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REVIEW

Outcomes of cementless fixation in medial unicompartmental knee arthroplasty: review of recent literature

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Abstract

Introduction Medial unicompartmental knee arthroplasty (UKA) is considered the most effective treatment for anteromedial knee osteoarthritis. Cementless fixation of UKA was developed to reduce aseptic loosening. We performed a review of the recent literature to assess the latest outcomes of cementless UKA.

Methods A review of English literature was performed on Medline through Pubmed. Retrospective or prospective studies with at least 2 years of follow-up (FU) and at least 20 patients were included. The PRISMA 2009 flowchart and checklist were considered to edit the review. Survival rate, revision rate, time for revision, incidence of radiolucent lines and reasons for revision (such as aseptic loosening, osteoarthritis progression, bearing dislocation or periprosthetic fracture) were extrapolated from the papers.

Results Nineteen articles were included in the review, only 2 with a level of evidence of I. A total of 3432 UKA with a FU range of 24–132 months were analyzed. The studies showed good clinical and functional outcomes. In 12 studies, survival rate were more than 90%. Revision rate for aseptic loosening were lower than 2% for 15 studies.

Conclusion Cementless UKA represents a surgical option allowing low revision rate. Further high-quality long-term studies would better clarify complications, clinical and radiological results of this promising fixation method.

Keywords Aseptic loosening · Cement · Cementless fixation · UKA · Unicompartimental knee arthroplasty · Radiolucent lines · Survival rates · Antromedial osteoarthritis

Introduction

Medial unicompartmental knee arthroplasty (UKA) is considered the most effective treatment for anteromedial knee osteoarthritis. In England, UKA accounts for around 11.1% of all primary knee replacement [1]. In 1976 Insall described UKA surgical technique and few years later, showed high failure rate at seven years of follow-up (FU) [2, 3]. In the same years, Goodfellow and O'Connor designed and implanted a mobile bearing UKA: Oxford Partial Knee. The Oxford UKA is the most implanted worldwide from the New Zealand Joint Registry and this prosthesis reported good long-term survival rates at 10 years (98%) and at 20 years (91%) [4, 5].

To ensure better results it is essential to strictly follow indications for UKA. A patient candidate for UKA should present a knee with anteromedial osteoarthrosis, with less than 15° varus-valgus deformity, with less than 10° of flexion contracture and intact Anterior Cruciate Ligament (ACL) [6].

Following the NJR [1] aseptic loosening is considered one of the most common reason for revision, resulting the cause of 37% of all UKA revisions. Inappropriate cementation technique or misdiagnosis of incorrect positioning could be the main causes for aseptic loosening. Errors during cementation are more possible, especially if a minimally invasive surgical technique, such as for UKA implantation, is used [7]. Hauptmann et al. [8, 9] have shown that cementation technique during a minimally invasive UKA, could due to inappropriate cement penetration in the bony interface or production of loose fragments of cement, reaching an

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incidence of 4 out of 6 cases (66.7%). Moreover, the reduced intraoperative visibility of a minimally invasive approach makes more difficult the removal of excessive cement.

Misdiagnosis of loosening could be due to misinterpretation of radiolucent lines (RL). Radiolucent lines are a common finding especially in UKA and they are recently described by Gulati et al. [10]. The authors observed "physiologic" RL (narrow, well defined and non progressive) and "pathological" RL (wide, poorly defined and progressive). The pathological RL could lead to aseptic loosening, particularly if associated with knee pain.

Radiolucent lines are indicative of fibrocartilage at the interface and are seen in over half of cemented UKR tibial components [10]. In the presence of pain, these can be misinterpreted as aseptic loosening and lead to revisions despite studies showing no relation.

Cementless UKA has demonstrated a lower radiolucent lines incidence [11–13].

