

Cemented versus Cementless Unicompartmental Knee Arthroplasty (Systematic Review & Meta-Analysis)

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ABSTRACT

Background:

The exact treatment of choice for primary unicompartmental knee osteoarthritis of the knee is still controversial. Most of the options available to the orthopedic surgeon include arthroscopic or open debridement, high tibial osteotomy (HTO), McKeever hemiarthroplasty, total knee arthroplasty (TKA), unicompartmental knee arthroplasty (UKA), and arthrodesis. HTO has excellent short-term results and perfect outcomes but deterioration may follow regardless of the alignment achieved at the time of osteotomy assessment. The primary rehabilitation from this intervention is much more extensive than that from other surgical procedures.

Aim of the work:

This study aims to assess and compare the clinical outcomes, survival rates, and follow-up results of cemented and cementless UKAs.

Materials and Methods:

This review was done using the standard methodology outlined in the Cochrane Handbook and reported the findings under the Preferred Reporting Items for Systematic Reviews and Meta-analyses (PRISMA) statement guidelines. An initial search was carried out using PubMed, Cochrane library & Google scholar. Review articles and bibliographies of each study identified were searched for additional references that may contain further related studies. Personal contact with colleagues, collaborators, and other trialists working in the field of orthopedic surgery will be made to identify other published relevant studies.

Results:

No significant difference in mean PRO score, survival probability, or revision surgery rate is present in the Cemented group compared to the Cementless group ($p > 0.05$). The Comparative study between the two groups found non-significant differences as regards all the remaining indications of revision ($p > 0.05$).

Conclusion:

No functional difference was observed between cemented and cementless UKAs. The cementless implant is as safe and effective as the cemented device. Further future high-quality long-term studies of clinical trials with powerful evidence would better clarify the promising technology of cementless UKA and determine which fixation method is preferred for Oxford UKA.

Keywords:

Knee Arthroplasty, Knee Replacement, Unicompartmental, Uncemented, Cementless.

INTRODUCTION

The exact treatment of choice for primary unicompartmental knee osteoarthritis of the knee is still controversial. Most of the options available to the orthopedic surgeon include arthroscopic or open debridement, high tibial osteotomy (HTO), McKeever hemiarthroplasty, total knee arthroplasty (TKA), unicompartmental knee arthroplasty (UKA), and arthrodesis [1]. HTO has excellent short-term results and perfect outcomes but deterioration may follow regardless of the alignment achieved at the time of osteotomy assessment [2,3]. The primary rehabilitation from

this intervention is much more extensive than that from other surgical procedures.

UKA is a resurfacing procedure of the arthritic femoral and tibial condyles that aims to recreate the natural tibial slope and maintain the joint line maintenance, many studies comparing UKA to HTO have proven that UKA provides more consistent pain relief than HTO [4,5]. On the other hand, revisions after HTO have also shown a greater clinical success rate than those after UKA [6].

UKA is an effective well-established treatment option for late end-stage, symptomatic anteromedial knee osteoarthritis (AMOA) and less

commonly for lateral compartment osteoarthritis [7]. It is confined to a single compartment that has failed to respond to conservative management [8]. While Unicompartmental Knee Replacement (UKR) offers substantial benefits over total knee replacement (TKR) [9-11], is associated with significantly lower perioperative morbidity and mortality [12,13], smaller incision, less soft tissue injury, minimal bone stock resection, less blood loss, as well as lower infection rate, lower cost, shortened hospital stay, faster recovery, better range of movement (ROM) in addition to superior function, preservation of both cruciate ligaments, complete preservation of patellofemoral articulation, maintaining normal knee kinematics, stability, and mechanical alignment, rapid return to work and sport, subjective preference and satisfaction for a normal feeling and natural function of the knee [1,14]; controversy on the validity and durability of UKA, remains because it has higher revision rates [15], particularly for aseptic loosening [16-22].

There are many long-term follow-up studies on cemented unicompartmental knee components, but there is limited information on cementless components [23].

