Is there evidence for a superior method of socket fixation in hip arthroplasty? A systematic review

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Abstract

Purpose Total hip arthroplasty has been a very successful orthopaedic procedure. The optimal fixation method of the acetabular component however, has not yet been defined.

Methods We performed a systematic review using the Medline and Embase databases to find evidence for the superiority of cemented or cementless acetabular components on short- and long-term clinical and radiological parameters. Methodological quality for randomised trials was assessed using the van Tulder checklist, and for the non randomised studies we used the Newcastle-Ottawa quality assessment scale.

Results Our search strategy revealed 16 randomised controlled trials (RCT) and 19 non RCT studies in which cemented and cementless acetabular components are compared. A best evidence analysis for complications, wear, osteolysis, migration and clinical scores showed no superiority for either cemented or cementless socket in the RCTs. A best evidence analysis for non RCT studies

revealed better osteolysis, migration properties and aseptic loosening survival for cementless sockets; however, wear and overall survival favoured the cemented sockets.

Conclusions We recommend that an orthopaedic surgeon should choose an established cemented or cementless socket for hip replacement based on patient characteristics, knowledge, experience and preference.

Introduction

Total hip arthroplasty (THA) is a very successful orthopaedic procedure [1], but we still face the challenge of defining optimal socket fixation. The acetabular component is crucial for a good long-term outcome of THA [2, 3]. Long-term survival data on cemented hip arthroplasty has frequently been used to favour cement fixation [4–6]. In spite of these good long-term results, specific survival analysis of cemented hip arthroplasty showed increasing revision rates for acetabular components [7, 8]. In the early 1970s scientists developed cementless arthroplasties to solve the so-called cement disease, now known to be as a result of wear debris particles. Cementless fixation continued to develop and showed promising early to mid-term results. Long-term survival data and the further development of cementless fixation was needed to provide the right for existence for cementless sockets compared to long-term cemented data [4, 9]. The improvement of cementless sockets into third generation versions has been described in literature [10, 11].

The choice whether to use cement or cementless fixation is based on knowledge, experience and personal preference. The reasons for choosing cementless fixation in high

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demand patients could be, for example, the absence of the cement–bone interface, biological fixation over time will profit from stresses imposed on the bone–implant interface, and prevents wear particles reaching peri-acetabular bone and resulting osteolysis.

Literature is providing us with excellent reports on long-term data for both cemented and cementless sockets [4, 6, 12, 13]. The question therefore remains valid as to which acetabular component fixation can be considered superior—cemented or cementless. For this we performed a systematic literature review in which we evaluated studies that compared cemented and cementless sockets to find evidence for the superior method of acetabular fixation. Since most randomised controlled trials (RCTs) deal with a short- to medium-term follow-up, we also included cohort studies in which cemented and cementless sockets were compared. For these non RCT studies there had to be sufficient internal control for bias and adequate handling of lost to follow-up patients in order to evaluate long-term effects.

Methods

Search strategy for identification of studies

We conducted a literature study to identify all relevant randomised controlled trials and comparative cohort studies in which cemented and cementless sockets were compared. According to the QUOROM guidelines [14], a search was conducted through the Medline and Embase electronic databases for studies published between 1980 and December 2009. Our search strategy used the key-words: acetabul* AND cement* AND cementless OR uncemented OR non cemented. Only publications written

in the English or German language were considered for review. In an attempt to identify all relevant trials, literature references of the retrieved articles were examined for additional relevant publications.

Selection of studies

One reviewer conducted the literature search and selected relevant literature in which comparison between cemented and cementless acetabular components has been reported through a hierarchical approach using title, abstract and full manuscript. The inclusion criteria were: primary total hip arthroplasty comparing cemented and cementless acetabular components, indication for performing THA had to be primary or secondary osteoarthritis, minimal follow-up had to be 12 months and data presented had to be clinical (complications, Harris hip score and survival) and radiological outcome measurements (wear, migration and osteolysis). Double publications of the same patient populations were not accepted.

Assessment of methodological quality

Articles that met all the mentioned criteria were independently examined by two reviewers (DP, GH). For the randomised controlled trials the quality level was assessed using the van Tulder checklist [15] (Table 1). When no consensus could be reached between the two reviewers, a third independent observer (WJ) was consulted to cast the decisive vote.

We used the Newcastle-Ottawa quality assessment scale to assess the quality level in the non randomised controlled trials (n-RCT) [16] (Table 2). This analysis was performed by one author (DP) in simultaneous co-operation with the other reviewer (GH).

