

Review article: Cemented or uncemented femoral component in primary total hip replacement? A review from a clinical and radiological perspective

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ABSTRACT

Controversy exists regarding the optimal method of fixation for primary total hip replacement, particularly the femoral component. We performed a systematic literature review to explore whether cemented total hip replacement can achieve better clinical and radiological outcomes. A total of 29 publications were selected using computer-aided and manual searches. A qualitative comparison of results in clinical and radiological changes was then conducted. Most of the literature showed that better short-term clinical and functional outcomes could be obtained from cemented femoral fixation than from uncemented femoral fixation. Results were less clear for the mid-term clinical outcome, though in general, cemented fixation still appeared to show a superior clinical outcome. Radiographic differences are variable and do not seem to correlate with clinical findings. For the short- and

mid-term, cemented femoral component is recommended. However, a long-term randomised trial combined with a large cohort study or registry is needed.

Key words: arthroplasty, replacement, hip; bone cements; clinical protocols; review

INTRODUCTION

Total hip replacement (THR) is one of the most successful and cost-effective surgical procedures and remains the treatment of choice for long-term pain relief and restoration of function for patients with diseased or damaged hips. We performed a systematic literature review¹⁻⁵⁶ to explore whether cemented THR can achieve better clinical and radiological outcomes, as the choice of fixation method is one of the major issues confronting contemporary hip

surgeons.^{32,47} Since the first total hip replacements performed by Charnley in the 1960s, many different types of prostheses have been used. The traditional method of fixation of an implant to bone involved the use of cement. However, in the 1980s, implant loosening and loss of bone stock, particularly in younger and more active patients, was seen with greater frequency. Osteolysis was once considered a 'cement disease', but now is believed to be a response to wear-debris particles. Therefore, the idea of implanting prostheses without cement and eventually having prostheses that can become part of the living body was most appealing. However, the popularity of non-cemented prostheses began to waver with cases of 'non-cement disease' with worse outcomes. As a result, the hybrid prosthesis, a procedure with the acetabulum uncemented and the femoral component cemented, appeared on the scene.

Controversy exists regarding the optimal method of fixation of THR, in particular the femoral component. The perceived advantages of cemented versus non-cemented fixation have been previously reviewed.^{32,47} However, the comparative outcomes, advantages, and preferred indications of cemented versus non-cemented fixation, especially regarding the femoral component, remain unresolved issues. The superiority of either fixation method has not been proved conclusively because of the influences of confounding variables, such as patient age, sex, body weight, and diagnosis.³² On the other hand, various studies have been designed to compare the clinical and radiological outcomes of cemented fixation with uncemented fixation using randomised clinical trials,^{20,24} non-randomised comparison (both non-matched pair^{6,22} and matched pair^{10,29}), and comparison in the same patient (bilateral THR using different methods on each side).^{14,21} Therefore, no study has been able to draw a decisive conclusion because the conclusion was often limited to its own study method and result. A horizontal or longitudinal comparison of the literature has not been reported. In 2002, Khan et al.¹⁸ conducted a systematic review on whether better outcomes could be achieved by cemented hemiarthroplasty in treating patients with displaced intracapsular femoral neck fractures. They concluded that the literature tended to support the use of cement.

METHODS

In October 2003, a comprehensive search of the English language medical literature of all studies comparing primary cemented THR with uncemented THR was performed. This involved computer-aided searches of

PubMed. We focused only on the comparison of cemented with uncemented femoral component; therefore, cemented femoral components with acetabulum either cemented or uncemented was chosen and treated as the same group. We input the following key words and limited the study type to human study: (total hip replacement [ab] OR total hip arthroplasty [ab]) AND (cemented [ab] OR cement [ab] OR hybrid [ab]) AND (cemented [ab] OR cementless [ab] OR noncemented [ab]) AND (comparison OR versus). We then selected references found from PubMed using the following criteria: (1) either one of the major objectives or the only objective was to compare cemented and uncemented THR according to the clinical and/or radiological outcome; (2) the surgical procedure used in the study should be primary THR, not revision THR nor hemiarthroplasty; (3) it should be an original clinical study, rather than a literature review.