AIM OF THE WORK

This work aims to provide cumulative data about the efficacy and safety of cemented vs uncemented UKA as regards: functional, clinical, and radiographic outcomes, quality of fixation, implant bearing dislocation, insert failure rates & other Complications and operation time, survivorship, and revision rates.

MATERIALS AND METHODS

This review was done using the standard methodology outlined in the Cochrane Handbook and reported the findings under the Preferred Reporting Items for Systematic Reviews and Meta-analyses (PRISMA) statement guidelines [24].

Identification of studies:

An initial search was carried out using PubMed, Cochrane library & Google scholar using the following keywords: Unicompartmental knee arthroplasty, unicompartmental knee joint replacement, unicompartmental knee arthroplasty and partial knee replacement, cemented, cementation, uncemented, cementless.

Review articles and bibliographies of each study identified were searched for additional references that may contain further related studies. Personal contact with colleagues, collaborators, and other

trialists working in the field of orthopedic surgery will be made to identify other published relevant studies.

When two or more papers were based on an identical study; the paper was used that principally investigated the outcome of Cemented group versus the Cementless group in UKA patients.

We will consider published, full-text studies in English only. Moreover, no attempts were made to locate any neither unpublished studies nor non-English studies.

Criteria of accepted studies:

Types of studies:

The review will be restricted to comparative studies either prospective or retrospective, which studied the outcome of Cemented group versus the Cementless group of UKA patients. As well as cohort, randomized controlled trials (RCTs), clinical trials and case-control studies.

Types of participants:

Participants with partial knee osteoarthritis and have performed UKA operations.

Types of interventions:

Cemented implant group versus Cementless implant group.

Types of outcome measures:

At least one of these outcome measures will be considered:

1. Functional & clinical average patient's reported outcome scores (primary efficacy outcome).
2. Fixation quality & Implant survival probability (primary efficacy outcome).
3. Failure rate & Rate of revision surgery (secondary safety outcome).

Inclusion criteria:

- English literature.
- Full-text journal articles.
- Trials that involve papers from 2010 till 2020.
- Describing UKA operation by either Cemented group or Cementless group.
- Human studies.

Exclusion criteria:

- Studies in Unicompartmental Knee Osteoarthritis (UKO) are considered for treatment other than UKA in comparative studies according to regular clinical practice.
- Studies not published in a peer-review journal.
- Animal studies.
- Cadaver studies.

Methods of the review:

Locating and selecting studies:

Abstracts of articles identified using the above search strategy will be viewed, and articles that appear to fulfill the inclusion criteria will be retrieved in full, when there is a doubt, a second reviewer will assess the article and consensus will be reached.

Evidence of publication bias:

Will be sought using the funnel plot method. A funnel plot is a simple scatter plot of the intervention effect estimates from individual studies against some measure of each study's size or precision.

Statistical Analysis:

Data entry, processing, and statistical analysis were carried out using MedCalc ver. 18.2 (MedCalc, Ostend, Belgium). A meta-analysis was performed to calculate direct estimates of each

treatment technique. According to the heterogeneity of treatment effect across trials using the I²-statistics; a fixed-effect model ($P \geq 0.1$) or random-effects model ($P < 0.1$) was used. P-value: level of significance: $P > 0.05$: Non-significant (NS), $P < 0.05$: Significant (S), $P < 0.01$: Highly significant (HS).

RESULTS

Study Selection:

We found 456 records; 25 articles removed for duplication, 28 articles before 2010 were deleted, 378 were excluded based on title and abstract screening, 16 articles are searched for eligibility by full-text review, 6 full-text articles were excluded where 4 ones were excluded from the abstract, one after reuse of the same UKR cohort and one only analyze subgroup of population leaving 10 studies that met all inclusion criteria (figure 1).

