Cemented total hip replacement in patients under 55 years

Good results in 104 hips followed up for ≥ 22 years

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Background and purpose — About 86,000 total hip replacements (THR) have been registered in patients under 55 years in the National Joint Registry of England and Wales (NJR). The use of uncemented implants has increased, despite their outcomes not having been proven to be significantly better than cemented implants in this registry. We determined the implant survivorship and functional outcomes of cemented THR in patients under 55 years at a minimum follow-up of 22 years.

Patients and methods — 104 hips in 100 patients were included in this prospective study. Functional outcome was assessed using the Harris Hip Score and radiographs were assessed for implant failure and "at risk" of failure. Kaplan–Meier survivorship analysis was performed.

Results — 89% of hips showed good to excellent results at final follow-up with a mean Harris Hip Score of 88 at a mean follow-up of 25 years. Revision was performed in 3/104 hips. 14 acetabular components and 4 femoral components were "at risk" of failure. The survivorship at minimum 22 years with revision for any reason as the end-point was 97% (95% CI 95–98).

Interpretation — Cemented hip replacements perform well in young patients with good long-term functional and radiographic outcomes.

There has been a constant debate regarding the use of uncemented vs. cemented implants in total hip replacement (THR). Although meta-analyses have reported no substantial difference in patient satisfaction, functional, or radiological outcome, there has been an increasing use of uncemented implants, especially in patients under 55 years of age, according to the National Joint Registry (NJR) report 2015 (Abdulkarim et al. 2013, NJR report 2015). The NJR has recorded about 86,000 THRs in patients under 55 years from the time of its inception in 2003. The most common cemented implant used in our database was the Charnley stem/Ogee cup (Wrightington, UK). The long-term outcomes of Charnley total hip replacement (THR) in the elderly are well established (Neumann et al. 1994, Sochart and Porter 1997a, Sochart and Porter 1997b, Callaghan et al. 2000, Wroblewski et al. 2009). The primary aim of our study was to determine the implant survivorship and functional outcome of a cohort of cemented total hip replacements in patients under 55 years at a minimum follow-up of 22 years.

Patients and methods

All patients under the age of 55 undergoing primary cemented THR between January 1990 and December 1995 were reviewed from our audit database. All uncemented and hybrid THRs and patient who were over 55 years were excluded. 71 Bicontact/Plasmacup uncemented THRs and 122 Exeter/Trident hybrid THRs performed during the same period were excluded. Charnley/Ogee THR had been performed in 112 hips. 5 patients died and 3 patients were lost to follow-up leaving 104 hips in 100 patients for this analysis. The mean age of the patients was 48 (16–55) years. The mean follow-up was 25 (22–27) years. Demographic, clinical, and radiological follow-up data were recorded. All the surgeries were performed by 5 consultant orthopedic surgeons using the classic Charnley trochanteric approach in a supine position. Palacos bone cement (Zimmer Biomet, Warsaw, IN, USA) with gentamycin was used with modern techniques like retrograde cementation, and adequate femoral and acetabular preparation using lavage systems were used.

The patients were reviewed postoperatively at 6 weeks, 3 months, 6 months, and 1 year by the surgeons. Subsequent

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Table 1. Demographic data

Sex (M/F), n	56/44
BMI, mean (SD)	26.8 (4.8)
Normal, n	49
Overweight, n	32
Obese, n	14
Very obese, n	5
Bilateral THR	4

Table 2. Preoperative diagnosis

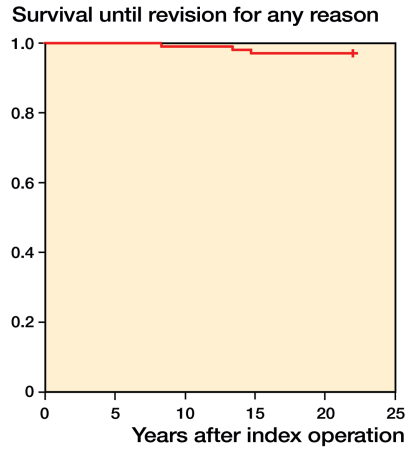
Diagnosis	Number of patients
Osteoarthritis	60
Rheumatoid arthritis	9
Avascular necrosis	6
DDH	21
Ankylosing spondylitis	2
Fracture neck femur	2
Total	100

Table 3. Harris Hip Score and pain profile

Score	Pre-op	1 year	5 years	10 years	15 years	Final
HHS, mean (SD)	47 (12)	92 (7)	92 (8)	90 (11)	90 (10)	88 (9)
No pain, n	0	97	93	90	89	86
Mild, n	1	3	7	8	9	11
Moderate, n	50	0	0	2	2	2
Severe, n	45	0	0	0	0	1
Very severe, n	4	0	0	0	0	0

Table 4. Complications in 104 hips

Complication	Number
Dislocation	3
Peroperative femoral fracture	2
Deep infection	1
Superficial infection	1
Aseptic loosening of acetabulum	1



Kaplan–Meier survival curve.

reviews were at 3, 5, 10 years and every 4 to 5 years after that in the local arthroplasty audit clinic where the data were recorded by independent audit specialist practitioners. Harris Hip Score (HHS) was used as a measure of functional outcome and a score less than 70 was considered as a failure. The pain profile was recorded using a visual analog scale (VAS). Radiographs were taken at every follow-up. All the radiographs were analyzed for signs of implant failure, wear, loosening, heterotopic ossification, and fractures by 2 blinded observers, senior fellows with a specialist interest in hip surgery. Femoral loosening was defined by Harris classification as definite, probable, and possible (Harris et al. 1982). Progressive radiolucent lines in 2 or more Charnley DeLee zones were considered signs of loosening in the acetabulum (DeLee and Charnley 1976). Definite implant position change or migration and eccentric wear of the cup were also considered signs of implant failure. Brooker's classification was used for heterotopic ossification (Brooker et al. 1973).