Subsequently, manual search was performed using the same criteria. After all the publications were identified, 2 independent extractors carried out data extraction separately based on a checklist. The studies were divided into different categories according to their study design and the mean follow-up period. Based on the study design, there were 4 categories: randomised clinical trial (R), non-randomised comparison (non-matched pair [N] and matched pair [M]), and comparison in the same patient (S). According to the mean follow-up period, the categories were further divided into short-term (less than 2 years) and mid-term (2–10 years) studies. For mid-term studies, short-term outcomes were also analysed if available. A qualitative comparison of results from clinical and functional assessment together with radiological changes was performed.

RESULTS

A total of 57 publications were found from the computer-aided search. Only 17 of these met our criteria and were selected.^{2,4,6,11,14,15,21,22,24,26,29,34,40,45,54–56} An additional 13 publications were found through manual search.^{10,16,19,23,30,31,33,36,41,44,46,51,53} A total of 30 publications were selected. However, 2 publications^{2,45} in different journals had almost the same content, most likely because 2 research groups published the results separately. We therefore chose only one of them,⁴⁵ giving a final total of 29 publications.

The basic information extracted from these selected studies is shown in Table 1. Of the studies, 69% were prospective and 31% were retrospective. Two

Table 1
Basic information from selected studies

| Reference No. | Year published | Study type (P/R) [*] | Randomisation | Blinded study | Matched variables between cemented and uncemented groups |
|---------------|----------------|-------------------------------|--|----------------------|--|
| 4 | 1998 | P | NA | No | No |
| 4 | 1998 | P | NA [†] | No | Age, sex, follow-up, weight, diagnosis |
| 6 | 2002 | R | NA [†] | No | Age not matched |
| 10 | 1994 | R | NA | No | Age, sex, weight, follow-up, diagnosis |
| 11 | 1992 | P | Random draw through envelope | Patient | Pain, hip score, age |
| 14 | 1995 | P | NA | No | Bilateral |
| 15 | 1993 | P | NA | No | No |
| 16 | 1994 | P | Computer, stratified by age, sex, weight, quality of bone, diagnosis | NM | Yes |
| 19 | 2003 | P | NA | No | Hip score |
| 21 | 2002 | P | NA | No | Bilateral |
| 22 | 1993 | R | NA | No | No |
| 23 | 1989 | R | NA | No | Bilateral |
| 24 | 2002 | P | Computer, stratified by age, surgeon, with sample size calculation | Patient and assessor | Yes |
| 26 | 1994 | P | NA | No | No |
| 29 | 1990 | R | NA | No | No |
| 29 | 1990 | R | NA | No | Age, sex, weight, diagnosis |
| 30 | 1991 | R | NA | No | Age not matched |
| 31 | 1996 | P | NA | No | Age not matched |
| 33 | 1996 | P | Stratified by age, surgeon | Patient and assessor | Age, sex |
| 34 | 1997 | P | Stratified by age, surgeon | Patient and assessor | Age, sex |
| 36 | 1986 | P | Yes | NM | Age, diagnosis, follow-up |
| 40 | 1996 | R | NA | No | Age, sex, weight, diagnosis, approach |
| 41 | 1993 | P | Yes | No | Age, sex, weight |
| 44 | 1986 | P | NA | No | Bilateral |
| 45 | 1994 | P | Stratified by age, surgeon | Patient and assessor | Age, sex |
| 46 | 1996 | P | Stratified by age, surgeon | Patient and assessor | Age, sex |
| 51 | 2001 | P | NA | No | No |
| 53 | 1995 | R | NA | No | Age, diagnosis, follow-up |
| 54 | 1991 | P | NA | No | Age not matched |
| 55 | 1991 | P | Numbers | No | Age, weight, diagnosis |
| 56 | 2002 | P | NA | No | No |