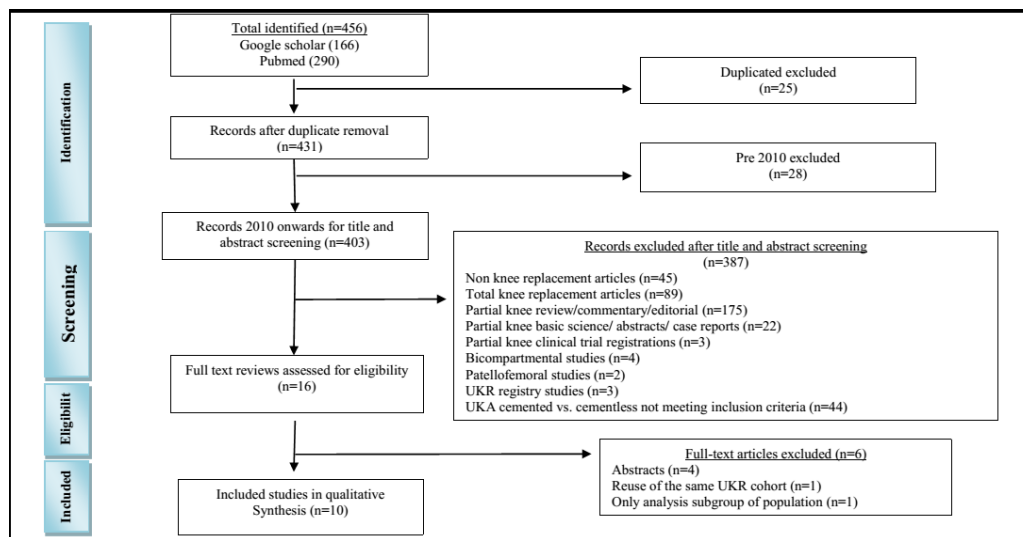


Figure (1): PRISMA flow chart

Table (1): Summary of patients and study characteristics:

N	Author	Number of patients			Age (average years)	Follow-up time (average years)
		Total	Cemented group	Cementless group		
1	Akan et al., 2013[19]	263	141	122	63	3.5
2	Schlueter-Brust et al., 2014[25]	230	152	78	69	10
3	Kendrick et al., 2015[20]	43	21	22	65.4	2
4	van Dorp et al., 2016[26]	99	53	46	63	1.5
5	Stempin et al., 2017[7]	79	29	50	65	7
6	Campi et al., 2018[27]	1120	522	598	65	10
7	Horsager et al., 2019[28]	80	55	25	64	5
8	Knif Sund et al., 2019[29]	3355	2279	1076	65	5
9	Kagan et al., 2020[30]	160	119	41	68	10
10	Mohammad et al., 2020[31]	14814	7407	7407	65	10

#Studies were arranged according to the publication year. --- NR: not reported.

This table showed that; the included studies published between 2013 and 2020. The total number

of patients in all the included studies was 20243 patients; 10778 in the cemented group, 9465 in the

cementless group, while their average follow-up time was (6.4± 3.4 years). The average age of all patients was (65.2 ± 1.9 years); with the youngest

mean age of 63 years in *Akan et al.* [20] and *Van Dorp et al.*, [26] studies; and the oldest mean age of 69 years in *Schlueter-Brust et al.*[25]study.

Outcome data:

Table (2): Summary of primary efficacy outcomes in all studies

N	Author	Primary efficacy outcomes				
		PRO score			Survival probability %	
		Type of PRO score	Cemented group	Cementless group	Cemented group	Cementless group
1	<i>Akan et al., 2013</i> [19]	OKS	39.3	41.1	98.6	98.9
2	<i>Schlueter-Brust et al., 2014</i> [25]	Knee score	94	94	95.4	97.4
3	<i>Kendrick et al., 2015</i> [20]	OKS	38.35	41.5	NR	NR
4	<i>van Dorp et al., 2016</i> [26]	OKS	41.7	43.3	97	93
5	<i>Stempin et al., 2017</i> [7]	OKS	37.9	38.6	96.3	98
6	<i>Campi et al., 2018</i> [27]	OKS	40	40	91	91
7	<i>Horsager et al., 2019</i> [28]	OKS	38	23	NR	NR
8	<i>Knifsund et al., 2019</i> [29]	---	NR	NR	82.6	92.3
9	<i>Kagan et al., 2020</i> [30]	PF CAT	41.4	44.3	89	92
10	<i>Mohammad et al., 2020</i> [31]	---	NR	NR	90	93

PRO: patient's reported outcomes. OKS: Oxford knee score. PF CAT: physical function computerized adaptive test.

