Comparison of the early postoperative outcomes of cementless and cemented medial unicompartmental knee arthroplasty

results from the Dutch National Arthroplasty Registry

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Cite this article:
Bone Jt Open 2024;5(5): 401–410.

DOI: 10.1302/2633-1462.55.BJO-2024-0007.R1

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Aims
The primary objective of this registry-based study was to compare patient-reported outcomes of cementless and cemented medial unicompartmental knee arthroplasty (UKA) during the first postoperative year. The secondary objective was to assess one- and three-year implant survival of both fixation techniques.

Methods
We analyzed 10,862 cementless and 7,917 cemented UKA cases enrolled in the Dutch Arthroplasty Registry, operated between 2017 and 2021. Pre- to postoperative change in outcomes at six and 12 months' follow-up were compared using mixed model analyses. Kaplan-Meier and Cox regression models were applied to quantify differences in implant survival. Adjustments were made for patient-specific variables and annual hospital volume.

Results
Change from baseline in the Oxford Knee Score (OKS) and activity-related pain was comparable between groups. Adjustment for covariates demonstrated a minimally greater decrease in rest-related pain in the cemented group (β = -0.09 (95% confidence interval (CI) -0.16 to -0.01)). Cementless fixation was associated with a higher probability of achieving an excellent OKS outcome (> 41 points) (adjusted odds ratio 1.2 (95% CI 1.1 to 1.3)). The likelihood of one-year implant survival was greater for cemented implants (adjusted hazard ratio (HR) 1.35 (95% CI 1.01 to 1.71)), with higher revision rates for periprosthetic fractures of cementless implants. During two to three years' follow-up, the likelihood of implant survival was non-significantly greater for cementless UKA (adjusted HR 0.64 (95% CI 0.40 to 1.04)), primarily due to increased revision rates for tibial loosening of cemented implants.

Conclusion
Cementless and cemented medial UKA led to comparable improvement in physical function and pain reduction during the initial postoperative year, albeit with a greater likelihood of achieving excellent OKS outcomes after cementless UKA. Anticipated differences in early physical function and pain should not be decisive factor in the choice of fixation technique. However, surgeons should consider the differences in short- and long-term implant survival when deciding which implant to use.

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Take home message

- Comparable improvement in physical function and pain reduction can be achieved during the first postoperative year with both cementless and cemented fixation techniques for medial unicompartmental knee arthroplasty.
- Cemented fixation was associated with a greater likelihood of implant survival during the initial 12 months following surgery, which was mostly attributed to early complications of cementless implants. However, after the second postoperative year, there was a tendency for higher implant survival following cementless fixation.

Introduction

Despite well-documented benefits of unicompartmental knee arthroplasty (UKA) over total knee arthroplasty (TKA) for medial compartment osteoarthritis (OA),[1-3] joint registries unanimously continue to report inferior implant survival rates compared to TKA.[4-6]

The discrepancy in survival between UKA and TKA has prompted further investigation into factors potentially enhancing performance of UKA, including the choice of fixation technique. Similar to TKA, cemented fixation has traditionally been the standard fixation for UKA. However, cement-related issues, such as third-body wear, inappropriate cement penetration, radiolucent lines, prolonged operating time, and aseptic loosening, have led to a renewed interest in cementless fixation.[5,7-9]

Cementless systems rely on biological bone-implant fixation, which is theorized to promote a more durable fixation.[7] Large studies have shown superior implant survival and comparable or favourable clinical outcomes of cementless over cemented fixation at mid- to long-term follow-up.[7-10] By contrast, a recent study reported significantly lower pain scores following cemented UKA during the first postoperative year.[11] This is an interesting finding as comparative studies typically focus on outcomes at a minimum of two years' follow-up, while pain relief and improved function are commonly the main motivation for OA-affected patients to undergo surgery.[12] In order to properly inform patients on the expected clinical course and facilitate shared decision-making, it is important to further define characteristics of cementless and cemented UKA, not only in the long term, but also during the initial postoperative year. However, there is currently a lack of large-scale analysis of early postoperative performance of both fixation methods.

The primary objective of this study was to compare patient-reported physical function and pain during the first postoperative year between cementless and cemented medial UKA as treatment for medial compartment OA. The secondary objective was to assess one- and three-year implant survival and reasons for revision following both fixation techniques. The null-hypothesis of this study was that cementless and cemented UKA would yield comparable patient-reported outcomes and implant survival during the first postoperative year.