Cementless fixation could reduce problems related to inappropriate cementation technique, thus improving survival rate [8, 9]. One of the reasons for using cementless designs is the high incidence of aseptic loosening in cemented UKA [14] and TKA [15, 16] at the implant–cement or cement–bone interface. Cementless fixation has been available since 1990 [17]. Poor results of first cementless UKAs limited its diffusion [18]. Theoretically, UKA should be the ideal implant for cementless fixation (young and good bone stock quality). Liddle et al. have suggested that cementless designs may be more beneficial for UKA than for TKA. UKA should be implanted restoring the normal kinematics preserving ligament tension with a minimal constraint. Reducing the level of constraint and preserving a valid anterior cruciate ligament means decreasing shear forces through the prosthesis components [19].

With this review of literature, we would like to briefly summarize risks and benefits of cementless medial UKA, underlining their clinical outcomes, reason for revision, survival rate and complications encountered with this technique.

Materials and methods

The primary search was performed on December 2018 on Medline, through Pubmed using the following strategy:

arthroplasty, replacement, knee" [MeSH Terms] OR ("arthroplasty" [All Fields] AND "replacement" [All Fields] AND "knee" [All Fields]) OR "knee replacement arthroplasty" [All Fields] OR ("partial" [All Fields] AND "knee" [All Fields] AND "arthroplasty" [All Fields]) OR "partial knee arthroplasty" [All Fields]) OR ("arthroplasty, replacement, knee" [MeSH Terms] OR ("arthroplasty" [All Fields] AND "replacement" [All Fields] AND "knee" [All Fields]) OR "knee replacement arthroplasty" [All Fields] OR ("unicompartmental" [All Fields] AND "knee" [All Fields] AND "arthroplasty" [All Fields]) OR "unicompartmental knee arthroplasty" [All Fields])) AND cementless[All Fields].

Studies were selected according to Preferred Reporting Items for Systematic Reviews and Meta-Analysis (PRISMA). We included clinical studies with a follow-up greater than 24 months and with a cohort of patients greater than 20. Only papers related to cementless medial unicompartmental knee replacement were included in our analysis. Non-pertinent manuscripts were excluded. Exclusion criteria were: preclinical studies, case report and review or meta-analysis. We carefully examined reference lists from previous reviews or meta-analysis in order not to miss pertinent papers. The search was limited to studies published in English.

Two reviewers (MB and AZ) independently screened the titles and abstracts from all identified articles to assess their appropriateness to the research focus. We excluded articles referring cementless total knee or hip arthroplasty, letters to the editor and cemented or hybrid fixation of UKA. References from the identified articles were checked in order not to miss any relevant articles. All titles and abstracts that met our keywords were examined. The PRISMA flow 2009 diagram illustrates the number of studies that were identified, included and excluded as well as the reason for exclusion (Fig. 1).

For each study we collected data such as year of publication, level of evidence (LOE), based on the 2011 Oxford Centre for Evidence-based Medicine Levels of Evidence [18], number of knees evaluated (divided in fixed bearing rather than mobile bearing UKA). Demographic data, sex, mean age and body mass index (BMI) of patients were analyzed. We extracted from the articles the following clinical data: mean follow-up, preoperative and postoperative (last follow-up) Oxford Knee Score (OKS), survival rate, revision rate and time for revision. Radiological and clinical findings were also collected: incidence of Radiolucent Lines (RL), global rate of aseptic loosening, osteoarthritis progression, bearing dislocation and periprosthetic fracture (less than 3 months after operation).

Results

A total of 383 articles were identified. Among eligible articles, we selected only those matching our inclusion criteria. During the selection of papers, no cases of conflict between two authors were reported. A total of 19 manuscripts [11–13, 20–35] were finally included and fully evaluated. Only two studies were rated as level I according to LOE.