Regarding Cemented group, the average pre-operative PRO score was (46.3 ±19.3), and the average post-operative PRO score was (92.5 ± 5.3)%.

Regarding the Cementless group, the average pre-operative PRO score was (45.7± 20.6), and the average post-operative PRO score was (94.5 ± 3.1)%.

Table (3): Summary of secondary safety outcomes in all studies

N	Author	Secondary safety outcomes	
		Revision rate	
		Cemented group	Cementless group
1	<i>Akan et al., 2013</i> [19]	10	6
2	<i>Schlueter-Brust et al., 2014</i> [25]	7	2
3	<i>Kendrick et al., 2015</i> [20]	NR	NR
4	<i>van Dorp et al., 2016</i> [26]	4	5
5	<i>Stempin et al., 2017</i> [7]	1	1
6	<i>Campi et al., 2018</i> [27]	5	60
7	<i>Horsager et al., 2019</i> [28]	1	1
8	<i>Knifsund et al., 2019</i> [29]	342	64
9	<i>Kagan et al., 2020</i> [30]	75	40
10	<i>Mohammad et al., 2020</i> [31]	289	218

Regarding Cemented group, (734) (6.8%) patients had revision surgery. Regarding the Cementless group, (397) (4.2%) patients had revision surgery.

Table (4): Meta-analysis of (average survival probability) on Cemented group vs. Cemented group– Mean difference

N	Study	Cemented group	Cementless group	Total	SMD	SE	95% CI	t	P-value	Weight (%)		Survival probability (%)	
										Fixed	Random	Cemented group	Cementless group
										1	<i>Akan et al., 2013</i> [19]	141	122
2	<i>Schlueter-Brust et al., 2014</i> [25]	152	78	230	-0.19	0.13	-0.47 to 0.07			1.11	12.57	95.4	97.4
3	<i>van Dorp et al., 2016</i> [26]	53	46	99	2.64	0.27	2.1 to 3.19			0.29	11.81	NR	NR
4	<i>Stempin et al., 2017</i> [7]	29	50	79	-0.24	0.23	-0.7 to 0.2			0.40	12.10	97	93
5	<i>Campi et al., 2018</i> [27]	522	598	1120	0	0.05	-0.11 to 0.11			6.01	12.81	96.3	98
6	<i>Knifsund et al., 2019</i> [29]	2279	1076	3355	-1.94	0.04	-2.0 to -1.85			11.18	12.83	91	91
7	<i>Kagan et al., 2020</i> [30]	119	41	160	-0.29	0.18	-0.65 to 0.05			0.66	12.38	NR	NR
8	<i>Mohammad et al., 2020</i> [31]	7407	7407	14814	-0.3	0.01	-0.33 to -0.26			78.93	12.86	82.6	92.3
	Total (fixed effects)	10702	9418	20120	-0.45	0.01	-0.48 to -0.42	-30.8	<0.001	100	100	89	92
	Total (random effects)	10702	9418	20120	-0.07	0.33	-0.72 to 0.57	-0.23	0.817	100	100	90	93

Q test for heterogeneity = 1430.3 (p< 0.0001**). I2 (inconsistency) = 99.5% and SMD = -0.07.

Regarding 1ry outcome measures, we found 8 studies reported survival probability with the total number of patients (N=20120). I2 (inconsistency) was 99.5% with highly significant Q test for heterogeneity ($p < 0.0001$), so random-effects model was chosen to assess efficacy; with overall SMD= -0.07 (95% CI -

0.72 to 0.57). The random-effects model of the meta-analysis study showed a non-significant difference in survival probability in the Cemented group compared to the Cementless group ($p > 0.05$).