Methods

Data source and study design

This is a population-based observational study, conducted using data from the Dutch Arthroplasty Registry (LROI). The LROI is a nationwide registry of prospectively collected data on joint arthroplasty procedures, performed in the Netherlands. The LROI has been collecting data since 2007 and has a 100% coverage of all Dutch hospitals since 2012. Arthroplasty data are routinely entered directly into the LROI database and include patient characteristics and information about the procedure. Registration completeness is validated annually by comparison of LROI registrations with the number of procedures recorded in the hospital information system. Data completeness was between 99% and 100% for primary knee arthroplasties, and between 97% and 98% for knee revision arthroplasties over recent years.[13]

For the current study, data of all patients undergoing primary medial UKA for the indication of OA between 1 January 2017 and 31 December 2021 were retrieved from the LROI. Patient characteristics, including previous surgery to the operative knee, smoking status, American Society for Anesthesiologists (ASA) grade,[14] Charnley score,[15] patient-reported outcome measures (PROMs), surgical approach, fixation technique, revision status, and anonymized hospital identification number, were extracted for each patient. For each case, bearing type was identified using the prosthesis (brand) name. The annual hospital volume of medial UKA per institution was determined using the anonymized hospital identification number. Annual hospital volumes were categorized into four groups, based on the interquartile range of this variable.

Patient demographics

A total of 18,779 knees were included, comprising 10,862 cementless (58.8%) and 7,917 cemented UKA cases (42.2%) (Figure 1). Included patients had a mean age of 64.7 years (standard deviation (SD) 8.7), mean BMI of 29.1 kg/m^2 (SD 4.5), and 54.1% (n = 10,155) of patients were female (Table I). Key implants used were the Uncemented Oxford Partial Knee (Zimmer Biomet, UK) in the cementless group (98.7% of cases; n = 10,725), and the Cemented Oxford Partial Knee (Zimmer Biomet) and Physica Zimmer Unicompartmental High Flex Knee (LIMA, Italy) in the cemented group (55.8% (n = 4,417) and 32.7% (n = 2,582) of cases, respectively).

Patient-reported outcomes

The primary outcomes of interest were the Oxford Knee Score (OKS; range 0 to 48; higher scores indicating a better physical function),[16,17] Numerical Rating Scale (NRS) for rest- and activity-related pain (range 0 to 10; higher scores indicating a higher level of pain), and NRS for overall satisfaction with the outcome of the procedure (range 0 to 10; higher scores indicating a higher level of satisfaction). To characterize improvement in activities of daily living (ADL) following the surgery, patients were asked the following question: "How would you describe the overall change in ADL after your knee surgery?" Response options included: "very much worse," "much worse," "slightly worse," "unchanged," "slightly improved," "much improved," or "very much improved." PROMs were prospectively collected prior to surgery and at six- and 12-month follow-up. The LROI has been collecting PROMs since 2014. Response rates at six- and 12-month follow-up were between 20.7% and 29.7% during the study period.

To define thresholds for interpretation of improvement for the OKS, minimal important change (MIC) and substantial clinical benefit (SCB) values were determined. MIC

Table I. Demographic details of the included study population.

Variable	Total	Cementless medial UKA	Cemented medial UKA
Knees, n	18,779	10,862	7,917
Mean age, yrs (SD)	64.7 (8.7)	64.8 (8.8)	64.5 (8.5)
Mean BMI, kg/m^2 (SD)	29.1 (4.5)	29.2 (4.6)	29.0 (4.3)
Sex, n (%)			
Female	10,155 (54.1)	5,876 (54.1)	4,279 (54.0)
Male	8,624 (45.9)	4,986 (45.9)	3,638 (46.0)
Smoking, n (%)			
Smoking	1,664 (8.9)	918 (8.5)	746 (9.4)
Non-smoking	17,115 (91.1)	9,944 (91.5)	7,171 (90.6)
ASA grade, n (%)			
I	3,432 (18.3)	1,845 (17.0)	1,587 (20.1)
II	12,572 (67.0)	7,420 (68.4)	5,152 (65.1)
III to IV	2,763 (14.7)	1,590 (14.6)	1,173 (14.8)
Charnley score, n (%)*			
A	9,304 (49.7)	5,059 (46.7)	4,245 (53.9)
B1	5,829 (31.2)	3,677 (34.0)	2,152 (27.3)
B2/C	3,542 (18.9)	2,070 (19.1)	1,472 (18.7)
N/A	35 (0.2)	23 (0.2)	12 (0.2)
Previous surgery, n (%)†	4,086 (22.3)	2,334 (22.1)	1,752 (22.5)
Surgical approach, n (%)			
Medial parapatellar	17,847 (95.2)	10,258 (94.7)	7,589 (96.0)
Lateral parapatellar	20 (0.1)	7 (0.1)	13 (0.2)
Vastus (mid/sub)	771 (4.1)	477 (4.4)	294 (3.7)
Other	104 (0.6)	95 (0.9)	9 (0.1)
Bearing design, n (%)			
Mobile-bearing	15,142 (80.6)	10,725 (98.7)	4,417 (55.8)
Fixed-bearing	3,368 (17.8)	10 (0.1)	3,358 (42.4)
Unknown	269 (1.4)	127 (1.2)	142 (1.8)
Annual hospital volume, n (%)‡			
1 to 42 ($P_0 - P_{25}$)	4,730 (25.2)	2,501 (23.0)	2,229 (28.2)
43 to 73 ($P_{25} - P_{50}$)	4,587 (24.4)	2,697 (24.8)	1,890 (23.9)
74 to 124 ($P_{50} - P_{75}$)	4,716 (25.1)	2,961 (27.3)	1,755 (22.2)
125 to 264 ($P_{75} - P_{100}$)	4,746 (25.3)	2,703 (24.9)	2,043 (25.8)