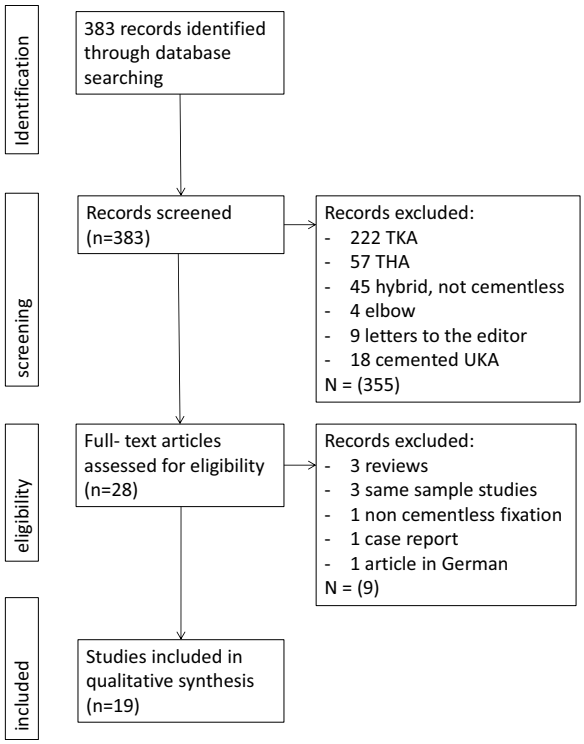

Fig. 1 The PRISMA flow diagram illustrates the studies that have been identified, included and excluded as well as the reason for exclusion

Demographic data

From the selected articles we analyzed a total of 3432 cementless medial UKA with a minimum FU of 24 months and a maximum of 132 months. First prospective case series was conducted in 1990. In the last 2 years 6 articles were published regarding results of cementless UKA. Only 7 studies reported more than 100 patients. In Table 1 we summarized main demographic data extrapolated from selected articles (Table 1). Mean age of patients ranged from 62 to 71.8 years. Only 6 studies showed patient's BMI, ranging from 27.4 to 30, meaning most patients were overweight.

Clinical and implant results

In terms of clinical evaluation method, the OKS was the most used. Comparing preoperative OKS to OKS at last FU, all the authors showed improved results. Only 1 comparative cemented UKA versus cementless UKA study showed better clinical outcomes in cemented group. Three studies reported clinical outcomes after 10 years from surgery. Survival rate was more than 90% in 12 studies analyzed. From those, the longest FU period was 128.4 months. Three articles reported a survival rate of 100%, respectively, at 24, 60 and 78 months (Table 2). Worst survival rate was 74.3% (6 years FU), from a fixed bearing implant. For a mobile bearing implant, at 11 years of FU, the worst survival rate was 82%.

Fourteen studies showed results obtained with a mobile bearing UKA, the others 5 articles evaluated fixed bearing implants. Eleven articles declared the incidence of radiolucent lines. 4 of those were comparative (cementless vs. cemented group). These all demonstrated a decreased incidence in cementless group (Table 3). The highest aseptic loosening rate was 14.5%, and the highest bearing dislocation rate was 14.7%. Only 5 studies analyzed operation time and demonstrated a reduction when compared with cemented UKA.

Discussion

UKA has been a popular treatment of osteoarthritis since the 1970s. Initial reports showed high failure rates in short-term FU [3]. The use of this implant decreased until 1990. Magnussen et al. [32] performed the first prospective study considering clinical and radiological results of cementless UKA, with minimum follow-up of 2 years in 1990. The authors observed their first 51 cementless UKA (42 medial UKA and 9 lateral). They analyzed a fixed bearing implant using the Hospital for Special Surgery score for the knee clinical evaluation. They also collected if radiolucent lines were present. Excellent or good results were obtained in 88% of patients and RL were recorded in 44.7% of patients. In spite of the high incidence of RL, results were not affected by this radiological finding. Fair results were due to early mobilization of femoral component in one case, one oversized femoral component with iatrogenic damage to patello-femoral joint and one case of recurrent synovitis after surgery. A few years later, in 1993, the same type of prostheses (PCA: Porous-Coated Anatomic UKA, Howmedica, Rutherford, NJ) was evaluated by Harilainen et al. [34]. We excluded this study because the authors used frequently hybrid fixation using both cemented and cementless components in the same knee (cementless femoral component and cemented tibial component). They reported 21% failure rate at 2–5 years in a series of 52 patients. The most frequent failure mechanism of this fixed bearing UKA was poly wear and femoral component loosening.