Table (5): Meta-analysis of (revision surgery rate) in the cemented group - Proportion

N	Study	SD	Proportion (%)	95% CI	Revision rate	
					Cemented group	Cementless group
1	Akan et al., 2013[19]	141	7.092	3.453 to 12.656		
2	Schlueter-Brust et al., 2014[25]	152	4.605	1.871 to 9.258	10	6
3	van Dorp et al., 2016[26]	53	7.547	2.095 to 18.211	7	2
4	Stempin et al., 2017[7]	29	3.448	0.0873 to 17.764	NR	NR
5	Campi et al., 2018[27]	522	0.958	0.312 to 2.221	4	5
6	Horsager et al., 2019[28]	55	1.818	0.0460 to 9.719	1	1
7	Knifsund et al., 2019[29]	2279	15.007	13.564 to 16.540	5	60
8	Kagan et al., 2020[30]	119	63.025	53.694 to 71.692	1	1
9	Mohammad et al., 2020[31]	7407	3.902	3.472 to 4.368	342	64
	Total (fixed effects)	10757	5.937	5.498 to 6.400	75	40
	Total (random effects)	10757	9.395	4.027 to 16.703	289	218

Q test for heterogeneity = 537.6 ($p < 0.0001$ **). I2 (inconsistency) = 98.5%.

Regarding 2ry outcome measure, the Meta-analysis table showed that; (revision surgery rate) in the cemented group in fixed and random-effects models were (5.9% and 9.4% respectively). I2 (inconsistency) was 98.5%; with a highly

significant Q test for heterogeneity ($p < 0.0001$); so the random-effects model was chosen to assess prevalence; with overall (revision surgery rate) in cemented group= 9.4% and a 95% CI ranged from 4.027 to 16.703.

Cemented group vs. Cementless group:

Table (6): Meta-analysis of (revision surgery rate) on Cemented group vs. Cementless group- Odds Ratio

N	Study	Cemented group	Cementless group	OR	95% CI	Z	P-value	Weight (%)	
								Fixed	Random
1	Akan et al., 2013[19]	10/141	6/122	1.476	0.520 to 4.186			1.93	13.10
2	Schlueter-Brust et al., 2014[25]	7/152	2/78	1.834	0.372 to 9.048			0.82	9.49
3	van Dorp et al., 2016[26]	4/53	5/46	0.669	0.169 to 2.657			1.10	10.81
4	Stempin et al., 2017[7]	1/29	1/50	1.750	0.105 to 29.081			0.27	4.72
5	Campi et al., 2018[27]	5/522	60/598	0.0867	0.0345 to 0.218			2.47	13.97
6	Horsager et al., 2019[28]	1/55	1/25	0.444	0.0267 to 7.406			0.26	4.72
7	Knifsund et al., 2019[29]	342/2279	64/1076	2.792	2.115 to 3.685			27.18	17.77
8	Kagan et al., 2020[30]	75/119	40/41	0.0426	0.00566 to 0.321			0.51	7.37
9	Mohammad et al., 2020[31]	289/7407	218/7407	1.339	1.120 to 1.601			65.45	18.05
	Total (fixed effects)	734/10757	397/9443	1.358	1.188 to 1.553	4.489	<0.001	100	100
	Total (random effects)	734/10757	397/9443	0.752	0.370 to 1.528	-0.789	0.430	100	100

Q test for heterogeneity = 73.34 ($p < 0.0001$ **). I2 (inconsistency) = 89% and Odds Ratio (OR) = 0.752.

We found 9 studies reported revision surgery rates with the total number of patients (N=20200). I2 (inconsistency) was 89% with highly significant Q test for heterogeneity ($p < 0.0001$), so random-effects model was chosen to assess safety; with overall OR= 0.752 (95% CI 0.370 to 1.528). The

random-effects model of the meta-analysis study showed a non-significant difference in revision surgery rate in a Cemented group compared to the Cementless group ($p > 0.05$).

