



E-ISSN: 2395-1958
P-ISSN: 2706-6630
IJOS 2022; 8(2): 10-12
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www.orthopaper.com
Received: 07-02-2021
Accepted: 09-03-2021

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Cemented versus uncemented hemiarthroplasty of the hip for displaced neck of femur fractures: A prospective comparative study

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DOI: <https://doi.org/10.22271/ortho.2022.v8.i2a.3109>

Abstract

Objective: To prospectively compare the functional outcome associated with cemented and uncemented hemiarthroplasty of the hip.

Patients: All individuals designated for hemiarthroplasty, older than 55 years, with a displaced femoral neck fracture and the ability to walk prior to injury (48 patients) presented with a displaced femoral neck fracture.

Materials and Methods: Hip hemiarthroplasty with a cemented femoral component or an uncemented component is done.

Observations: Harris Hip Score was used to objectively measure functional outcomes.

Results: No statistically significant differences were present in the groups' preoperative or intraoperative characteristics, like ASA grade, operative time, anesthesia time, estimated blood loss. No difference was found in haemoglobin level or acute complication rate postoperatively. At 30-day, 60-day, and 1-year follow-ups, no clinically or statistically significant differences were found in mortality, complication rate including infections, and change in Daly.

Conclusions: In treating femoral neck fractures, cemented and uncemented femoral components are associated with similar functional outcomes at 1 year. Neither of the treatment modalities has a statistically significant advantage over the other. Either can be chosen according to the surgeon's preference, implant availability and affordability, and familiarity with the technique.

Keywords: Cemented versus uncemented hemiarthroplasty, hip, displaced neck, femur fractures

1. Introduction

The neck of the femur is the most common site of a hip fracture. Its incidence sharply increases with an increase in age beyond 50. Hemiarthroplasty of the hip is the most common and preferred treatment for displaced fractures of the femoral neck in the elderly. Hemiarthroplasty of the hip has been associated with better functional outcomes^[1, 2].

Currently, hemiarthroplasty done for the neck of femur fracture favours the use of cemented femoral stem, particularly in the geriatric age group, due to the presence of osteoporotic bone. This technique reduces the risk of intraoperative fractures and also permits early weight-bearing post op^[3, 4] However, its benefits are to be weighed against the risk of sudden cardiopulmonary collapse associated with cementing^[5]. For this reason, uncemented femoral stems offer the surgeon an alternative, especially in morbid patients.

Multiple trials have been conducted by various groups aiming to compare and look for statistically significant differences in outcomes of cemented versus uncemented hemiarthroplasty, but no conclusive evidence has been found proving the supremacy of one method over the other. In 2006, a meta-analysis concluded that the evidence was too limited to recommend a cemented or an uncemented hemiarthroplasty. Recently, a randomized trial demonstrated equivalent functional outcomes, complication rates, and mortality between the 2 methods^[6].

This investigation compared the morbidity, mortality, and functional outcomes associated with cemented and uncemented hemiarthroplasty. Our study also concluded that there is no significant difference in functional outcomes or patient satisfaction among either of the two methods.

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Patients and Methods

Study Design

The Institutional Ethics Committee granted approval for the approved study performed at a government hospital. All individuals older than 55 years who presented to the emergency room with a displaced femoral neck fracture were evaluated during our study period. Patients with fractures scheduled for hemiarthroplasty by the attending orthopedic surgeon were recruited for potential participation from these cases. Patients who fulfilled inclusion criteria and consented were randomized to cemented or uncemented hemiarthroplasty.

Inclusion Criteria

Eligible patients were those with a nonpathologic displaced subcapital femoral neck fracture that was scheduled for surgical reconstruction with a hemiarthroplasty by the attending surgeon and were older than 55 years. Patients must have been able to ambulate 10 feet before the presentation.

Exclusion Criteria

Patients were excluded from the study if they were unable to walk 10 feet before hip fracture, had suffered multiple extremity trauma, had a pathologic fracture of the hip (including malignancy), had a clinically recognized acute myocardial infarction (MI) within 30 days before enrolment, or had symptoms associated with anaemia or preexisting metabolic bone disease.

Randomization

Once informed consent was obtained, the patients were randomized to hemiarthroplasty with a cemented femoral prosthesis or an uncemented component.

Operative Technique

All operative procedures were performed by the attending orthopedic surgeon with the assistance of the house staff. Before induction, the patient's randomization assignment (cemented or uncemented) was known to the anesthesia team. Once anesthetized, the patient was placed in the lateral decubitus position, and a standard posterolateral approach (Southern Moore) was used.

The hemiarthroplasty was completed using the assigned component (cemented or uncemented) in accordance with the standard technique. All patients received a unipolar head. For the cemented femoral prosthesis in addition to the size of the implants, the neck length was modifiable. The uncemented prosthesis allowed for standard or large metaphyseal sizing, standard or extended offset, and adjustments in neck length. Whenever possible, the hip capsule was reapproximated. Postoperatively, all patients were allowed to weight bear to tolerance on the operative extremity.