The first comparative study of cemented fixation versus cementless was conducted by Forsythe et al. [31] in 2000, analyzing results of 57 cementless UKAs and comparing them with cemented UKA. They did not find any relation between demographic parameters such as sex, BMI, age or follow-up interval and the clinical results. They stated that UKAs with more than 1 mm of radiolucency or presence of loose beads had significantly lower knee scores compared to those without radiolucencies. Keblish et al. [29], in 2004,

Table 1 Summary and main features of the included studies, with type of UKA and demographic data

Study	Year	LOE	Knees	Bearing (fixed/mobile)	Demographic data		
					Male (%)	Mean age (range)	BMI (range)
Campi et al. [35]	2018	IV (single center control)	598	M(Oxford)	51	65 (31–94)	Not declared
Blaney et al. [20]	2017	IIb (2 center with control)	257	M (Oxford)	51.7	65 (59–73)	30 (27.5–33)
Panzram et al. [21]	2017	IV (single center control)	30	M (Oxford)	55.5	62.5 (49–76)	Not declared
Stempim et al. [22]	2017	Ib (prospective control)	50	M (Oxford)	20	65.3 (48–79)	Not declared
Pandit et al. [11]	2017	IV (prospective)	512	M (Oxford)	58.4	65.1 (35–94)	Not declared
Kerens et al. [12]	2017	IV (multicenter retrospective)	51	M (Oxford)	45.1	62 (45–82)	29 (20–37)
Bruni et al. [13]	2016	IV (prospective)	76	F (Preservation Uni)	47.4	62 (56–65)	27.4 (19–30)
Hooper et al. [23]	2015	Ib (observational prospective)	147	M (Oxford)	53.1	63.6 (39–86)	Not declared
Kendrick et al. [24]	2015	Ib (RCT)	22	M (Oxford)	59	67.6 (49.1–81.6)	Not declared
Lecuire et al. [25]	2014	IV (prospective case series)	61	F (Alpina)	28	71.8 (50–80)	28 (20–38.4)
Schlueter-Brust et al. [26]	2014	IV (prospective)	78	M (Uniglide)	33.3	69 (39–95)	29.1 (18.8–48.1)
Liddle et al. [27]	2013	IV (prospective multicenter)	1000	M (Oxford)	56.7	66 (39–89)	Not declared
Hall et al. [28]	2013	IV	65	F (Unix)	57	65 (60–90)	Not declared
Akan et al. [29]	2013	IV (retrospective controlled)	122	M (Oxford)	16.4	64.9 (35–79)	28.6 (18.3–38.8)
Pandit et al. [30]	2013	Ib (RCT ccontrol)	30	M (Oxford)	53.3	64.7 (45–82)	27.9 (21.3–39.9)
Keblish et al. [31]	2004	IV (prospective non blinded)	158	M (LCS)	30	68 (52–87)	Not declared
Jeer et al. [32]	2004	IV (prospective case series)	66	M (LCS)	Not declared	69 (54.4–87.4)	Not declared
Forsythe et al. [33]	2000	IV (case series cross sectional)	72	F (Whiteside Ortholoc)	Not declared	68.3 (46–82.5)	Not declared
Magnussen et al. [34]	1990	IV (prospective case series)	42	F (PCA)	Not declared	69 (50–85)	Not declared