Table 1 Methodological criteria of the checklist of van Tulder et al. (2003) [15]

Aspect	Description	Item
Randomisation	Is a valid randomisation technique applied	A
Allocation concealment	Was the treatment allocation concealed	B
Prognostic factors	Are the patient groups comparable on prognostic factors	C
Patient blinding	Is the patient blinded for the treatment	D
Surgeon blinding	Is the surgeon blinded for the treatment	E
Outcome assessor blinding	Is the outcome assessor blinded for the treatment allocation	F
Co-interventions	Are the co-interventions described in sufficient detail	G
Compliance	Is the compliance acceptable	H
Drop-out	Is the drop-out rate given and acceptable	I
Timing	Is the timing of the outcome assessments comparable between groups and consistent within groups	J
Intention to treat	Is an intention to treat analysis given	K
Homogeneity	Is the patient group homogeneous on prognostic factors	L

Table 2 Newcastle-Ottawa quality assessment scale cohort studies

Category	Description
Selection	
1. Representativeness of the exposed cohort	a) Truly representative of the average _____ (describe) in the community b) Somewhat representative of the average _____ in the community c) Selected group of users, e.g. nurses, volunteers d) No description of the derivation of the cohort
2. Selection of the non exposed cohort	a) Drawn from the same community as the exposed cohort b) Drawn from a different source c) No description of the derivation of the non exposed cohort
3. Ascertainment of exposure	a) Secure record (e.g. surgical records) b) Structured interview c) Written self report d) No description
4. Demonstration that outcome of interest was not present at start of study	a) Yes b) No
Comparability	
1. Comparability of cohorts on the basis of the design or analysis	a) Study controls for _____ (select the most important factor) b) Study controls for any additional factors (this criteria could be modified to indicate specific control for a second important factor)
Outcome	
1. Assessment of outcome	a) Independent blind assessment b) Record linkage c) Self report d) No description
2. Was follow-up long enough for outcomes to occur	a) Yes (select an adequate follow up period for outcome of interest) b) No
3. Adequacy of follow-up of cohorts	a) Complete follow-up; all subjects accounted for b) Subjects lost to follow-up unlikely to introduce bias; small number lost -> ____ % (select an adequate % follow-up, or description provided of those lost) c) Follow up rate < ____ % (select an adequate %) and no description of those lost d) No statement

Best evidence synthesis

Best-evidence syntheses focuses on the “best evidence” in a field, the studies highest in internal and external validity, using well-specified and defended a priori inclusion criteria, and use effect size data as an adjunct to a full discussion of the literature being reviewed. Based on literature we therefore used the van Tulder checklist for the selected RCT studies and the Newcastle-Ottawa checklist for the selected non-RCT studies. Articles that scored above 50% on the van Tulder or above 67% on the Newcastle-Ottawa checklists were selected and deemed to yield the best evidence. For double publica-

tions using the same patient population, the article with the highest checklist score was included in the best evidence synthesis. Neither in the van Tulder nor in the Newcastle-Ottawa checklist were the items weighted against their relevance. Therefore articles with elaborate statistics and articles with well-defined scores on other criteria could rank in the same category of 50% or higher. Although formally included in this review, these articles provided information of different quality. We tried to regain the most valuable statistical and textual information from the articles found in our review. Nevertheless, one could argue that the quality of the different types of information is similar.

Data collection

Data was extracted using a pre-developed data extraction form by two reviewers. Items in this form were study type, population characteristics, complications, treatment characteristics and outcome parameters (survival and radiological analysis).

Results

Our search revealed 5,837 eligible articles. Initially 5,732 articles were excluded based on screening for our inclusion criteria. On the basis of the title and abstract, 65 articles were excluded leaving 40 articles from which 16 RCTs and 19 non RCT articles and five arthroplasty registries reports were isolated (Fig. 1). In these 16 publications cemented and cementless acetabular components were compared [17–32] in a randomised clinical trial. These articles were published based on six performed RCTs and 879 hip arthroplasties. The 19 non RCT studies were based on 4,479 arthroplasties [33–51].

Methodological quality

Among reviewers, there was disagreement on 15% of the items of the van Tulder checklist. All disagreements were resolved in consensus between the reviewers and the

independent reviewer. We simultaneously reviewed the non RCT studies using the Newcastle-Ottawa quality assessment scale, all scores were reached by consensus. The methodological scores are based on the published articles and its contents, and imply no judgement of the performed trial.