* P denotes prospective and R retrospective

[†] NA not applicable

[‡] OA denotes osteoarthritis, ON osteonecrosis, RA rheumatoid arthritis, and CA coxarthrosis

[§] NM not mentioned

studies^{4,29} were assigned to both categories N and M because they were basically non-randomised and non-matched pair studies. In addition, a matched pair subgroup was included in the 2 studies. Therefore, there were 12 publications in category N,^{4,6,15,19,22,26,29,30,31,51,54,56} 10 in category R,^{11,16,24,33,34,36,41,45,46,55} 5 in category M,^{4,10,29,40,53} and 4 in category S.^{14,21,23,44} The mean

postoperative follow-up period ranged from one year to 9.3 years. Among all these studies, one was designed to compare cemented, porous-coated, and hydroxyapatite-coated THR¹⁶; one was to compare cemented, uncemented, and hybrid THR.⁵⁴ For the randomised clinical trial group, 2 paired studies obviously originated from the same project, but with

| Mean age of patients (cemented/uncemented) [years] | Diagnosis [†] | Cemented group | | | Uncemented group | |
|--|------------------------|----------------|-------------------------------|---------------------|--|-------------------------------|
| | | No. of hips | Mean follow-up period (years) | Cemented acetabulum | No. of hips | Mean follow-up period (years) |
| 72.5/70.4 | Mainly OA | 100 | 7.0 | Mainly Yes | 100 | 5.8 |
| 62/61 | Mainly OA | 25 | 7.0 | NM [§] | 25 | 5.8 |
| 70/55 | Mainly OA | 102 | 7.2 | NM | 78 | 7.8 |
| 61/57 | Mainly OA | 41 | 6 | No | 41 | 6 |
| 64.4/64.5 | OA | 30 | 2 | No | 28 | 2.0 |
| 63 | Mainly OA | 30 | 3.6 | NM | 30 | 3.0 |
| 64/52 | Mainly OA | 71 | 4.3 | Yes | 70 | 4.1 |
| Range, 30–65 | OA | 20 | 2 | NM | 21 (porous-coated); 23 (hydroxyapatite-coated) | 2 |
| 67.4/64.8 | ON | 75 | 9.3 | NM | 75 | 9.3 |
| 63 | Mainly ON | 70 | 7.8 | NM | 70 | 7.8 |
| NA | RA | 17 | 5 | NM | 25 | 3 |
| 65.3 | Mainly OA | 20 | 7.5 | No | 20 | 6 |
| 64 | OA | 124 | 6.3 | Yes | 126 | 6.3 |
| NA | OA/RA | 86 | 2 | NM | 98 | 2 |
| NA | Mainly OA | 67 | 2.7 | No | 69 | 3.1 |
| 65/64 | Mainly OA | 25 | 2.7 | No | 25 | 3.1 |
| 66/56 | OA | 70 | 1 | No | 65 | 1 |
| NA | Mainly OA | 31 | 2 | NM | 9 | 2 |
| 65 | OA | 76 | 4.8 | Yes | 71 | 4.8 |
| NA | OA | 114 | 4.0 | Yes | 112 | 4.0 |
| 67/64 | Mainly OA | 61 | 1 | NM | 58 | 1 |
| 72.5/70.4 | OA | 100 | 2 | Yes | 100 | 2 |
| 65/64 | CA | 60 | 5 | NM | 60 | 5 |
| 66 | Mainly OA | 6 | 3 | Yes | 6 | 3 |
| 64 | OA | 124 | 2 | Yes | 126 | 2 |
| 65 | OA | 76 | 4.8 | Yes | 71 | 4.8 |
| 64/41 | RA | 47 | 6.5 | No | 51 | 8.3 |
| 62.6/66.9 | Mainly OA | 85 | 6.5 | NM | 66 | 7 |
| 67/54 | Mainly OA | 79 | 3 | Partly yes and no | 65 | 2.9 |
| 67.4/64.8 | Mainly OA | 75 | 5 | NM | 75 | 5 |
| 75.3/72.4 | OA | 174 | 1 | No | 85 | 1 |

different outcomes^{33,46} or follow-up periods.^{24,45} Double blind and stratification were adopted in 3 projects,^{24/45,33/46,34} single blind in one study,¹¹ others were not blind or this was not mentioned. Only one study conducted sample size calculation.²⁴