*The Charnley score includes four categories: A, one knee joint affected; B, both knee joints affected; B2, prosthesis in the contralateral knee joint; C, multiple joints affected.

†Previous surgery indicates any previous surgical procedure to the operative knee.

‡Annual hospital volume was categorized into four groups, based on the interquartile range of the total study sample.

ASA, American Society of Anesthesiologists; N/A, not available; SD, standard deviation; UKA, unicompartmental knee arthroplasty.

values represent the smallest improvement to be considered clinically important from the patients' perspective,[18] whereas SCB reflects the amount of change required to experience significant improvement.

Implant survival

The secondary outcome of interest was implant survival at one and three years' follow-up, defined as the time from initial implantation to a first revision procedure. Date of death, or end of the study follow-up, was considered the censoring date. The LROI revision form allows surgeons to select one or more reasons for revision. The endpoint 'revision' was defined as a revision of a primary UKA for any reason during which one or more components were removed, exchanged, or added. Revision information further included the revision date, which was linked to the index procedure using an identification number. To correctly determine implant survival, the LROI is linked to the Dutch National Insurance database, which enables identification of deaths and their inclusion in the registry.

Statistical analysis

Descriptive statistics were used to summarize demographics and PROMs by fixation group. Discrete variables were compared using chi-squared tests or Fisher's exact test when deemed appropriate. Pre- to postoperative change in PROMs was analyzed using linear mixed model analyses. MIC and SCB values for OKS were estimated using two anchor-based methods. The receiver operating curve (ROC) method is commonly used in the literature and allows for comparison with other studies. MIC and SCB using the ROC curve method were defined as the optimal cutoff point that maximizes sensitivity and specificity (Youden index).[19] The second method, the predictive modelling approach, has been shown to provide a more precise estimate of MIC and SCB,[20] and was conducted using logistic regression analysis.[18] Pre- to postoperative change in ADL reported as "slightly improved" was used as an anchor to determine the MIC,[20] and "much improved" to determine the SCB. Thresholds established through the predictive modelling method were adjusted for the proportion of improved patients based on these thresholds. Logistic regression analyses were conducted to estimate the probability of achieving change from baseline in the OKS that corresponded with, or exceeded the MIC. We conducted a similar analysis to estimate the probability of achieving an excellent OKS outcome (> 41 points).[21]

Kaplan-Meier models were applied to estimate one- and three-year implant survival. The log-rank test was used to compare implant survival between groups. Cox proportional hazard regression models were conducted to quantify any differences in implant survival, after adjustment for age, sex, BMI, ASA grade, and annual hospital volume. Outcomes of these analyses are presented as crude and adjusted hazard ratios (HRs) with corresponding 95% confidence intervals (CIs). Due to a time-dependent interaction of implant survival with the fixation modality (i.e. violation of the proportional hazard assumption), HR calculation was stratified for follow-up (first two years and third year after index surgery) by adding a time-dependent covariate to the model. Level of significance was set at 0.05 for all tests. Analyses were conducted using SPSS version 26.0 (IBM, USA).