published a 2-center study of 177 UKAs. Nineteen were lateral UKA and were excluded from our analysis. The authors evaluated the LCS (Low Contact Stress, Depuy, Warsaw, IN) both first and second generation. Only 40 knees are clearly declared to be treated with cementless second generation LCS. Mean follow-up was 132 months, the longest in literature. Revision rate for medial UKAs at eleven years is 18.3% with 29 cases revisioned. In 14 cases revision required only substitution of mobile bearing. In conclusion, Keblish encouraged this type of implant especially in a more active and younger population. The same implant was evaluated by Jeer et al. [30] during 2004. The authors calculated a survival rate at 5 years of 89.7% with 6 patients revised. Only one knee was revised because of fixation failure, in this case a cemented UKA was used. In 2009 Pandit and Murray followed 30 patients at 6 and 12 months after surgery for a cementless medial UKA. Surgeries were performed by 3 consultants. They analyzed clinical and radiological results obtained from 2 groups of patients in which cementless or cemented implant were selected randomly. No difference between groups were found, nevertheless radiolucent lines were mostly present in cemented implant 75% (complete in 32% and partial in 43% patients), rather than in cementless 7% all partial. This study has been excluded from our review because of its short follow-up. As observed by Pandit et al. [28] cementless fixation needs shorter surgical time. The author published a randomized controlled trial of 30 patients treated with cementless UKA and 32 with cemented UKA. Survival rate of implant was 100%, with only one case of hematoma reoperated at 10 days after intervention for evacuation, debridement and bearing substitution. Radiolucent lines were present in 7% of patients and always partial and resolved 1 year postoperative. Liddle et al. [25] conducted the study with the most important number of

Table 2 Summary and main features of the included studies, including mean FU, preoperative and postoperative Oxford Knee Score (OKS) and survival rate, revision rate and time for revision

Study	Mean follow-up (range)	OKS preop (range)	OKS postop (range)	Survival rate	Revision rate	Time for revision (months)
Campi et al.	32.4 (6–84)	22 (14–30)	40 (32–48)	95.8	3.2	
Blaney et al.	69.6 (67.2–70.8)	16 (13–19)	37 (27–42)	95.3	2.7	49
Panzram et al.	60 (47–69)	27.2 (25–30)	42.1 (29–45)	89.7	10	20
Stempim et al.	78 (74.4–86.4)	14.7 (11–21)	38.6 (32–46)	100	4	
Pandit et al.	40.8 (12–122.4)	27 (18–36)	43 (36–48)	97.6	1.2	18
Kerens et al.	35 (12–51)		39 (10–48)	90	8.5	
Bruni et al.	72 (56–84)			74.3	25	11.2
Hooper et al.	60	22.9 (22–48)	42.6 (18–48)	98.7	1	60
Kendrick et al.	24	23.7 (12–36)	41.5 (24–48)	100	0	
Lecuire et al.	132 (120–156)			88	16.9	
Schlueter-Brust et al.	128.4 (120–224.4)			97.4	4.2	42
Liddle et al.	38.2 (19–88)	20.9 (13–29)	40.1 (12–48)	97.2	1.9	
Hall et al.	120 (76–156)		38 (13–48)	76		
Akan et al.	30 (24–36)	20.9 (12–29)	41.1 (34–47)	95	5	
Pandit et al.	60	21.1 (15–27)	39.4 (30–48)	100	0	
Keblish et al.	132 (60–228)			82	18.3	
Jeer et al.	70.8 (61.2–79.2)	20.5 (13–32)	37 (17–48)	89.7	9.5	29
Forsythe et al.	40.2 (12–96)					
Magnussen et al.	24 (24–40)			97.6	2.4	

patients evaluated in 2012. Their multicenter study collected 1000 cementless UKA with a mean FU of 38.2 months. They observed a total of 19 knees (1.9%) with significant implant-related complications, 13 of these required revision. Implant survival rate at 6 years was 97.2%. Moreover, radiolucent lines were present in 72 knees (8.9%) and they were all partial. Comparing these results with cemented UKA, the authors failed to find any significant differences and they concluded that there is not specific contraindication to cementless fixation. In 2013 Schlueter-Brust et al. [24] collected results at 12 years of a medial unicompartmental cementless mobile bearing arthroplasty (Uniglide, Corin, Cirencester, UK). Revision rate were 2.5% for 78 cementless prostheses at a mean time to revision of 41.6 months. The authors calculated a survival rate at 12 years of 97.4%.