Clinical, functional, and radiological outcomes summarised from studies in each category are shown

in Tables 2 to 5. For the randomised clinical trials (Table 2), all the studies suggested better short-term clinical outcomes for patients who had undergone cemented THR. The mid-term clinical outcomes of most studies gave equal results comparing cemented and uncemented THR. However, increased thigh pain⁵⁵ and reduced walking ability without support¹¹

Table 2
Randomised clinical trial*

| Mean follow-up period (years) | Pain | Thigh pain | Hip score | Gait | Quality of life | Osteolysis | Micro-motion | Bone remodelling | Heterotopic ossification |
|-------------------------------|----------------------------|--|-------------------------------|--|-------------------------|-------------------|--|-------------------|--------------------------|
| Short-term (<2) | CSU ^{11,36,55} | CSU ⁵⁵ | CSU ^{36,55} | CSU ^{36,55} | NA | NA | NA | NA | NA |
| Mid-term (2–10) | CEU ^{11,16,33,55} | CSU ⁵⁵ CEU ³³ | CEU ^{16,33,45,46,55} | CSU ¹¹ CEU ⁵⁵ | CEU ^{24,45,46} | CEU ⁴⁶ | CSU ^{41,55} CEU ^{16,46} | CEU ⁴¹ | CEU ^{16,34,41} |

* CSU denotes cemented superior to uncemented, CEU cemented equal to uncemented, and NA not available

Table 3
Comparison of matched pair*

| Mean follow-up period (years) | Pain | Thigh pain | Hip score | Gait | Quality of life | Osteolysis | Micromotion | Bone remodelling | Heterotopic ossification |
|-------------------------------|-------------------|------------------------|----------------------|------|-----------------|----------------------|-------------------|------------------|--------------------------|
| Short-term (<2) | CSU ²⁹ | CSU ^{29,53} | CSU ^{10,29} | NA | NA | NA | CSU ⁴ | NA | NA |
| Mid-term (2–10) | NA | CSU ^{4,29,53} | CEU ^{4,53} | NA | NA | CSU ^{10,29} | CSU ²⁹ | NA | CEU ^{40,53} |

* CSU denotes cemented superior to uncemented, CEU cemented equal to uncemented, and NA not available

Table 4
Comparison of non-matched pair*

| Mean follow-up period (years) | Pain | Thigh pain | Hip score | Gait | Quality of life | Osteolysis | Micro-motion | Bone remodelling | Heterotopic ossification |
|-------------------------------|---|----------------------|--|------|-----------------|-------------------|--|------------------------|--------------------------|
| Short-term (<2) | CSU ²⁹ | CSU ^{19,29} | CSU ²⁹ | NA | NA | CSU ²⁹ | CSU ²⁹ | NA | NA |
| Mid-term (2–10) | CEU ⁵⁶ CEU ^{15,54} | CSU ^{4,54} | CSU ⁴ CEU ^{19,22,51,54} | NA | NA | CEU ¹⁹ | CSU ^{4,51} CEU ²² | CEU ^{6,19,31} | CEU ^{26,30,54} |

* CSU denotes cemented superior to uncemented, CEU cemented equal to uncemented, and NA not available

Table 5
Comparison in the same patient*

| Mean follow-up period (years) | Pain | Thigh pain | Hip score | Gait | Quality of life | Osteolysis | Micromotion | Bone remodelling | Heterotopic ossification |
|-------------------------------|----------------------|-------------------|----------------------|--|-----------------|----------------------|----------------------|------------------|--------------------------|
| Short-term (<2) | CSU ⁴⁴ | CSU ²¹ | NA | CSU ⁴⁴ | | NA | NA | NA | NA |
| Mid-term (2–10) | CSU ^{23,44} | CEU ²¹ | CEU ^{14,21} | CSU ⁴⁴ CEU ²³ | | CEU ^{14,21} | CEU ^{21,23} | NA | CEU ^{14,23} |