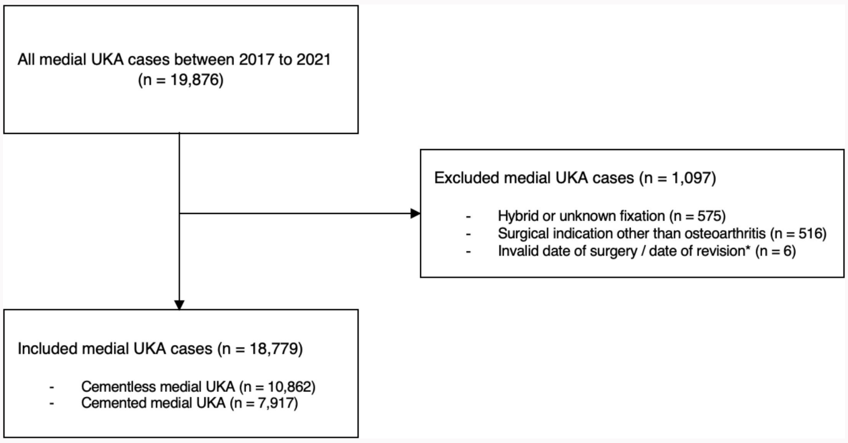

Fig. 1
Flowchart of inclusion of medial unicompartmental knee arthroplasty (UKA) cases. *Date of revision before date of surgery.

Table II. Patient-reported outcomes by fixation mode for medial unicompartmental knee arthroplasty at baseline, and at six- and 12-month follow-up.

Baseline	Knees, n	Mean OKS (SD)	Mean NRS Pain, Activity (SD)	Mean NRS Pain, Rest (SD)	Mean NRS Satisfaction (SD)
Cementless medial UKA	4,433	24.4 (7.5)	7.4 (1.9)	5.1 (2.5)	-
Cemented medial UKA	4,289	24.0 (7.1)	7.5 (1.8)	5.3 (2.4)	-
6 mths					
Cementless medial UKA	2,990	39.7 (7.8)	2.4 (2.4)	1.4 (2.0)	8.1 (2.2)
Cemented medial UKA	3,266	39.0 (7.7)	2.5 (2.4)	1.6 (2.1)	8.2 (2.0)
12 mths					
Cementless medial UKA	2,533	41.0 (7.1)	2.1 (2.4)	1.2 (2.0)	8.1 (2.2)
Cemented medial UKA	2,808	40.6 (7.1)	2.2 (2.4)	1.4 (2.0)	8.2 (2.1)

NRS, numerical rating scale; OKS, Oxford Knee Score; SD, standard deviation; UKA, unicompartmental knee arthroplasty.

Table III. Crude and adjusted differences between cementless and cemented medial unicompartmental knee arthroplasty in change from baseline of patient-reported outcomes.

Variable	Crude β (95% CI)	p-value*	Adjusted β (95% CI)†	p-value*
OKS	-0.22 (-0.68 to 0.23)	0.343	0.02 (-0.22 to 0.27)	0.854
NRS Pain, Activity	-0.02 (-0.15 to 0.12)	0.803	-0.04 (-0.11 to 0.03)	0.271
NRS Pain, Rest	-0.12 (-0.26 to 0.02)	0.089	-0.09 (-0.16 to -0.01)	0.023

*Linear mixed model analyses.
†Adjusted for age, sex, BMI, American Society for Anesthesiologists grade, and annual hospital volume.
CI, confidence interval; NRS, numerical rating scale; OKS, Oxford Knee Score.

Results

Patient-reported outcomes

Completed PROMs at six- and 12-month follow-up were available for 6,256 and 5,341 knees, respectively. Demographic details of responders and non-responders to PROMs are presented in Supplementary Table i, showing a lower response rate in the cementless group without major differences in other demographics. Mean scores were comparable between fixation groups (Table II). Crude differences in change from baseline during the initial postoperative year were not significant (Table III; Figure 2). After adjusting for potential confounders, there was a significant yet minor difference in favour of the cemented group in pre- to postoperative change of NRS pain during rest (β = -0.09 (95% CI -0.16 to -0.01); p = 0.023, linear mixed model).