Table (7): Comparison between the 2 groups of studies as regards indications for revision surgery using Chi-square test

Variable		Cemented group (10 studies) N=10778	Cementless group (10 studies) N=9465	P value
Disease progression	N (%)	100 (0.9%)	91 (1%)	= 0.8068
Aseptic loosening	N (%)	164 (1.5%)	52 (0.5%)	< 0.0001**
Bearing dislocation	N (%)	45 (0.4%)	47 (0.5%)	= 0.4063
Pain	N (%)	85 (0.8%)	43 (0.5%)	= 0.0029**
Infection	N (%)	27 (0.3%)	27 (0.3%)	= 0.6334
Instability	N (%)	27 (0.3%)	23 (0.2%)	= 0.9147
Malposition	N (%)	30 (0.3%)	31 (0.3%)	= 0.5254
Malalignment	N (%)	13 (0.1%)	24 (0.3%)	= 0.027*
Impingement	N (%)	0 (0%)	6 (0.1%)	= 0.009**
Stiffness	N (%)	6 (0.1%)	6 (0.1%)	= 0.8219
Polyethylene wear/fracture	N (%)	7 (0.1%)	7 (0.1%)	= 0.8079
Periprosthetic fracture	N (%)	28 (0.3%)	26 (0.3%)	= 0.8379
Implant breakage	N (%)	2 (0%)	0 (0%)	= 0.1851
Component dissociation	N (%)	13 (0.1%)	0 (0%)	= 0.0007**
Lysis	N (%)	11 (0.1%)	3 (0%)	= 0.0576
Hemarthrosis	N (%)	0 (0%)	2 (0%)	= 0.1313
Other	N (%)	238 (2.2%)	59 (0.6%)	< 0.0001**
Unknown	N (%)	17 (0.2%)	10 (0.1%)	= 0.3117

N=number of patients. % per column total.

A comparative study between the 2 groups revealed; a highly significant increase in aseptic loosening, pain, and component dissociation; in the Cemented group; compared to the Cementless group; with a significant statistical difference ($p < 0.05$ respectively). Comparative study between the 2 groups revealed; a highly significant decrease in malalignment and impingement; in the Cemented group; compared to the Cementless group; with a significant statistical difference ($p < 0.05$ respectively). A comparative study between the 2 groups revealed non-significant differences as regards all the remaining indications of revision ($p > 0.05$).

DISCUSSION

Tibiofemoral UKR can be an extremely satisfying procedure with very happy patients, when it fails it tends to be within the first 2 years [32]. Usually, early failure is due to surgical error i.e. poor patient selection or poor surgical technique. Failures at around 5 years tend to be due to disease progression [32]. Proper patient and implant selection, surgical volume and surgeon experience, appropriate surgical technique, and well-designed instrumentation are the golden keys to obtain good long-standing survivorship with objective outcomes and subjective results.

This systematic review showed 20243 patients in which 10778 were cemented while 9465 were cementless with an average follow-up time was (6.4 ± 3.4 years). The average age of all patients was (65.2 ± 1.9 years).

The average patient's reported outcome (PRO) score was (92.5 ± 5.3) % regarding cemented

group while in the cementless group it was (94.5 ± 3.1) %.

734 patients (6.8%) had revision surgery in the cemented group while 397 patients (4.2%) had revision surgery in the cementless group.

A meta-analysis study was done on 10 studies that described and compared the 2 different techniques for UKA; with an overall number of patients (N=20243).

Regarding Iry outcome measures;

We found 7 studies [7,19,20,25-28] reported PRO scores with a total number of patients (N=1914).

The random-effects model of the meta-analysis study showed a non-significant difference in mean PRO score in the cemented group compared to the cementless group ($p > 0.05$), which came in agreement with Akan et al., 2013 [19], Kendrick et al., 2015 [20], Stampin et al., 2017 [7], Horsager et al., 2019 [28] & Kagan et al., 2020 [30] & came in disagreement with van Dorp et al., 2016 [26].