The majority of the selected study analyzed a type of mobile bearing UKA: Oxford which is the most implanted nowadays. Regarding fixed bearing implant, Hall et al. [26] published results obtained implanting a different type of UKA cementless prostheses. They evaluated mid-long-term results of Unix (Stryker, Malwah, NJ) fixed bearing UKA. They calculated a survival rate of 76% at 12 years of FU. Considering aseptic-loosening as the end point this survival rate increased at 88%.

Lecuire et al. [23] evaluated another fixed bearing prosthesis called Alpina (Biomet, France). Their study has the longest mean FU period: 132 (120–156) months. The authors observed that when revision for any reason was defined as the end point the survival rate at 13 years was 88%, otherwise when revision due to implant mechanical failure was defined, survival rate was 94%. This special kind of prostheses summarized all systems used in cementless fixation to ensure better stability. The internal surface of femoral component has two pegs at 30° angle to ensure resistance to rotatory forces. Tibial tray fixation is assured by 3 different systems: a medial keel, a peg and an optional screw. All bone contact surfaces are Hydroxyapatite coated for cementless fixation.

On the other hand, other fixed bearing UKA showed unsatisfactory results. Marcacci and Bruni published results obtained from 76 consecutive patients treated with cementless UKA [11]. The authors added a biomimetic ceramic scaffold inside tibial and femoral fixation pegs to ensure better fixation. Nevertheless, in the group of patients treated, there were a relevant percentage of avascular necrosis of the medial femoral condyle (32 patients, 42.1%) and patients revised were mostly from this pathologic condition. In fact, from 19 patients revised, 13 were affected by avascular necrosis and aseptic loosening of the femoral component was the main reason for revision. The authors, observing a survival rate of 74.3% at 6 year FU, do not recommend the widespread use of cementless fixation technique, especially for cases of avascular necrosis of medial femoral condyle.

Table 3 Incidence of radiolucent lines (RL), rate of aseptic loosening, osteoarthrosis (OA) progression, bearing dislocations, periprosthetic fracture extrapolated from the included studies

Study (%)	Radiolucent lines	Aseptic loosening	OA progression	Bearing dislocation	Periprosthetic fracture	Mean operation time
Campi et al.		0.1[a]	2.3[a]	0.8[a]	0.5	
Blaney et al.	13.5		1.5	0.4	0.3	54.8 min (m)
Panzram et al.			3.3	3.3	3.3	
Stempim et al.	8.1		2	2		62.5 m ($p < 0.01$)
Pandit et al.	2.3		0.8	0.4		
Kerens et al.	17	1.7	5		1.7	10 m shorter ($p < 0.001$)[b]
Bruni et al.		14.5			1.3	
Hooper et al.	7.3	0.7	2	2.8		
Kendrick et al.	29					
Lecuire et al.	9.2		24.6			
Schlueter-Brust et al.		1.3		1.3		
Liddle et al.	8.9		0.7	0.7	0.5	
Hall et al.						
Akan et al.			1.6	2.5	0.8	36.1 m ($p < 0.001$)
Pandit et al.	7					9 m shorter ($p < 0.049$)
Keblish et al.		4.8		14.7	1.2	
Jeer et al.		1.3	3.2		1.6	
Forsythe et al.	54.4				7	
Magnussen et al.	44.7	1.9	4.8			

OA: osteoarthritis; PCA: porous coated anatomic, Howmedica, Rutherford, NJ; Unix: Stryker Malwah, NJ; preservation Uni: Depuy Warsaw, IN; LCS: low contact stress, Depuy, Warsaw, IN; Alpina: Biomet France; Uniglide: Corin, Cirencester, UK; whiteside Ortholoc: Wright Medica, Missisauga, ON

[a]The authors did not declared if cemented or cementless

[b]Operation time not reported

Kendrick et al. [22] in 2015 performed a randomized controlled trial of 43 patients treated with UKA cemented (21 patients) versus cementless (22 patients). They observed no statistically significative differences in terms of Oxford Knee Score or radiological misalignment. They used a radiostereometric analysis to evaluate migration of components and they discovered that tibial component subsided significantly more in cementless UKA compared to cemented (0.28 mm vs. 0.09 mm) in the first year of FU. Nevertheless, cemented UKA showed more complete radiolucent lines (24% vs. 0%) compared to cementless UKA.