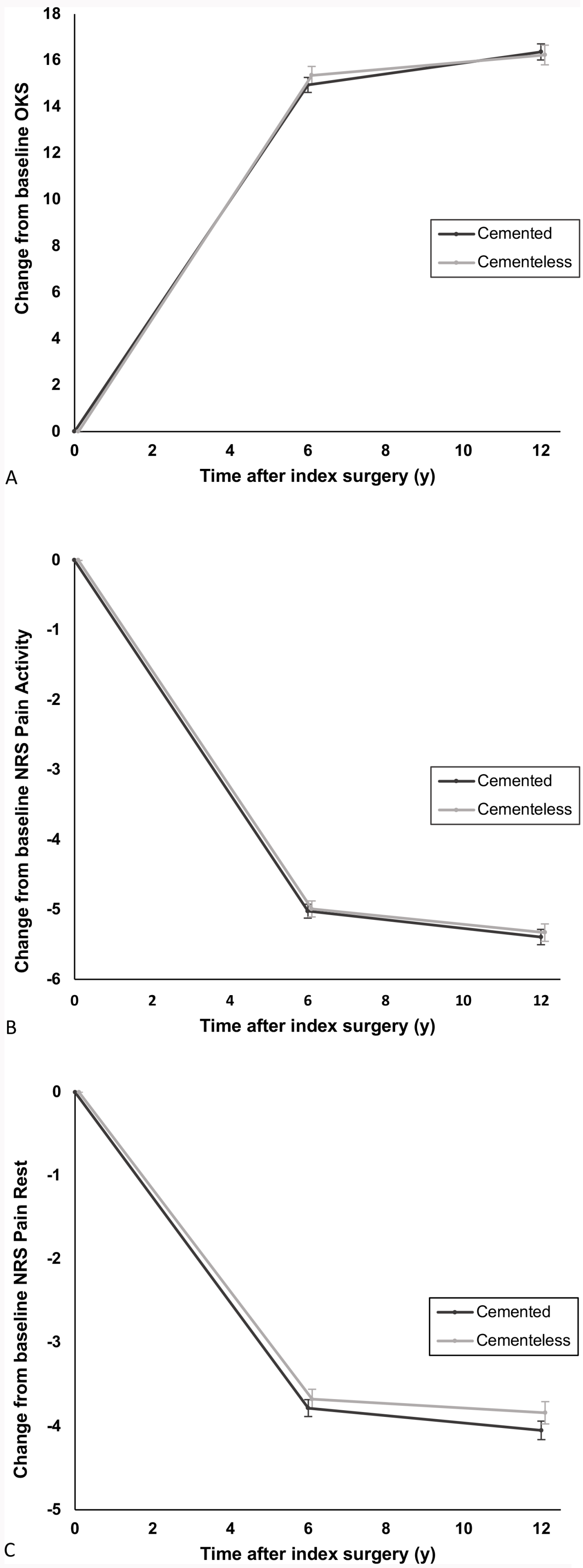

Fig. 2
Mean change from baseline to six- and 12-month follow-up for cementless and cemented medial unicompartmental knee arthroplasty. a) Oxford Knee Score (OKS), b) numerical rating scale (NRS) pain during activity, and c) NRS pain during rest.

Table IV. Summary table of clinically relevant change thresholds for the Oxford Knee Score at six-month follow-up.

Anchor-based method	MIC (95% CI)	SCB (95% CI)
Predictive modelling method		
Estimate	12.1 (11.2 to 13.0)	13.0 (12.4 to 13.6)
Adjusted estimate*	10.0 (9.5 to 10.5)	11.6 (11.3 to 11.9)
ROC curve method		
Estimate	10.5 (9.3 to 12.3)	13.5 (10.3 to 14.3)

*Estimate after adjustment for prevalence of improved patients.
CI, confidence interval; MIC, minimal important change; ROC, receiver operating characteristic; SCB, substantial clinical benefit.

Clinically relevant change thresholds for the Oxford Knee Score

At six-month follow-up, the adjusted MIC threshold for OKS was 10.0 points (95% CI 9.5 to 10.5). The adjusted SCB threshold was 11.6 points (95% CI 11.3 to 11.9). Unadjusted MIC and SCB estimates, and estimates according to the ROC curve method are summarized in Table IV.

Achievement of clinically relevant thresholds

Cementless and cemented UKA patients had a similar adjusted OR for achieving the MIC threshold for OKS at six months' (OR 1.0 (95% CI 0.9 to 1.2); p = 0.599, logistic regression), and 12 months' follow-up (OR 0.9 (95% CI 0.8 to 1.1); p = 0.414, logistic regression) (Table V). The cementless group had a significantly higher adjusted likelihood for achieving an excellent OKS, at six months' (OR 1.3 (95% CI 1.1 to 1.4); p < 0.001, logistic regression), and 12 months' follow-up (OR 1.2 (95% CI 1.1 to 1.3); p = 0.008, logistic regression).

Implant survival

One-year implant survival rates of cementless and cemented medial UKA were 98.1% (95% CI 97.7 to 98.3) and 98.6% (95% CI 98.3 to 98.9), respectively, with a crude HR of 1.31 (95% CI 1.04 to 1.67; p = 0.024, Cox proportional hazard regression). Adjustment for covariates demonstrated an HR of 1.35 (95% CI 1.06 to 1.71).