* CSU denotes cemented superior to uncemented, CEU cemented equal to uncemented, and NA not available

were found in the uncemented group. Considerable improvement in health-related quality of life could be obtained in both cemented and uncemented groups at different follow-up periods, but no significant difference could be found between the 2 groups.^{24,45,46} Proximal hydroxyapatite coating seemed to be able to enhance the early fixation of the stem.¹⁶ Cementless titanium stem seemed to be able to have good radiological results.³³ No difference could be

found for heterotopic ossification (HO) formation between both groups.^{16,34,41}

For the matched-pair comparisons (Table 3), cemented THR was superior to uncemented THR in clinical and functional assessment in the short-term. A similar hip score was found between both groups after a 2-year follow-up; however, more thigh pain was reported in the uncemented group.^{4,29,53} Less femoral osteolysis and migration was found in the cemented

group.^{10,29} No difference in HO formation between the 2 groups was found.⁵³

Comparison of the results from studies in non-matched pair is shown in Table 4. For the short-term clinical outcome, most studies favoured the cemented THR. However, one study equally favoured both groups at a one-year follow-up.⁵⁶ For the mid-term outcome, most found no significant difference in pain and hip score between the 2 groups; however, more thigh pain was found in the uncemented group.^{4,54}

The results from studies in the same patient are shown in Table 5. Within postoperative 2 years, more pain, thigh pain, and less hip score were found in the uncemented group. Two years later, the cemented side was still superior in terms of pain.^{23,44} No difference in HO formation was found between the 2 groups.^{14,23}

For the short-term clinical outcome, all but one study for non-matched pair⁵⁶ showed that cemented THR was superior to uncemented THR. For the mid-term clinical outcome, most of the studies suggested equivalence between cemented and uncemented THR; however, superiority of cemented THR could be found in some aspects from studies in all 4 categories. On the other hand, radiographic differences between cemented and uncemented THR were variable and did not seem to correlate with clinical findings.

DISCUSSION

Clinical and functional evaluation

Cemented femoral component provides an immediate postoperative advantage (ie of intimate contact between the prosthesis cement and the bone, which permits dramatic early relief of pain and more weight-bearing). Our review shows that for a short-term outcome, almost all the relevant studies reported superiority of the cemented fixation to the uncemented in terms of pain reduction, thigh pain, hip score, walking with support, gait analysis, etc. Only one study reported equal results at the one-year follow-up.⁵⁶ This was a multi-institutional composition of the cohort, with enrolled cases coming from 12 hospitals and numerous surgeons. Therefore, some variables that could be related to the observed outcomes such as the nature of the prosthetic implant, its design features, the surgeon's skill, and the methods used for introducing the cement fixation were not considered. Therefore, it is very likely that the existing significant difference could not be detected.

Unlike the unanimous conclusions on the short-term outcome, there was divided opinion over

mid- and long-term results. Some thought that the cemented THR had a gradual but discernible diminution in quality over time, and one of the advantages of the cementless fixation was its potential of making a permanent bond with bone.¹⁵ Therefore the difference between these 2 procedures might wane, or even reverse. In our review, equivalence was reported from most of the studies; however, superiority of cemented THR could also be found from studies in all 4 categories in terms of pain,^{23,44} thigh pain,^{4,29,53-55} and overall assessment.^{4,53,55} The mean follow-up period for these studies ranged from 4 to 7.8 years. As to the health-related quality of life, several studies stated that rapid, substantial, and constant improvements could be obtained both from cemented and uncemented THR.^{24,45,46} However, no significant difference was found between the 2 groups at different follow-up periods (2, 4.8, and 6.3 years, respectively). Therefore, we conclude that for the mid-term clinical and functional outcome, the cemented group tends to be equal, if not superior, to the uncemented group.