We found 8 [7,19,25-31] studies that reported survival probability with a total number of patients (N=20120).

The random-effects model of the meta-analysis study showed a non-significant difference in survival probability in the Cemented group compared to the Cementless group ($p > 0.05$), which came in agreement with Akan et al., 2013 [19], Campi et al., 2018 [27], Kagan et al., 2020 [30] and came in disagreement with Stampin et al., 2017 [7], Knifund et al., 2019 [29] & Mohammad et al., 2020 [31].

Regarding 2ry outcome measure;

Revision surgery rate in the cemented group in fixed and random effects models were (5.9% and 9.4% respectively) and indications for revision revealed a highly significant increase in aseptic loosening, pain, and component dissociation compared to the Cementless group with a significant statistical difference ($p < 0.05$ respectively).

Revision surgery rate in the cementless group in fixed and random effects models were (3.8% and 11.9% respectively) and indications for revision revealed a highly significant decrease in malalignment and impingement in the Cemented group compared to the Cementless with a significant statistical difference ($p < 0.05$ respectively).

We found 9 [7,19,25-31] studies that reported revision surgery rates with a total number of patients (N=20200).

The random-effects model of the meta-analysis study showed a non-significant difference in revision surgery rate in the Cemented group compared to the Cementless group ($p > 0.05$), which came in agreement with Akan et al., 2013 [19], came in disagreement with Kendrick et al., 2015 [20], van Dorp et al., 2016 [26], Campi et al., 2018 [27] & Mohammad et al., 2020 [31].

Akan et al. 2013, showed that uncemented UKA provides good clinical and functional outcomes similar to those of cemented UKA [19].

Schlueter-Brust et al. 2014, prospective Cohort study demonstrated that cementless fixation has a slightly better survival at five years and up to a minimum of 10 years [25].

Kendrick et al. 2015, suggested in a randomized controlled trial using radio stereometric analysis that there are no complete radiolucencies with uncemented implants, whereas 24% of cemented UKAs had complete RLLs and concluded that the fixation of the cementless components is at least as good as if not better than that of the cemented device [20].

VanDorp et al. 2016, showed with cross-sectional study better clinical results and promising short-term clinical outcomes for cementless Oxford phase III medial UKP when compared to cemented UKP [26].

Stampin et al. 2017, found in a prospective comparative Cohort study that cementless UKA offers shorter operation times and may lead to a lower incidence of postoperative RLLs [7].

Campi et al. 2018, prospective consecutive case series cohort highlight 91% implant survival at 10 years, 5-year survival were similar in cemented and cementless implants with higher cumulative failure rate reported in a designer series of

cemented UKRs with similar follow-up (5.3% VS 2.9%) [27].

Horsager et al. 2019, in a randomized study design, found similar wear rates for the cemented and HA-coated cementless Oxford medial UKA, which supports the continued use of the cementless Oxford medial UKA [28].

Knifund et al. 2019, discovered that the cementless Oxford technique has higher short-term survivability than that of the cemented Oxford 3 technique [29].

Kagan et al. 2020, At a 10-year follow-up, observed that aseptic tibial loosening alongside compartment knee arthroplasty was the most prevalent cause of revision, with the same findings seen for both cemented and cementless UKA [30].

Mohammad et al. 2020, in a retrospective observational study concluded that the observed risk of revision of the cementless Oxford UKR was 24% less than that of the cemented up to 10 years [31] and positive results for cementless UKA for all age groups.

Pandit et al. found no difference in clinical outcomes comparing the cemented and cementless UKAs and demonstrated narrow radiolucent lines in 3/4 of cemented tibial components at the bone-implant interfaces, whilst, there was only 7% partial lucency in the cementless implants with no complete radiolucency [21], yielding efficient bone ingrowth into the cementless designs.