Best evidence synthesis

There were three RCT studies which scored ‘yes’ on more than 50% of the van Tulder criteria [20, 26, 30]. In orthopaedic surgery, surgeon blinding is not feasible. Therefore when re-evaluating the results of the van Tulder questionnaire we could select seven articles that scored yes on more than 50% of the van Tulder items [20, 21, 23, 26–28, 30]. Excluding double publications we selected three articles and analysed short-term survival, complication (luxations, infections), early migration and clinical scores. In Table 3 study characteristics are summarised of the selected RCT studies. Twelve non randomised studies scored more then 67% on the Newcastle-Ottawa quality assessment scale. For the best evidence synthesis in non RCT studies we evaluated these 12 articles for wear, osteolysis, migration, long-term survival and clinical scores. In Table 4 the study characteristics are summarised for the selected non RCT studies.

Wear was analysed using RSA in two RCT studies [27, 30] and five non RCT studies (Table 5). Onsten and associates

Fig. 1 Medline and Embase database, the QUOROM statement flow diagram

Table 3 Characteristics of randomised controlled trails included in the best evidence synthesis

Trial	Prosthesis C:UC	Number of hips C:UC	Follow-up mean (mo)	Age mean (y)	Clinical score	Radiological score	Complications
Onsten et al. 1998 [27]	Charnley : HG1	51:51	63	69	HHS	A+C	D
Laupacis et al. 2002 [26]	Mallory Head	124:126	75	64	HHS	X	D
Digas et al. 2004 [30]	Reflection: Trilogy	59:37	24	67	HHS	A+B + C	X

C:UC cemented:uncemented, HHS Harris hip score, A wear, B osteolysis, C migration, D complications, X not reported

found no differences between the cemented and cementless sockets [27, 28]. Digas et al. described higher 3D penetration wear rates for cemented acetabular components ($p < 0.001$) [30]. These findings could be explained by the different sterilisation techniques (cemented ETO vs. cementless gamma radiation) used in this study. From the five non RCT studies [33–36, 39], two [33, 39] showed superior wear characteristics for the cemented socket. All other studies showed no difference for wear between cemented and uncemented fixation at a minimum of ten years follow-up.

In the study published by Digas et al. [30], the authors found that the cementless sockets showed less osteolysis and even a decrease in radiolucent lines surrounding the component. In the group of non RCT studies seven articles described osteolysis. Four reports described a difference between cemented and uncemented sockets. Zicat et al., Hartofilakidis et al. and Clohisy et al. all reported superiority for the uncemented socket at a minimal follow-up of nine years [34, 36, 37]. Ring et al. described superiority of the cemented socket only three years after implantation [46].

Migration of acetabular components in the RCT study group was analysed using RSA [27, 30] (Table 5). The general conclusion of these studies was that the method of fixation did not influence migration and rotation of the cup. In the non RCT study group eight studies analysed migration using standard pelvic radiographs. Four reported superior fixation of uncemented sockets [33, 34, 37, 50], three of which reported these results based on minimal follow-up data of nine years [33, 34, 37]. Kordelle and Starker reported superior stability of the cemented socket six years after implantation [42].

The Harris hip score (HHS) was used in all selected RCTs. Table 5 shows articles that present scores with description of average and range of outcome. None of the reported studies showed difference in favour of cemented or cementless acetabular components. Only four non RCT studies reported clinical scores using the HHS and none showed superior mid- to long-term results for either cemented and uncemented sockets [34, 35, 39, 44].

All retrieved RCT studies reported on follow-up data well below the ten-year interval. Laupacis et al. found more

Table 4 Characteristics of the non-randomised controlled trials included in the best evidence synthesis

Non RCT	Prosthesis	Hips, <i>n</i>	Follow-up mean (mo)	Age mean (y)	Clinical score	Radiological score
Clohisy et al. 2001 [34]	Harris/HG	90	144	62	HHS	A+B+C
Gaffey et al. 2004 [33]	Charnley/HG	261	180	67	X	A+B + C
Hartofilakidis et al. 2009 [36]	Charnley/Multiple	117	168	43	X	A+B
Hearn et al. 1995 [35]	Multiple/Multiple	72	48	61	HHS	B+C
Kim et al. 2003 [39]	Multiple/Duraloc	95	120	47	HHS	A+B
Kordelle and Starker 2000 [42]	Muller/Zweymuller	47	72	62	X	C
Kruckhans and Dustmann, 2004 [44]	X/Multiple	600	120	66	HHS	X
Pospula et al. 2008 [45]	Exeter/Zweymuller	182	36	50	X	C
Ring et al. 1983 [46]	X/Ring	1101	36	X	X	B+C
Riska 1993 [47]	Ceravit osteal/X	255	48 vs 84 ^a	62	X	A
Weber et al. 1998 [50]	Multiple/Multiple	66	36 vs 120 ^a	52	X	C
Zicat et al. 1995 [37]	AML/AML	137	108	56	X	B+C