Statistics

The data were statistically analyzed using the Statistical Package for Social Sciences (SPSS) software version 20.0 (IBM Corp, Armonk, NY, USA). Statistical differences in functional outcome were assessed by using Student's t-test for independent samples. Paired t-test was used to analyze improvement post- surgery. The Kaplan–Meier method was used to determine survivorship of the implant with revision for any reason as the end point; $p < 0.05$ was used as a measure of statistical significance.

Ethics, funding, and potential conflicts of interests

The study received Caldicott Guardian ethical approval. There were no external sources of funding and none of the authors had any conflicts of interest.

Results

The demographic data and preoperative diagnoses are given in Table 1 and 2. The mean HHS of the 104 hips at final follow-up was 88. On the basis of the HHS, the functional outcome was good to excellent results at final follow-up in 89% hips. BMI did not statistically significantly influence the final outcome ($p = 0.09$). There was a significant improvement in pain after surgery ($p < 0.001$), which was maintained at final follow-up (Table 3,).

The most common complication was dislocation, occurring in 3 hips (Table 4). Revision surgery was performed in 3 hips. 1 hip was revised for aseptic loosening of the acetabular component at 15 years. The second hip underwent a 2-stage revision for deep hematogenous infection at 13 years. The third hip was revised for recurrent dislocation at 8 years. Radiographic analysis at final follow-up showed "at risk" signs of radiological loosening in 14 acetabular components and 4 femoral components. With revision surgery for any reason as the end-point, the THR survivorship at final follow-up using the Kaplan–Meier method was 97% (95% CI 95–98) (Figure). If we included the patients "at risk" of revision, the survivorship reduced to 82% (95% CI 79–85).

Discussion

Over 700,000 total hip replacement operations have been reported to the National Joint Registry of England and Wales in the last 13 years, of which almost 86,000 have been performed in patients under 55 years (NJR 2015). The management of hip problems in these younger patients is challenging. Cemented, uncemented, hybrid THR, reverse hybrid, and hip resurfacing have been performed in these patients. The NJR report shows an increase in uncemented THR in this age group. This trend has also been seen in the Swedish, Norway, and New Zealand Joint Registries. In contrast, the use of hip resurfacing has reduced substantially since the recognition of problems with metal-on-metal bearings (NJR 2015).

Cemented THR has been performed in the management of a wide range of pathologies in the young, namely osteoarthritis, rheumatoid arthritis, developmental dysplasia of the hip, avascular necrosis, ankylosing spondylosis, and juvenile idiopathic arthritis (Joshi et al. 1993, Sochart and Porter 1997b, Lehtimäki et al. 1997, Wroblewski et al. 2010). The mean HHS and number of patients with good to excellent results in our study is comparable with other series from specialist centers or teaching hospitals with long-term follow-up (Lehtimäki et al. 1997, Goodman et al. 2014). A majority of our patients were pain free with a well-functioning hip at final follow-up.

In concurrence with other series, dislocation was our most common complication (Joshi et al. 1993). However, our rate of deep infection (0.9%) was less than other series with long-term follow-up, with rates of 1.2% to 8% (Wroblewski et al. 2009, Warth et al. 2014). The use of strict aseptic technique and antibiotic-loaded cement may have contributed to the low infection rate. Aseptic loosening has been reported to be one of the leading causes of failure and revision in this age group. Good cementing technique is essential. Early studies of cemented THR have reported low revision rates in patients followed up for less than 5 years (Halley and Charnley 1975, Bisla et al. 1976). Subsequently, higher rates of revision ranging from 12% to 37% at 15- to 20-year follow-up were reported (Joshi et al. 1993, Boeree and Bannister 1993, Caton and Prudhon 2011, Warth et al. 2014). Various authors have stressed on the importance of long-term follow-up as aseptic loosening is progressive (Eftekhar 1987, Wroblewski et al. 1992, Keener et al. 2003). Based on our number of revisions and number of cases "at risk," we agree with these studies and suggest that regular long-term clinical and radiographic review should be standard practice. Although our revision rate of 3% was lower than the rates reported in other studies using cemented implants at 20 years, the number of hips radiographically "at risk" suggest that further follow-up might result in higher revision rates as seen in other series with longer follow-up.

The Get it Right First Time (GIRFT) report by the British Orthopaedic Association (BOA) recognized the need to standardize the use of total hip replacement implants in the National Health Service with a move towards cemented implants (Briggs 2012). Additionally, transparency in the pricing of hip implants has been highlighted (Pennington et al. 2013, Briggs 2015). The GIRFT report found that the cost of uncemented implants was almost double that of the cemented implants. Similar results were found in the United States (Unnanuntana et al. 2009). The Swedish Joint Registry did not show any clear advantage of hybrid implants and the use of hip resurfacing has seen a steady decline in all registries since problems with metal-on-metal bearings have been recognized.

The strength of our series is the prospective nature with complete long-term functional and radiological follow-up in a cohort of young patients using a single cemented hip implant. A relative weakness is the varied diagnoses included, which mirrors the variety of pathology in this age group that require THR. Additionally, the choice of implant was based on surgeon preference and training and the experience of the surgeon in using a particular implant may influence the final outcome. Our series provides evidence for the utility of established cemented hip implants, which may be used in also in young adults.

MK, LJ, SS, and AJ conceived and designed the protocol. LJ and SS collected the data. MK, LJ, and GM analyzed the data and performed statistical analysis. MK and AJ drafted the manuscript. LJ, SS, and GM proof-read the manuscript.

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