At three years' follow-up, implant survival rates were 96.3% (95% CI 95.9 to 96.7) in the cementless group and 95.7% (95% CI 95.1 to 96.3) in the cemented group. Crude and adjusted HRs were therefore stratified for 0 to two years and two to three years' follow-up, and are summarized in Table VI. The crude and adjusted HRs for follow-up period two to three years were 0.59 (95% CI 0.36 to 0.96; p = 0.032, Cox proportional hazard regression) and 0.64 (95% CI 0.40 to 1.04; p = 0.071, Cox proportional hazard regression), respectively (Figure 3).

Reasons for revision

Instability and infection were the most common reasons for revision during the first postoperative year, with equal distributions between both fixation groups (Table VII). During this period, there was a higher incidence of revision for

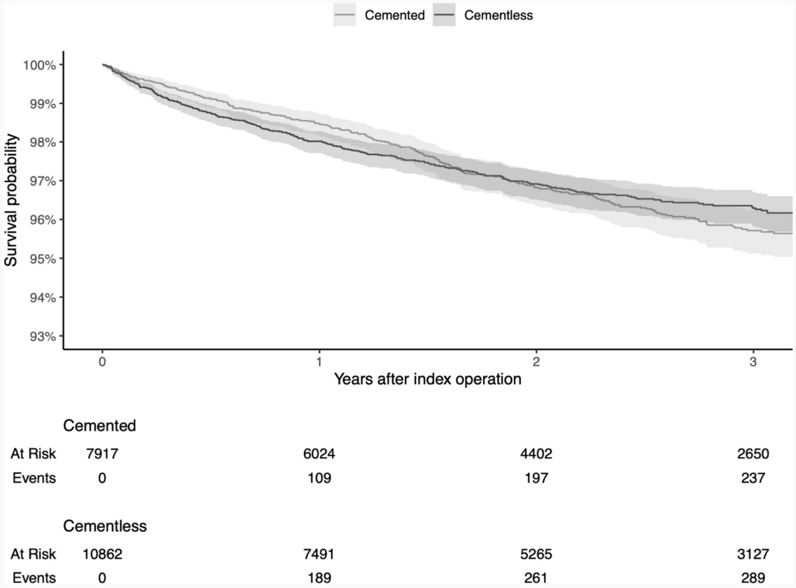

Fig. 3
Kaplan-Meier curve for cementless and cemented medial unicompartmental knee arthroplasty. The shaded area represents confidence intervals.

Table V. Probability estimates of achieving clinically relevant thresholds for the Oxford Knee Score, defined as a change from baseline equal to or greater than ten points, as well as the probability estimates of achieving an excellent postoperative outcome (> 41 points), during the initial operative year.

Follow-up	Cementless medial UKA, n (%)	Cemented medial UKA, n (%)	OR (95% CI)	p-value†	Adjusted OR (95% CI)*	p-value†
6 mths						
MIC OKS (CFB ≥ 10)	1,487 (72.6)	1,988 (71.7)	1.1 (0.9 to 1.2)	0.491	1.0 (0.9 to 1.2)	0.599
Excellent OKS (> 41)	1,369 (53.2)	1,497 (48.1)	1.2 (1.1 to 1.4)	< 0.010	1.3 (1.1 to 1.4)	< 0.001
12 mths						
MIC OKS (CFB ≥ 10)	1,188 (76.3)	1,772 (77.3)	0.9 (0.8 to 1.1)	0.444	0.9 (0.8 to 1.1)	0.414
Excellent OKS (> 41)	1,248 (60.5)	1,542 (57.9)	1.1 (1.0 to 1.3)	0.071	1.2 (1.1 to 1.3)	0.008

*Adjusted for age, sex, BMI, and American Society for Anesthesiologists grade.
†Logistic regression.
CFB, change from baseline; CI, confidence interval; MIC, minimal important change; OKS, Oxford Knee Score; OR, odds ratio; UKA, unicompartmental knee arthroplasty.

Table VI. Crude and adjusted hazard ratios for implant survival of cementless and cemented medial unicompartmental knee arthroplasty, calculated using Cox proportional hazard regression models and stratified for follow-up period by adding a time-dependent interaction covariate to the model.

Timepoint	Crude HR (95% CI)	p-value	Adjusted HR (95% CI)*	p-value	p-value interaction
0 to 1 yr	1.31 (1.04 to 1.67)	0.024	1.35 (1.06 to 1.71)	0.015	N/A
0 to 2 yrs	1.03 (0.86 to 1.24)	0.740	1.06 (0.88 to 1.27)	0.568	0.034
2 to 3 yrs	0.59 (0.36 to 0.96)	0.032	0.64 (0.40 to 1.04)	0.071	0.059

*Adjusted for age, sex, BMI, American Society for Anesthesiologists grade, and annual hospital volume.
CI, confidence interval; HR, hazard ratio; N/A, not applicable.

periprosthetic fractures in the cementless group (18.0% vs 9.2% of all revisions; p = 0.039, chi-squared test).