RCT randomised controlled trial, A wear, B osteolysis, C migration, X not reported, HHS Harris hip score

^a Separate follow-up duration for uncemented vs cemented sockets

Table 5 Valid statistical analysis in the selected randomised controlled trial (RCT) and non RCT studies containing mean (range)

Studies	Migration					
	Translation (mm)			Rotation (degrees)		
RCT						
Onsten et al. 1998 [27]	Cemented		Uncemented	Cemented		Uncemented
Transversal	0.3 (0.01–2.5)		0.3 (0–1.5)	0.8 (0–8.7)		0.6 (0.1–3.0)
Longitudinal	0.4 (–0.2–5.0)		0.2 (–0.3–1.1)	0.7 (0–3.4)		0.7 (0–2.1)
Sagittal	0.2 (0–2.2)		0.3 (0–1.7)	0.6 (0–5.4)		0.6 (0–2.6)
Digas et al. 2004 [30]	Cemented 1	Cemented 2	Uncemented	Cemented 1	Cemented 2	Uncemented
Transversal	–0.01 (–0.59–1.58)	–0.09 (–1.02–0.69)	0.12 (–0.33–3.22)	–0.0– (–1.34–1.13)	–0.21 (–1.82–1.32)	0.23 (–0.60–6.54)
Longitudinal	0.12 (–0.05–0.71)	0.12 (–0.13–1.07)	0.15 (–0.13–1.00)	–0.05 (–2.45–2.20)	–0.08 (–1.49–0.75)	0.03 (–0.87–3.16)
Sagittal	–0.01 (–1.23–0.70)	0.02 (–0.72–0.49)	0.06 (–0.72–0.49)	–0.01 (–2.61–1.42)	0.06 (0.6–2.51)	0.09 (–0.49–1.42)
Non-RCT	Wear			Harris hip score		
	Cemented		Uncemented	Cemented		Uncemented
Clohisy et al. 2001 [34]	0.08 (0–0.27)		0.08 (0–0.23)	87 (34–100)		92 (60–100)
Gaffey et al. 2004 [33]	0.10 (0–0.25)		0.15 (0.01–0.36)	Not reported		Not reported
Hartofilakidis et al. 2009 [36]	0.112 (0.01–0.34)		0.114 (0–0.5)	Not reported		Not reported
Kim et al. 2003 [39]	0.24 (0.08–0.57)		0.32 (0.1–0.69)	82 (55–96)		82 (55–95)
Hearn et al. 1995 [35]	Not sufficiently reported		Not sufficiently reported	92 (76–100)		91 (56–100)
RCT						
Onsten et al. 1998 [27]	0.09 (0.02–0.26)		0.1 (0.03–0.22)	94 ^a		96 ^b
Digas et al. 2004 [30] ^b	0.45 (0.31–0.58)	0.42 (0.29–0.55)	0.21 (0.17–0.24)	95 (69–100)	89 (48–100)	94 (54–100)

^a No statistical significant difference (CI 2.3–7.3)^b Wear measured as total 3D penetration

revisions in the cemented group compared to the cementless arthroplasties (13 vs. 6) [26]. They reported nine (7%) acetabular revisions due to aseptic loosening compared to four (3%) revisions in the cementless group. Although not significant, these results showed a trend in favour of the cementless sockets. All other selected articles published short- to medium-term follow-up without any difference between cemented and cementless arthroplasties with regard to acetabular survival [27, 30]. Long-term follow-up (over ten years) was seen in five non RCT studies [33, 34, 36, 39, 44]. Three authors reported no statistical difference, whilst two authors favoured the cemented socket [36, 44]. In Hartofilakidis et al., different cementless sockets were compared with a Charnley cemented socket. The cementless sockets showed superior aseptic loosening but were revised more often due to expansive osteolysis compared with the Charnley socket [36]. A cementless polyethylene Endler socket was used and later discarded by Kruckhans and Dustmann [44]. The authors noticed large osteolytic defects behind these cementless sockets and

opted for revision. Later during the study period the Endler socket was replaced with the Allopro socket. Since this change the authors saw no difference in survival between the cemented and cementless group.