Again in 2015, Hooper et al. [21] published their clinical and radiological results at 5 year follow-up of 150 consecutive cementless UKA. They observed excellent functional score maintained at 5 years and only 2 patients underwent a revision of prosthesis components with a TKA, showing a survival rate of UKA of 98.7%. Two patients underwent bearing exchanges for acute dislocation. In one patient bearing dislocation occurred after an ACL rupture. This patient was treated with an ACL reconstruction and bearing exchange with "upsizing" the mobile bearing 1 mm.

More recently, in 2017, Blaney et al. [19] showed their results of 257 consecutive cementless UKA at more than 5 years of FU. Patients were treated by two non designing surgeons with no previous experience in UKAs. They also evaluated the mean surgical time that was 54.8 min (range 38–89). Seven patients were revised, but only 1.9% within 5 years postoperatively. The cumulative survival at 5 years was 98.8%.

In 2016, Kerens conducted a more recent multicenter retrospective study [10]. A cohort of 60 cementless UKA was compared with 60 cemented UKA. Survival rates were 90% at 34 months for the cementless implantation and 84% at 54 months for the cemented fixation. They drew attention to radiolucent lines that were always partial and 17% versus 21% for cementless and cemented UKA, respectively. Considering only tibial radiolucent zones was 4% for cementless and 9% for cemented. Cementless fixation, saving time for cement preparation and cementation itself, could decrease operation time by a mean of 10 min if compared with cemented fixation ($p < 0.001$).

Even in 2017, Panzram et al. [9] published results obtained with their first 30 cementless UKA after 5 years. They registered implant survival rate of 89.7%. UKA revision was performed in 3 cases: 1 tibial plateau fracture within first postoperative month, 1 osteoarthritis progression

and 1 case of bearing dislocation. Their cemented UKA survival rate at 5 years of follow-up is higher (94.1%). Authors, from the same group of patients, observed their ability to return to sports. Patients showed a rapid return to physical activity within 3 months after surgery in 17 out of 27 cases.

Stempim et al. [20] in 2017 reported a curious technique for evaluating when a cementless UKA could be performed. The surgeon performed intraoperative evaluation named Bone Hardness Test, exercising pressure with the thumb on the surface created after tibial resection. If a depression of bone surface is created, primary stability of a cementless implant could not be assured. Other authors advices the use of an intraoperative device that can measure bone quality and helps the surgeon to use cemented or cementless fixation [33]. Stempin et al. analyzed also surgical time reduction comparing cementless and cemented UKA. They reported a mean surgical time of 62.5 and 78 min, respectively, this difference was statistically significative. Bearing thickness was 0.6 mm higher in cementless group. Radiolucent lines were always partial and not related to clinical failure in 3 out of 38 cementless and in 12 out of 23 of cemented UKA.

Conclusion

The current review about cementless fixation of UKA is based on mainly low levels of evidence studies. Clinical outcomes are evaluated with different scales. FUs are from short to mid term and only few studies with long-term evaluation. Different models of cementless UKA have been analyzed in the literature. Despite these limitations, cementless fixation of UKA has been shown good results. This could allow reduction of surgical times, decreased rate of aseptic loosening and RL, decreased risk of third body particles of cement formation, maintaining equal or better outcomes if compared with cemented UKA. There is not a general consensus about the correct indication of a cementless rather than a cemented UKA. Nevertheless, young patients with good bone quality are recommended. We discourage the use of cementless fixation in cases of avascular necrosis. We strongly advocate further high-quality long-term studies to better clarify benefits and right indications of this promising technique in UKA.

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Compliance with ethical standards

Conflict of interest The authors declare that they have no conflict of interest.

Ethical approval This article does not contain any studies with human participants or animals performed by any of the authors.

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