Radiological evaluation

Our review suggested that radiographic differences were variable and did not seem to correlate with clinical findings. Osteolysis is the leading concern for surgeons performing THR today. However, the incidence of femoral osteolysis seems to be influenced by many factors. In a prospective, consecutive study, Thomason and Lachiewicz⁵¹ found a much higher incidence of femoral osteolysis in the uncemented group in which a first-generation cementless technique was used, compared with the cemented group in which a second-generation cementing technique was used. Also in a retrospective matched-pair study, Goetz et al.¹⁰ found no femoral osteolysis in the cemented group, whereas 29% femoral osteolysis was found in the uncemented group. The authors stated that the reason for the protective effect of the third-generation femoral cementing technique was that the method reduced access of polyethylene debris to the periprosthetic interface. Thus, third-generation cementing of the specific type of femoral stem appeared to protect the femur against osteolysis, compared with fixation without cement, during a mean period of 6 years.

In addition, the material nature of the prosthesis seems to have an effect on the incidence of osteolysis.^{6,24,46} Titanium has a low modulus of elasticity that makes it an attractive metal for femoral hip components. Emerson et al.⁶ directly compared 2 similar titanium stems, one cemented and the other

cementless, controlling the most important surgical variables. The mean radiographic follow-up was 6.7 and 7.0 years. Osteolysis was found in 12.7% of the cemented group and 0% of the cementless group. Cementless titanium stems were more resistant to osteolysis and mechanical failure, compared with similar cemented titanium stems. It was assumed that the mechanical features of titanium that are detrimental to the cement environment seem to have no detrimental effects in the cementless environment and may be beneficial, thus leading to different performance of cemented and uncemented titanium stems.^{3,6}

HO is a common complication of THR. The clinical results of THR deteriorate as severity of ossification increases.³⁰ Several factors have been found to be associated with the prevalence of HO. In our reviews, there were totally 10 papers involved with this issue, 4 of which were designed exclusively for it.^{26,30,34,40} Among these studies, 3 randomised comparative studies showed the same conclusions: namely, there is no significant difference between cemented and uncemented THR with regard to the prevalence of HO.^{16,34,41} The same finding also came from 2 matched pair comparisons^{40,53} and 2 comparative studies in the same patient.^{14,23} However, different findings were reported in 2 non-randomised comparisons.^{26,30,54} Lieberman et al.²⁶ found that the incidence of HO was greater after cemented (22%) compared with uncemented (9%) arthroplasty in patients with osteoarthritis. However, there was no significant difference between the 2 types of prosthesis in hips affected by rheumatoid arthritis. Maloney et al.,³⁰ however, claimed that the use of uncemented femoral components was in some way associated with an increased risk of HO. Although the exact reason for the controversy is unknown, it could be concluded that the type of prosthesis probably has little impact on the incidence of HO, with the study design taking into account.

Study design

A meta-analysis is definitely a better choice because the results of cemented and uncemented femoral components can be compared together as a package. As there were so many different designs (shape and material) found in the selected papers, the influence of these variables (such as implant shape, material, etc) could be evaluated if a meta-analysis was conducted. Unfortunately, the designs of the selected papers did not meet the requirement for a meta-analysis. Under this circumstance, a systematic review seems to be a good and reasonable choice.

In our review, 69% of the studies were prospective and 31% were retrospective. A major advantage of prospective studies is that the cohort is classified in relation to exposure to the factor before the disease develops and cannot be influenced by knowledge that the disease exists, as may be the case for retrospective studies. We divided all the studies into 4 categories according to their study design. Conclusions drawn from studies in different categories seem to be similar, except for one non-matched pair study⁵⁶ which declared equally favourable short-term clinical outcomes between the cemented and uncemented groups. In fact, every study design had certain disadvantages in terms of the comparison of the 2 groups.