Complications were described in two RCT articles. Laupacis et al. described complications based on the revisions performed (sepsis, fractures aseptic loosening) [26]. Luxations or successfully treated infections, in which the prosthesis was retained, were not described. Onsten et al. described one dislocation which they excluded from further follow-up [27]. The description and distribution of complications in the non RCT group are presented in Table 6. There were no apparent significant differences between the cemented and cementless groups.

Discussion

The selected RCT articles are only based on early- to medium-term follow-up and many articles lack the scien-

Table 6 Complications in the non randomised controlled trial (RCT) articles

Non RCT	Cemented			Uncemented		
	Dislocation (revision)	Infection	Other (socket related)	Dislocation (revision)	Infection	Other
Clohisy et al. 2001 [34]	1 (no)	0	0	4 (no)	0	Liner number
Gaffey et al. 2004 [33]	0	0	0	3 (yes)	0	0
Hartofilakidis et al. 2009 [36]	Nd	Nd	Nd	Nd	Nd	Nd
Hearn et al. 1995 [35]	1 (yes)	2	0	0	2	0
Kim et al. 2003 [39]	2 (no)	2	0	2 (no)	2	0
Kordelle and Starker 2000 [42]	Nd	Nd	Nd	Nd	Nd	Nd
Kruckhans and Dustmann 2004 [44]	Nd	Nd	Nd	Nd	Nd	Nd
Pospula et al. 2008 [45]	4 (no)	4	0	3 (no)	1	0
Ring et al. 1983 [46]	Nd	Nd	Nd	Nd	Nd	Nd
Riska et al. 1993 [47]	Nd	1	Cement number+socket migration	Nd	2	Nd
Weber et al. 1998 [50] ^a	1 (yes)	0	0	0	0	0
Zicat et al. 1995 [37]	0	0	0	2 (yes)	0	0

Nd not described

^a Unclear description concerning dislocation; one dislocation in the cemented socket resulting in revision and two dislocations without revision. The two dislocations were not subdivided in cemented or cementless

tific quality to satisfactorily answer our basic question. The best evidence synthesis for these randomised studies showed no statistical difference for osteolysis, migration and cup survival. To provide a total literature overview we also reviewed all relevant non RCT articles. The cemented socket was superior for long-term revision and polyethylene wear. The cementless socket provided better osteolysis and long-term cup migration results. As survival is the main resultant from wear, osteolysis, migration and clinical scores, cemented socket scored marginally better in this extensive literature review.

Investigators use systematic reviews to summarise existing data, refine hypotheses, estimate sample sizes, and help define future research agendas. Without systematic reviews, researchers may miss promising leads or may embark on studies of questions that have been already answered. Orthopaedic surgeons need review articles and other integrative publications to help generate clinical policies that optimise outcomes using available resources. Clinicians reason about individual patients on the basis of analogy, experience, and theory as well as research evidence. Awareness of a treatment's effectiveness does not confer knowledge about how to use that treatment in caring for individual patients. Although the RCT is viewed by many as the paradigm for clinical research, debate is growing stronger [52, 53]. Research designs with sufficient control of bias turned out to be as good as RCTs, especially when it came to evaluating long-term results. Modern

statistical approaches and careful selection of the research population can provide reasonably strong evidence. In surgery, especially in clinical practice, it is almost impossible to compare treatments since the effect of treatments will reveal themselves after at least a seven- to ten-year follow-up. In the case of wear and osteolysis the effect of treatment can be effectively evaluated after several years follow-up. Considering the statements given above, using validated questionnaires, carefully selected cohort studies with sufficient control could be regarded as the design of choice to evaluate surgical treatments instead of choosing the RCT.

The development of highly cross linked PE and addition of vitamin E to reduce wear [54, 55], more stable connections between the metal shell and PE insert, and development of monoblock systems as well as other tribological developments are potential answers that are all explored to improve outcome. In the RCT articles we studied there was no known difference between the PE type used, although in Digas et al. different sterilisation procedures were used [30]. In only two non RCT articles, the authors provided additional information concerning the polyethylene used. Both used a metal femoral head on air gamma irradiated PE articulation with varying head diameter (22–28 mm) [34, 36]. In both studies, PE wear was comparable for the cemented and cementless sockets but the incidence of osteolysis was significantly lower in cementless sockets. Riska et al. published medium-term

follow-up results of a ceramic on ceramic articulation [47]. They found no wear in either groups during their follow-up period, but did not focus and report osteolysis. In total five non RCT studies described wear [34–37, 40], with two favouring the cemented socket [33, 39].