Between two and three years' follow-up, revision for instability was more frequently reported following cementless fixation (31.0% vs 18.0% of all revisions; p = 0.022, chi-squared test), whereas revision for aseptic loosening of the tibial component occurred more often in the cemented group (35.9% vs 8.0% of all revisions; p < 0.001, chi-squared test).

Table VII. Overview revision characteristics by fixation group.

Variable	Rank	0 to 1 year follow-up			2 to 3 years' follow-up		
		Cementless medial UKA	Cemented medial UKA	p-value	Cementless medial UKA	Cemented medial UKA	p-value
No. of revised knees		189	109		100	128	
Reasons for revision, n (%)							
Instability	1	36 (19.0)	24 (22.0)	0.538*	31 (31.0)	23 (18.0)	0.022*
Infection	2	34 (18.0)	22 (20.2)	0.641*	3 (3.0)	10 (7.8)	0.120*
Periprosthetic fracture	3	34 (18.0)	10 (9.2)	0.039*	2 (2.0)	0 (0.0)	0.191†
Loosening tibial component	4	23 (12.2)	14 (12.8)	0.865*	8 (8.0)	46 (35.9)	< 0.001*
Malalignment	5	15 (7.9)	8 (7.3)	0.852*	8 (8.0)	15 (11.7)	0.355*
Progression of osteoarthritis	6	6 (3.2)	6 (5.5)	0.366†	27 (27.0)	38 (29.7)	0.656*
Revision removal	7	3 (1.6)	5 (4.6)	0.147†	1 (1.0)	0 (0.0)	0.439†
Arthrofibrosis	8	3 (1.6)	2 (1.8)	1.00†	3 (3.0)	1 (0.8)	0.322†
Patellar pain	9	2 (1.1)	3 (2.8)	0.359†	6 (6.0)	12 (9.4)	0.348*
Polyethylene wear	10	5 (2.6)	1 (0.9)	0.421†	4 (4.0)	2 (1.5)	0.408†
Patellar dislocation	11	1 (0.5)	0 (0.0)	1.00†	2 (2.0)	0 (0.0)	0.191†
Loosening femoral component	12	0 (0.0)	0 (0.0)	N/A	4 (4.0)	5 (3.9)	1.000†
Loosening patellar component	13	0 (0.0)	0 (0.0)	N/A	1 (1.0)	0 (0.0)	0.439†
Unspecified	N/A	56 (29.6)	40 (36.7)	N/A	24 (24.0)	21 (16.4)	N/A

*Chi-squared test.
†Fisher's exact test.
N/A, not applicable; UKA, unicompartmental knee arthroplasty.

Discussion

The main finding of this study, using data of approximately 18,800 cases from a national joint registry, was that cementless and cemented medial UKA led to comparable improvement in patient-reported physical function and pain reduction during the initial postoperative year, albeit with a greater likelihood of achieving excellent OKS outcomes after cementless UKA (odds ratio 1.2; p = 0.008, logistic regression). The likelihood of implant survival of cemented UKA during this period was 35% higher (HR 1.35; p = 0.015, Cox proptional hazard regression), primarily due to higher revision rates for periprosthetic fractures. At two years postoperatively, a contrasting trend was observed with higher revision rates among cemented prostheses, leading to a non-significantly 36% lower likelihood of implant survival compared to the cementless group during the two- to three-year follow-up period (HR 0.64; p = 0.071, Cox proportional hazard regression).

To the authors' knowledge, this study provides the first large-scale comparison of patient-reported outcomes during the initial postoperative year following cementless and cemented UKA. While mid- and long-term outcomes of both fixation techniques have been well studied, outcomes during the early postoperative phase remained under-reported.[8,10,22] Such data could help to create more comprehensive clinical expectation patterns and ultimately enhance candidate selection for both techniques. While cementless fixation has gained renewed interest, an obvious drawback lies in the potential inability to achieve immediate stable fixation, unlike the use of bone cement.[23] It has been discussed that, as a result, patients may experience increased pain during the early postoperative period, prior to biological fixation.[24,25]