Non-randomised comparison (both matched and non-matched pair studies), which is the most frequently used design in our review, is clearly not the ideal design to compare cemented and uncemented THR because many factors may introduce bias and variability into the studies. Four studies compared directly the 2 types of fixation used in the same patient. Theoretically, such comparison is the ideal design because comparison of results in the same patient eliminates variability introduced by differences in sex, age, weight, comorbidity, bone quality, and activity level. Control of these factors allows more meaningful comparison of the impact of fixation on the outcome of THR. However, this study design is practically infeasible for a large clinical trial, because there are few patients who have undergone bilateral THR with and without cement on each side. Furthermore, these 2 procedures may not be performed simultaneously on the same patient. Most importantly, between-sides comparisons cannot be performed on function scores, as a patient's functional status is independent of side.

The randomised clinical trial is considered the gold standard for the design of clinical research. However, the option to perform a randomised clinical trial to assess a surgical intervention is rare. There are several drawbacks with this study design, such as the risk of performance bias between centres of excellence and routine surgery.^{3,17} In addition, a randomised trial is expensive and laborious to perform and has a late feedback because of the demand for long-term follow-up.⁵ Therefore, performance of a randomised clinical trial might be of limited value because the prosthesis used in the randomised clinical trial may have been redesigned even before or soon after the study is completed.²⁸ In addition, strict entry and exclusion criteria lead to a highly selected group of patients who are operated on by a small number of surgeons. Among the

randomised clinical trials in our review, sample size calculation was conducted in only one study.²⁴ A total of 300 subjects was needed to ensure the statistical significance of the results of such a study. However, because of the slower-than-expected recruitment rate, recruitment was stopped when a total of 250 patients had been randomised. Therefore, insignificant differences are likely to result from the small sample size.

Due to the obvious disadvantages of performing randomised studies, there is discussion as to whether randomised trials can be replaced by observational studies such as register studies. National or local arthroplasty registries have been set up in many countries such as Sweden, Finland, Norway, Denmark, Germany, Canada, New Zealand, Australia, England, and many other countries.^{8,12,13,27,38,39,43,48,49} To determine whether randomised trials can be replaced by register studies, Garellick et al.⁹ compared the long-term survival results of a randomised and prospective study of 2 different hip implants with the results of the same implants obtained from the Swedish National Hip Registry. The authors concluded that despite the enormous amount of data, there are drawbacks, and registries can never replace a prospective, randomised trial. Swiontkowski⁵⁰ also prefers prospective clinical trials and hypothesis-driven research to register studies.

CONCLUSION

Apart from clinical and radiological outcomes, there are some other studies comparing the cemented and uncemented THR in terms of cost, complication, revision rate, etc.^{1,7,20,25,35,37,42,52} Although there are some

limitations in the selected studies, some conclusions can be drawn from this review.

It is almost certain that better short-term clinical and functional outcomes can be obtained from cemented femoral fixation than those from the uncemented. It is still unclear for the mid-term clinical and functional outcome. At least, the cemented group is equal, if not superior, to the uncemented group.

Radiographic differences are variable and do not seem to correlate with clinical findings. Different cement or cementless technique and nature of the prosthesis may associate with the incidence of osteolysis. There appears to be no difference in the incidence of HO between cemented and uncemented THR.

Of all the selected studies, none has a mean follow-up period of more than 10 years. Furthermore, there are some disadvantages in the study designs used. Therefore, it is hard to say which prosthesis is superior to the other from these studies. However, cemented fixation should be recommended if the short- and mid-term clinical and functional outcomes are considered.

It is recommended that randomised trials should be combined with other designs, such as large cohort studies and registries, which can document long-term durability and safety as well as the performance of the prosthesis.²⁴ For such a study, several considerations should be taken. As a multi-centred study, some variables should be controlled for each institution, such as the nature of the prosthesis implant, the surgical approach, the surgeon's skill, etc. More importantly, the methods used to introduce the cement fixation should be considered. In our review, different methods were used in different studies, thus making this comparison difficult.

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