Both cemented and cementless UKA designs are used. However, the cementless designs classically showed higher failure rates, reaching up to 20% ten years after surgery [39], so that Cemented UKA currently remains the gold standard. However, recently there is increasing evidence regarding the promising outcomes of the modern designs of uncemented UKA [22].

Cementation still regarded as the gold standard technique being has proven to be an appropriate fixation method for UKA. It has demonstrated good functional outcomes as reported by the joint registries and large systematic reviews [33-37]. Cementation errors, thermal necrosis, radiolucent lines misinterpretation, fibrocartilage, and fibrous tissue formation at the bone-cement interface would all promote the cemented UKA loosening [9,38]. Consequently, over the last decade, there has been a growing interest in cementless fixation to address these perceived drawbacks of cemented fixation and explore suitable alternatives.

A systematic review [31] comparing the long-term outcomes of cemented and cementless UKRs found that the revision rate of the cementless was nearly a third less than the cemented and the revision rate for aseptic loosening more than

halved. It also showed that mobile-bearing UKA in cementless not cemented groups had significantly lower revision rates than fixed-bearing UKA.

The modern state of the art, such as the use of a Porous-coated titanium surface covered with hydroxyapatite provided excellent osseointegration responsible for improved fixation of the cementless UKA. Osseous stability, either via ingrowth or on growth, and press-fit fixation of each one of the two components in cementless implants are the keystone for fixation. The oxford UKA is currently the most commonly used cementless prosthesis. The likely pitfall of the press-fit fixation is the high risk of peri-prosthetic fractures, besides subsidence in the tibial component especially on the tibial side in older osteopenic females [36-38].

In the cementless replacement, more impaction is required to introduce components properly leading to good primary fixation. Despite initial discrepancies, Recent data from randomized controlled trials and case series suggests that cementless UKA advanced designs are effective and safe in mid-term follow-up [38], In contrast to cemented designs, the cementless approach offers multiple benefits; including shorter surgical time, cementation errors avoidance, decreased incidence of radiolucency, and secure fixation. Despite these encouraging outcomes, longer follow-up data are necessary to evaluate the long-term profits of cementless UKA. Recent evidence suggests that the results of the cemented and cementless UKAs are the same in high volume centers [20], where technical errors, improper indications, and radiolucent lines (RLLs) misinterpretations are unusual.

Mean scores (KSS, OKS, and WOMAC) in the cemented and cementless groups didn't differ significantly after a comparison compared the results of cemented and cementless Oxford UKA knee replacement in an approximate seven-year follow-up [7]. Similar wear rates for the cemented and hydroxyapatite (HA) coated cementless Oxford medial UKA is found. However, a caveat is a relatively large 95% CI of the mean difference in the wear rate [28]. Almost similar long-term Passive Range of Motions (PROMs) was found between the cementless and cemented groups. However, both groups had better PROM scores than those of TKR [39]. These results are promising and satisfying, indicating that the cementless fixation is accomplishing its intended purpose.

Basso and colleagues [40] indicated in a recent review that employing a cementless fixation might increase the survival rate by eliminating

issues associated with cement, such as poor penetration and loose fragments.

Daniilidis et al. [41] found substantially improved quality of life in cementless-implant patients after retrospectively evaluating 106 knees (42 cemented and 64 uncemented UKA), but also observed higher and larger periprosthetic loosening areas on radiological analysis on the cementless tibial side. Similarly, Forsythe et al. [42] expressed concerns about tibial side radiolucency in cementless implants.

This study does have limitations; the relatively small number of patients, the lack of radiographic analysis, surgeon volume level data were not available, there is potential for residual confounding and matching can reduce the generalizability of findings, there is considerable heterogeneity between studies where the revision rate may be presented with some sort of varieties between studies.

CONCLUSION

No functional difference was observed between cemented and cementless UKAs. The cementless implant is as safe and effective as the cemented device. Further future high-quality long-term studies of clinical trials with powerful evidence would better clarify the promising technology of cementless UKA and determine which fixation method is preferred for Oxford UKA.

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