,25]. In 2018, Alnachoukati et al reported a 10-year, multicenter, survival analysis of 825 Oxford UKA's at a mean follow-up of 7.6 years. UKA survivorship was calculated 85% at 10 years. Average American Knee Society Score (AKSS) at last follow-up was 90, with 86% reporting excellent and good functional outcome [26]. Overall, outcomes on implant survivorship and joint functionality can be considered comparable between fixed- and mobile-bearing UKAs [32], at least with respect to published single-center series.

Considering the causes of revision instead, a comparison between fixed- and mobile-bearing UKAs highlighted some differences. In our study, 11 (2.4%) revisions were recorded out of 460 patients. The causes of revision were infection (n = 4; 36%), lateral overload (n = 2; 18%), progression of OA in the lateral compartment (n = 2; 18%), patellar pain with chondropathy (n = 2; 18%), and severe synovitis (n = 1; 9%). No component loosening, excessive poly wear, or other implant-related failures occurred. Compared to the causes of revision in the mobile-bearing series in literature [16,25,26], no revisions were recorded due to either dislocation of the bearing or ACL rupture or instability. In mobile-bearing designs, ACL rupture may lead to dislocation of the bearing, resulting in implant revision [25]. Pandit et al [25] reported 10 of 52 revisions (19%) related to dislocation of the bearing and instability. Price and Svard [16] reported 6 of 34 reoperations and revisions (17%) due to dislocation of the bearing. Alnachoukati et al [26] reported 8 of 93 revisions (9%) due to dislocation, instability, or impingement of the mobile-bearing. In fixed-bearing UKA, an ACL rupture does not lead to bearing dislocation and thereby, no implant revision. ACL insufficiency in an overall stable knee is not a contraindication to fixed-bearing UKA [33,34].

In our series, no revision occurred due to unexplained pain, in comparison with the 7 of 52 revisions (13%) reported by Pandit et al [25] and 3 of 34 revisions (9%) reported by Price and Svard [16]. Alnachoukati et al [26] reported 16 of 93 revisions (20%) due to unexplained pain or unknown cause. In this study, 2 of 11 revisions (18%) were recorded owing to patellar pain with chondropathy, which is comparable with another fixed-bearing series in the literature [11]. This was possibly because of failure to appropriately treat the lateral facet chondropathy that was already existing at the time of the index surgery (Table 4). No revisions for patellar pain or

Table 4
Details of the Revisions Occurred After UKA Surgery in This Patient Cohort.

Revision	Time to Revision (y)	Cause of Revision	Findings	Outcome
1	0.1	Infection	Culture: MRSA	2-Stage revision, using primary TKA
2	1.1	Pain, patellar chondropathy	Lateral facet grade 3 (preexisting)	Primary TKA
3	1.4	Infection	Culture: MSSA	2-Stage revision using primary TKA
4	2.0	Synovitis	Severe synovitis	Primary TKA with synovectomy
5	2.8	Pain, patellar chondropathy	Lateral facet grade 4 (preexisting)	Primary TKA
6	3.6	Lateral pain, overcorrection, lateral overload	Joint line raised 1-2 mm	Primary TKA
7	4.2	Lateral pain, overcorrection, lateral overload	2° Valgus tibial cut, joint line raised 2 mm	Primary TKA
8	5.3	Infection	Culture: *Streptococcus. agalactiae*	2-Stage revision using revision TKA
9	6.2	Pain, lateral OA	Joint line raised 1-2 mm	Primary TKA
10	7.6	Infection/skin trauma	Culture: MSSA	2-Stage revision using primary TKA
11	9.0	Pain, lateral OA	None; joint line not raised	Primary TKA

UKA, unicompartmental knee arthroplasty; MRSA, methicillin-resistant *Staphylococcus aureus*; TKA, total knee arthroplasty; MSSA, methicillin-sensitive *Staphylococcus aureus*; OA, osteoarthritis.

patellar chondropathy were reported by Price and Svard [16] (0/34), Pandit et al [25] (0/52), and Alnachoukati et al [26] (0/93). It may be possible that patellar pain and unexplained pain are overlapping clinical entities and are respectively underreported/overreported in mobile-bearing series.

In our series, 2 of 11 revisions (18%) occurred because of progression of OA in the lateral compartment compared to 29% [16], 48% [25], and 24% [26] in mobile-bearing series. Although the mean follow-up is longer, this is possibly related to the fact that most of the mobile-bearing UKA designs feature a mobile polyethylene insert. Because of the risk of luxation of the insert, a thicker insert is likely more often chosen. However, this may lead to an overcorrection with lateral load shift that may initiate lateral disease progression. Naturally, this is also an important matter in fixed-bearing UKA (Fig. 3). We agree with the analysis of Pandit et al [25], as well as with several other authors such as Vasso et al [17] and Chatellard et al [18] who support that undercorrection of the limb alignment and thinner inserts lead to better survival.

