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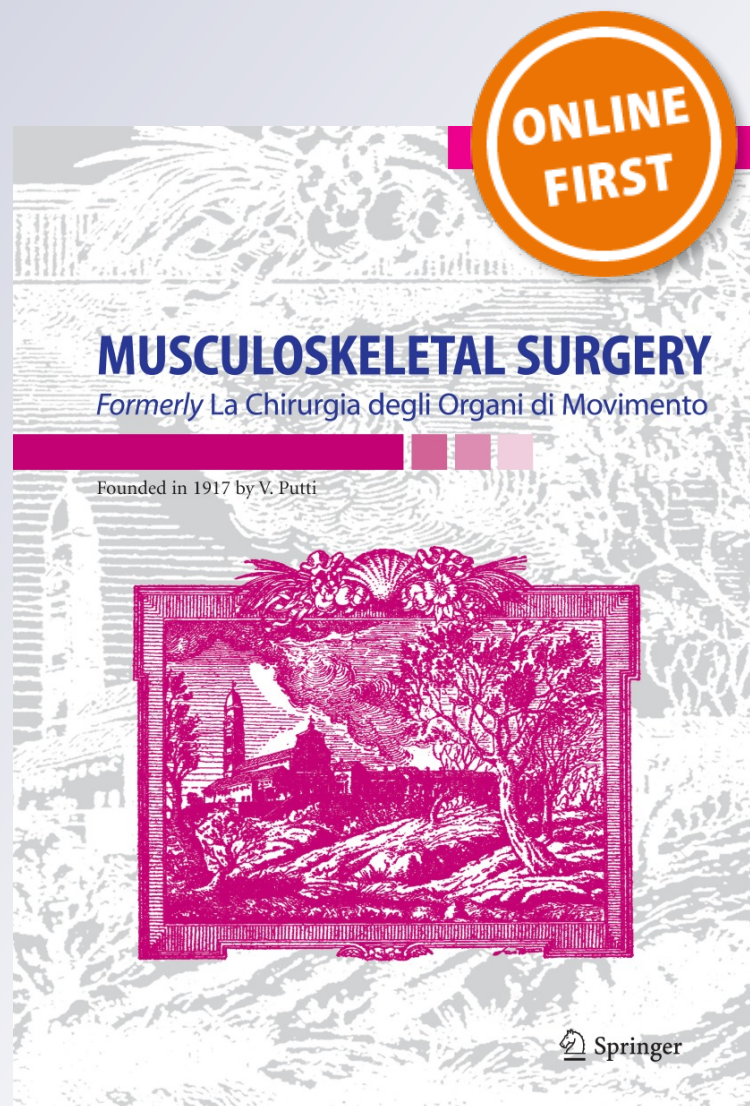
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# Cemented or cementless THA in patients over 80 years with fracture neck of femur: a prospective comparative trial

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## Abstract

**Background** Total hip arthroplasty is associated with a better long term outcome and lesser reoperation rates in the elderly but the risk of complications are believed to be higher in very elderly patients. The study aims to compare the short-term results of cemented and cementless total hip arthroplasty (THA) in active patients >80 years of age with femoral neck fractures.

**Methods** Sixty-two consecutive patients underwent THA during the study period (cemented—31 and cementless—31). The mean age was 84 years (81–94 years). Patients in both groups were comparable in their preoperative variables. Functional and radiological assessments were carried out using validated outcome measures. Complications were recorded.

**Results** Fifty-one patients were available for final analysis after accounting for deaths and cases lost in follow-up. Of the 51 patients, 25 (49 %) regained their pre-injury mobility status and 36 (70 %) were community ambulant. Cementless THA was associated with significantly less surgical time, blood loss, transfusion rates and hospital stay. The overall mortality rates, complications, functional and radiological results were similar in both groups though

the number of deaths in the perioperative period was significantly high in patients undergoing cemented THA.

**Conclusion** Satisfactory improvement in function with low reoperation rates can be achieved irrespective of the technique used. Complication rates are higher when compared to younger patients undergoing the procedure. Risks and benefits should be carefully assessed and explained before subjecting these patients to THA.

**Keywords** Total hip arthroplasty · Cemented · Cementless · Octogenarian · Neck of femur fractures

## Introduction

Femoral neck fractures in the elderly are on the rise because of the increasing life span and osteoporosis. Prosthetic replacement is widely preferred over internal fixation because of the higher complications and reoperation rates with internal fixation [1]. Hemiarthroplasty may provide satisfactory short-term outcomes in an elderly low-demand individual, but the success rates with hemiarthroplasty deteriorate over time and may not be appropriate for an active community ambulant elderly patient [2]. Total hip arthroplasty (THA) has been shown to produce better short- and midterm results in active elderly patients compared to hemiarthroplasty. Better function and low reoperation rates have been shown with THA in few of the randomized trials [3–5]. Cemented THA is considered gold standard, but the number of cementless THAs has been increased worldwide in view of better long-term outcomes [6, 7]. Though THA provides excellent functional results, the incidence of general- and surgery-related complications have been reported to be higher in elderly patients undergoing THA for femoral neck fractures. With this

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The study may be attributed to Department of Joint Reconstructive Surgery, Parvathy Hospital, Chennai, India.