Complications are seen in both cemented and cementless sockets, early complications such as dislocation and infection are commonly not caused by the type of acetabular fixation. Dislocation rates mostly depend on surgical experience and patients characteristics (indication, compliance, gender, age, muscle balance) [56]. A difference between infection rates between cemented and cementless THA was not observed in a recently published Swedish registry report [57]. In the RCT articles reviewed in our report, complications were not the focus of investigation and therefore provide no additional information. The non RCT studies show no apparent difference between the cemented and cementless sockets for dislocation and post-operative infections.

Proponents of cemented acetabular components argue that literature provides excellent long-term data concerning their use and that only short- to mid-term results show good results for uncemented sockets. The Scandinavian register provides a wealth of information on the performance of different arthroplasty components. In reports from this register, the most widely used cemented hip are the Charnley prosthesis, the Lubinus II and Exeter prosthesis. In contrast to the uniformity in cemented arthroplasty, the cementless components are heterogeneous in form, types, volume and fixation methods [2, 58]. We have also seen this in the non RCT studies found during our search, in which various components are used and compared. This could lead to a selection bias. Local tradition, expertise on fixation type, surgical approach and diagnosis also provide different demographics and long-term results between cemented and cementless arthroplasties [58]. Recently, Hailer et al. published a Swedish register report in which a comparison of the most commonly used cemented and cementless sockets showed no difference in revision for any reason [57].

Only a few meta-analysis are known to us in which literature on cemented and uncemented hip arthroplasty are compared [59–61]. None however have performed an RCT meta-analysis concerning the acetabular component. Yahiro et al. showed higher aseptic failure in cemented cups [59]. Morshed et al. concluded that cement was still the first choice for acetabular fixation [60]. The articles they included consisted of RCT and non RCT studies. Their literature search however was incomplete and ended at 2005. Huo et al. used the meta-analysis performed by Morshed et al. and provided an overview of the long-term literature of cemented components [61]. They concluded that “the results of cemented cups have been inferior to cementless fixation in most published reports”.

Several other authors who have frequently been referred to and found through our search, compared both fixation methods of acetabular components [33–36]. Gaffey et al. concluded superior results for cementless fixation with a follow-up of over ten years [33]. A matched pair analysis led to the conclusions that the cementless acetabular component showed significantly less loosening compared to the cemented version at nine to 11 years follow-up [34]. Superior aseptic survival for cementless fixation was also described by Hartofilakidis et al. [36]. In evaluation of both types of fixation in patients who received a bilateral hip arthroplasty, Hearn et al. found no difference in the early-term follow-up in radiological and clinical scores [35].

Nordic registry studies published during the last few years showed, in concordance with our results, ambiguous results concerning superiority of cemented and cementless sockets [2, 58, 62]. The Danish registry especially favours the cementless socket in patients below the age of 50 years [2].

Knowledge, familiarity and further developments on cementless arthroplasty have altered the results of these components. Morshed et al. showed a positive correlation between implant survival and publication date for articles referring to cementless acetabular components [60]. The long-term, ten to 20 year results seem to be limited by acetabular osteolysis, although our review showed a lower incidence of osteolysis in cementless sockets [34, 36, 37].

We conducted a literature search with which we have tried to determine the results comparing cemented and uncemented sockets. Long-term survival, osteolysis, migration, wear and clinical scores are important factors on which we can determine superiority. Complications are ill-described in the RCT articles and provided no conclusive answers. The RCTs provide only short- to medium-term follow-up and therefore cannot fully answer our primary question of fixation superiority. We also reviewed non RCT studies; these provided various long-term comparisons with ambiguous results in determining the superior fixation method. Complications such as dislocation and infections were better described in the non RCT group without apparent difference.

As orthopaedic surgeons and researchers we have to accept that RCT studies are difficult to perform and are not synonymous with the truth in orthopaedic care for our patients. We feel that it is imperative to use the highest grade of research available to find the optimal treatment in our practice. This could mean that non RCT (prospective clinical trials) with adequate follow-up and measurement could set the gold standard in orthopaedic care.

The future of hip arthroplasty includes developing articulating surfaces to diminish wear, osteolysis and further investigation of other causes of loosening such as retro-acetabular stress shielding. This literary review provides us with the information that the orthopaedic surgeon

should use his or her knowledge, experience and preference to choose an established cemented or cementless socket for each patient treated.

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

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