One revision in our series occurred due to severe synovitis, longstanding since before the index operation. Although the cause of the synovitis was never elucidated, extra attention should be

Fig. 3. Radiographs of revision No. 7. (A) Preoperative standing X-rays of a 60-year-old female patient with isolated medial osteoarthritis of her left knee. Her BMI was of 29.3 kg/m^2 before surgery. No particular medical history. The standing X-ray showed a medial grade 4 osteoarthritis. The patient's limb alignment was 6° varus. (B) Postoperative standing X-rays at 1 year showed a well-fixed femoral and tibial component, no overhang, discrete medial position of femoral component, 2° valgus cut on the tibia. An 11-mm polyethylene insert was used. Postoperative limb alignment of 1° varus. Joint line was raised by 2 mm. Patient was developing lateral pain due to overcorrection and lateral overload. (C) Postoperative standing X-rays at 4 year (anteroposterior + Rosenberg view) showed minor degenerative changes in the lateral compartment without lateral joint space narrowing. Patient continued having lateral pain. (D) Postrevision X-rays at 4.5 year: incapacitating lateral pain resulting in revision to TKA at 4.2 years postoperative. TKA, total knee arthroplasty.

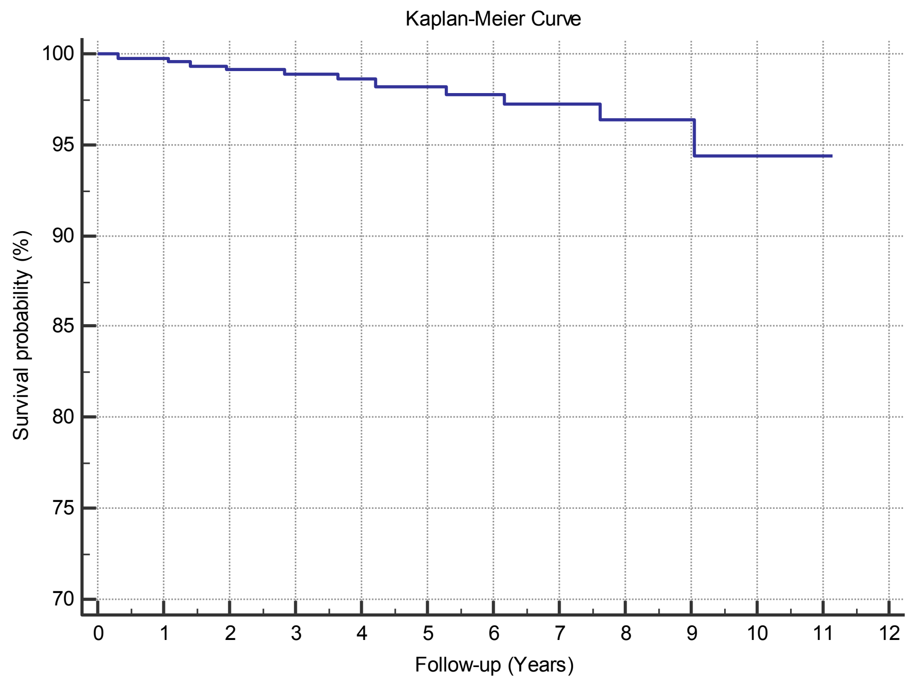

Fig. 4. Kaplan-Meier survivorship curve assessed for the whole patient cohort of this study, using as the end point of the analysis implant revision for any reason.

given to these cases in the preoperative and diagnosing setting. Inflammatory disease is sometimes very difficult to rule out. If there is any doubt about indication and inflammatory disease, we agree to stick to the Kozinn and Scott criteria [35] and will not favor a UKA in these cases.

Literature concerning the survivorship and poly wear of fixed-bearing UKA designs is excellent [10–12,14,27] but sometimes challenged [25]. Nevertheless, in several of the most prominent National Joint Registries [36–38], the most frequently used fixed-bearing UKA design outperforms the most frequently used mobile-bearing UKA design in terms of survivorship. A fixed-bearing UKA design is less susceptible of complications as bearing dislocation and instability (ACL and medial collateral ligament rupture), common modes of failure in mobile-bearing UKA designs [16,25,26]. A fixed-bearing UKA is possibly less prone to over-correction and consequently lateral disease progression on the long term.

The survivorship in this UKA cohort was 97.2% and 94.2% at 5 and 10 years, respectively. Postoperative joint functionality was excellent (OKS, 43.3), with 94.6% patients showing excellent or good outcomes. Compared to outcomes reported for TKA [1,20,21], we describe in this fixed-bearing series a comparable survivorship with higher functional outcomes. In UKA procedures, only the outworn compartment is addressed, while the joint line is maintained at the native level; besides, the limb alignment is only corrected for the cartilage wear, and the cruciate ligaments are not sacrificed. We believe that all these factors have contributed to facilitate fast recovery, excellent function, and long-term survivorship in our series. Interest on the native level of the joint line and limb alignment has increased only during the last decade in TKA research [6,39–42], whereas these concepts are an essential part in UKA philosophy.

This study presents several limitations. First, it is retrospective, without any specific inclusion and exclusion criteria apart from the clinical practice at our center. Second, there was no complete radiological follow-up. However, the size of the patient cohort ($n = 460$) under assessment may represent a strength of this investigation.

Conclusions

In conclusion, this study showed that a fixed-bearing UKA system could provide an optimal solution in the treatment of medial end-stage OA. Fixed-bearing UKA contributes toward restoring the native tibial and femoral joint surfaces while correcting to predisease limb alignment, thus ensuring effective functional recovery, pain relief, and low incidence of complications and revisions.

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