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background, we conducted a prospective nonrandomized analysis of 2 groups of patients over the age of 80 years undergoing cemented or cementless THA for femoral neck fractures at our institution.

## Patients and methods

Community ambulant patients >80 years with an acute intracapsular fracture neck of femur with preoperative ASA grades 1 and 2 were included in the study. Pathological fractures and extracapsular neck fractures were excluded. Sixty-two patients satisfying the inclusion criteria underwent THA at our institution within the stipulated study period from March 2006–January 2009. Patients were alternatively allotted into 2 groups, and the data were prospectively collected and analysed. Group 1—31 patients had a cemented prosthesis and group 2—31 patients had a cementless prosthesis. The institution review board approved the study, and informed consent was obtained after explaining expected outcome and complications. Associated medical co-morbidities were present in 31 patients. Preoperative baseline data are listed in Table 1.

Anterolateral approach was used in all patients. The prosthesis used was C-stem with OGEE cup, (DepuySynthes—India) in group 1. Duraloc shell with a collarless Corail or Summit stem (DepuySynthes—India) was used in group 2. Standard techniques recommended by the manufacturer were used in preparation of femur and acetabular surfaces. Second-generation cementing techniques were used in group 1. Acetabular fixation was always augmented with screws in group 2. The articulation was 28-mm metal head on polyethylene in both groups. Weight bearing as tolerated was allowed from 2nd day if there were no intraoperative complications. Low-molecular-weight heparin was used for 7 days beginning on the 1st post-operative day to protect against venous thromboembolism. Patients were discharged when they walk confidently with support and can independently perform toilet activities.

Radiographic evaluation was done as per the protocol recommended by Johnston et al. [8]. Aseptic loosening,

component position and migration, stem subsidence, osteolysis and presence of stress shielding or cortical hypertrophy were recorded. Ectopic ossification was graded according to Brooker et al. Functional outcome was assessed using the Harris hip score.

## Statistical analysis

Categorical variables are presented as proportions and analysed using chi-square or Fisher's exact test. Continuous numeric variables are expressed as means and standard deviation and were analysed using the independent samples *t* test. Difference was considered significant if  $P < 0.05$ .

## Results (Tables 1, 2, 3)

Both groups were matched in age, gender, pre-op haemoglobin, co-morbidities and preoperative ASA grades (Table 1). The mean surgical time, blood loss, post-operative blood transfusion and the mean hospital stay were significantly higher in group 1 (Table 2). Non fatal systemic complications were seen in 11 patients (18 %), 7 in group 1 and 4 in group 2 (Table 3) in the perioperative period ( $P = 0.31$ ). Nine patients (14.5 %) had died, 3 in the perioperative period (all in group 1), including 1 patient who died during the process of cementing. Further, 6 patients died during the first year and 2 patients had migrated accounting for total loss of 11 patients. The number of patients died in the perioperative period was high in group 1 ( $P = 0.07$ ), though not statistically significant it may suggest a trend towards it. The overall 1-year mortality rates were similar between two groups ( $P = 0.27$ ). Remaining 51 patients, 24—group 1 and 27—group 2, were available for final follow-up. The mean follow-up of 51 evaluable patients was 35 months (24–46 months).

Twenty-five of the 51 (49 %) patients returned to their pre-injury status (group 1—11 and group 2—14), and 11 (group 1—5, group 2—6) were community ambulant with assistive devices (Table 2). Fifteen patients (group 1—8, group 2—7) were restricted to activities within home. There were no incidences of thigh pain. Trendelenberg sign was present in 23 patients. The mean Harris hip score was  $75 \pm 12.13$  at final follow-up. The score was graded as excellent in 3, good in 22, fair in 13 and poor in 13 patients. The functional results were similar in both groups.

The mean acetabular inclination was  $42^\circ$  ( $32^\circ$ – $59^\circ$ ). Fifty of the 62 stems were inserted in anatomical position. Eight stems were in varus, and 4 were in valgus. No change in component position or migration was noted at last follow-up. Radiological evidence of cemented acetabular component loosening was seen in 1 patient at 3 years and was revised with cementless revision component. Grade I

**Table 1** Patient data

Pre-op variables	Gr I (31 patients)—cemented THA	Gr II (31 patients)—cementless THA	<i>P</i> value
Age	84.2 ± 3.2	84 ± 2.9	0.77
Sex (M:F)	15:16	17:14	0.61
Haemoglobin	10.4 ± 1.7	11.0 ± 1.9	0.7
ASA grade	I—17, II—14	I—16, II—15	0.79
Co-morbidities	14	17	0.44