In a prospective cohort study, Gifstad et al[11] found significantly higher activity- and rest-related pain scores in the first year after cementless medial UKA compared to cemented cases. Using a large registry cohort, we were unable to replicate these results. Our data showed a greater decrease in pain from baseline until 12 months' follow-up in the cemented group, only in rest-related pain (Figure 3). Nevertheless, the absolute difference between both groups, after adjustment for confounders, was minimal at just 0.09 points, and thus likely negligible (Table III). Based on the current observations, expected difference in early postoperative pain between fixation modes should not be a decisive factor in the choice of either technique. Nonetheless, biological osseointegration and subsequent stabilization of cementless implants is believed to occur primarily during the first postoperative months.[23,26] Since the first follow-up timepoint in the present study was at six months, it is possible that any differences in postoperative pain occurring prior to this point may have not been captured.

Our study also showed similar physical function improvements in both groups, with comparable proportions of patients experiencing clinically relevant improvement in the OKS. However, upon categorization of postoperative scores, the cementless group showed a greater likelihood of achieving excellent OKS outcomes at both follow-up timepoints. This finding is in accordance with recent literature that reports higher rates of excellent OKS outcomes following cementless UKA at five years' follow-up.[10] The current observations further align with the trend of equal or superior long-term outcomes of cementless over cemented UKA, as described in recent systematic reviews.[8,22]

Evaluation of implant survival in our study revealed a higher one-year survival rate in the cemented group, which was mainly caused by higher revision rates for periprosthetic fractures after cementless fixation. Although a systematic review found comparable rates of periprosthetic fractures among cementless and cemented UKA,[27] these rates are often reported to be higher after cementless fixation in registry-based studies and primarily involve the tibial plateau.[9,28] Surgeons should thus be aware of the increased fracture risk that is associated with the impaction technique required for cementless fixation.[29]

After the second postoperative year, we observed a trend of higher implant survival rates of cementless UKA. The crossing of the survival curves after the second year appeared to be mainly driven by increased revision rates for aseptic tibial component loosening in the cemented group. When examining implant survival curves of prior comparative registry studies, a similar phenomenon can be observed, with a turning point around two years' follow-up.[9,28,30] Current literature demonstrates that the superior survival of cementless implants after the initial postoperative phase is maintained over the mid- and long-term follow-up.[8,9,28,31] A possible explanation for this finding may be the well-described association between cemented fixation and an increased incidence of radiolucent lines around the bone-cement interface.[23,32] Radiolucent lines, when physiological, do not necessarily lead to loosening, but may indicate suboptimal fixation.[23] However, misinterpretation of physiological radiolucent lines, especially in the presence of pain, can lead to unnecessary revisions.[33] Hence, the initially higher revision rates of cementless prostheses observed in our study should be set off against the potential for a superior long-term fixation. Nonetheless, cementless fixation requires adequate bone quality and, as such, may not be suitable for all patients undergoing UKA.[28]

This study recognizes several limitations that should be considered when interpreting its results. It is a retrospective study of prospectively collected data, and observed associations may not imply causality. Although we corrected our analyses for potential confounders, there may have been residual confounding present due to factors that were either incompletely registered or not recorded in the registry at all. For example, the LROI does not record radiological data, which limits a more comprehensive analysis of outcomes. Moreover, the uneven PROM response rate may have introduced additional bias. Furthermore, although the key implants in both groups were the uncemented and cemented Oxford Partial Knee System, other implants were included in the cemented group. Though these implant designs are comparable and excellent outcomes have been reported for all three key implants,[8,34] we cannot rule out that any differences in observed results may have been due to implant design rather than fixation technique.

In conclusion, large-scale analysis of cementless and cemented medial UKA demonstrated that comparable improvement in physical function and pain reduction can be achieved during the initial postoperative year with both fixation techniques. The anticipated early clinical course should therefore not be a decisive factor in the choice of fixation technique. However, surgeons should consider the differences in short- and long-term implant survival when deciding which implant to use.

Supplementary material

A table containing the demographic details of responders and non-responders to patient-reported outcome measures.

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Funding statement

The authors received no financial or material support for the research, authorship, and/or publication of this article.

ICMJE COI statement

A. D. Pearle reports personal consulting fees from Smith & Nephew and DePuy Synthes, unrelated to this study. H. A. Zuiderbaan reports personal consulting fees from Smith & Nephew, unrelated to this study.

Data sharing

The datasets generated and analyzed in the current study are not publicly available due to data protection regulations. Access to data is limited to the researchers who have obtained permission for data processing. Further inquiries can be made to the corresponding author.

Ethical review statement

Ethical approval was not applicable for this study.

Open access funding
The open access funding for this study was self-funded.