**Table 2** Results

	Gr I (31 patients)— cemented THA	Gr II (31 patients)— cementless THA	<i>P</i> value
Surgical time (min)	94.6 ± 1.6	60.4 ± 2.3	<b>0.00</b>
Blood loss (ml)	490 ± 15.6	420 ± 13	<b>0.02</b>
Transfusion [no. (%)]	20 (71)	15 (44)	<b>0.03</b>
Hospital stay (days)	13.3 ± 2.13	10.4 ± 0.7	<b>0.0464</b>
Deaths [no. (%)]			
Acute (before discharge)	3 (9.6)	NIL	0.07
Overall 1-year mortality	6 (19)	3 (9.6)	0.27
Harris hip score	74.1 ± 12.6	75.7 ± 11.8	0.62
Return to pre-injury status			
Community ambulant (without aids)	11/24 (46 %)	14/27 (51 %)	0.57
Deterioration in function			
Community ambulant (with aids)	5 (21 %)	6 (22 %)	0.9
Restricted to household	8 (33 %)	7 (26 %)	0.82

Bold values indicate a statistically significant difference in the parameters compared between the two groups ( $P < 0.05$ )

**Table 3** Complications

	Gr I—cemented THA 31 patients	Gr II—cementless THA 31 patients	<i>P</i> value
Technique related			
Intra-op fractures	1 (3.2 %)	3 (9.6 %)	0.3
Dislocations	1 (3.2 %)	2 (6.4 %)	0.55
Aseptic loosening	1 (4 %)	0	0.28
Abductor dysfunction	11 (46 %)	12 (44.5 %)	0.76
Ectopic ossification	1 (4 %)	0	0.28
Systemic	7 (22.5 %)	4 (12.9 %)	0.31
Deep vein thrombosis	1	1	
Pulmonary embolism	1	0	
Acute renal failure	1	1	
Silent MI	1	0	
Cardiac ischaemia	2	1	
Pulmonary infection	1	1	

stress shielding was seen in 2 patients with cementless stem. No osteolysis or stem subsidence (>5 mm) was seen at last follow-up apart from the early fracture related subsidence in a patient with a cementless stem. The stem

revision in this patient done on the 6th post-operative day was not considered as a failure of the stem in the follow-up analysis as it was due to an unidentified intraoperative calcar fracture. The overall survivorship with radiological loosening or revision as the end point was 100 % in cementless group and 96 % in the cemented group. Grade 3 ectopic ossification was seen in 1 patient with cemented prosthesis.

Intraoperative calcar fractures were seen in 4 patients, group 1—1, group 2—3. Anterior dislocation was seen in 3 patients, group 1—1, group 2—2 all within 3 weeks. Two of the 3 hips had settled with closed reduction and immobilisation for 3 weeks followed by supervised rehabilitation, while 1 patient with a subsided cementless stem underwent stem revision in the immediate post-operative period. No deep infection was observed. Procedure-related complications failed to show statistical difference between the two groups.

## Discussion

Total hip arthroplasty has been reported to produce good short-term functional results even in a very elderly population [9]. In the current study, almost half the patients regained their pre-injury status and continued to be independently mobile at last follow-up. More than 2/3 of the patients were community ambulant with or without aids. This shows that a good functional outcome can be expected in the majority of these elderly patients undergoing THA. The functional outcome and survivorship were similar in both groups.

The mortality rate, 4.8 % in perioperative period, 14.5 % in the first year, and complication rates reported in the current study are much higher when compared with the rates reported in patients <80 years [10]. The incidence of deaths in the perioperative period was significantly higher in patients undergoing cemented arthroplasty that may be explained by embolic phenomenon during cement pressurisation and the direct cardiotoxic effects [11] of the bone cement. Though the results with respect to systemic complications and the overall 1 year mortality failed to show a statistical difference, which we attribute to the small sample size, the trend indicates lower systemic complication rates with cementless arthroplasty.

Higher dislocation rates have been reported in elderly and patients with femoral neck fractures undergoing THA. Meta-analysis by Iorio et al. [12] revealed 5 times higher dislocation rate following THA for neck of femur fractures compared with other indications. The dislocation rate in the current study was 4.8 % against the reported rates of around 3 % in younger patients with arthritic hips. The anterolateral approach was used in the study in an effort to

minimise dislocation rates. The posterior approach is reported to produce 2–3 times higher dislocation rates in this class of patients [13]. A high degree of abductor dysfunction (45 %) was found in the current study mainly attributed to the surgical approach. Higher incidence of post-operative fatty atrophy of the abductors has been previously described following THA. The incidence has been shown to be especially profound in elderly patients undergoing THA [14].

Satisfactory short-term functional outcome can be expected with THA in the majority of patients with low reoperation rates irrespective of chronological age and the type of prosthesis used. The incidence of heterotopic ossification seen in the current study was also relatively low compared with previously published results [15].

The mortality rates and the perioperative surgery-related morbidity is considerably higher compared to patients <80 years [10, 16], and the risk should be well explained. Cementless THA seems to be associated with lesser systemic effects in the perioperative period, but larger comparative studies are required to validate this argument. The study has its drawbacks: patients were not randomized and small sample size and follow-up were short. However, long-term outcomes in these patients are difficult to measure because of a higher attrition rate.

**Conflict of interest** None.

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