Outcome Measures

All patients were evaluated at the 1-year post-op stage to measure Harris Hip Score as a functional outcome measure. The patients' satisfaction level was measured and compared among the two groups. Patients were also asked about fatigue, level of energy, and self-efficiency.

The assessment was also made regarding mortality in the hospital, within 30 days, 60 days and at 1 year stage as well as any other complication post-op. Postoperative haemoglobin levels were also measured. We also measured outcomes such as dislocation, wound complication, thromboembolism and other such post-op complications among the two groups.

Statistical Methods

All independent variables [mortality (in hospital, 30 days, 60 days, and 1 year), diagnosed MI or elevated troponin, and functional test of walking without assistance) were cross-tabulated for cemented and uncemented groups and analyzed with χ^2 test of proportions.

Results

Over 8 months, 56 patients with displaced femoral neck fractures were treated with a hemiarthroplasty at our institution. Of these, 2 patients (3.57%) received a total hip arthroplasty.

Of the remaining 54 patients, 44 patients (81.48%) who were able to ambulate 10 feet at baseline elected to participate in the study.

The average age of enrolled participants was 74 years (range, 55–100 years), with 66.33% women, and an average body mass index of 26.8 (15.9–37.6). Before admission, 78.5% lived at home. There were no significant differences in the demographic features or baseline characteristics of the 2 treatment groups.

Of the 44 patients, 21 patients received an uncemented hemiarthroplasty, and 23 patients were randomized to the cemented arm. The average anesthesia and operative times were 161 and 98 minutes, respectively. The average estimated blood loss was 244 mL; 100% of patients received perioperative antibiotics (100% cefotaxime). There were no intraop fractures. In comparing the surgery-related characteristics of the 2 study groups, no statistically significant differences were identified.

At admission, the average haemoglobin level was 10.9 g/dL (SD, 1.6), and the average preoperative level was 11.4 g/dL (SD, 1.5). Before discharge, all participants had average haemoglobin of 10.4 g/dL (SD, 1.1). A blood transfusion was performed before surgery in 5 patients (11.36%), during surgery in 8 patients (18.18%), and after surgery in 6 individuals (13.63%). No significant difference was identified in haemoglobin levels or transfusion rates between the 2 groups.

No difference in acute complications was found between the cemented and uncemented groups. Seven patients (15.90%) experienced an acute complication: 4 patients (9.09%) were transferred to the intensive care unit, 2 wound infections (4.54%), and 1 reoperation (2.27%). There were no cerebral vascular accidents (0%), no cases of major hemorrhage (0%), and no thromboembolic events (0%).

There were no deaths during the hospitalization (0%), and 1 patient was deceased within 30 days of surgery (2.27%). By 60 days, 2 patients had died (4.54%) and 5 patients were deceased at 1 year (11.36%). There was no statistically significant difference in 30-day, 60-day, and 1-year mortality between the 2 groups.

The cemented and uncemented groups had no statistically significant difference in functional outcomes measured using the Harris hip score. Patient satisfaction was also similar between the two groups at 30-day, 60-day and 1 year follow up.

Discussion

Hemiarthroplasty is the preferred treatment for displaced femoral neck fractures in the elderly. Little evidence exists comparing cemented and uncemented implants for hemiarthroplasty. This prospective randomized trial compared the 1-year outcomes of an uncemented and a cemented implant in terms of function, morbidity, and mortality.

At 1-year follow-up, the functional results of cemented and uncemented hemiarthroplasty were comparable. At 30-day, 60-day, and 1-year follow-ups, patients in both groups achieved a similar level of function and satisfaction level. Additionally, the rate of adverse perioperative events was similar in the 2 groups.

In this investigation, the cemented prosthesis provided stable early fixation with good functional outcomes at 1-year follow-up. No catastrophic complications were associated with the use of cement or with its application (no intraoperative cardiopulmonary collapse). Similarly, no difference was found in either the anesthesia or operative times.

The strengths of this investigation are a product of the study design. Potential confounding factors are evenly distributed between the groups as a prospective randomized controlled trial. The success of the randomization is evidenced by the similar baseline characteristics of the enrolled patients. It was not possible to blind the surgical or anaesthesia staff as a surgical intervention.

One variable that was not controlled in the study design was the type of anaesthesia (general or spinal). Before induction, the anaesthesia staff was aware of the patient's group assignment (uncemented or cemented) and allowed them to independently choose their anesthetic agents.

As a limitation, because a single surgeon did not perform this series, the effect of multiple surgeons on the enrolled population cannot be fully understood. Although this study design should produce an externally valid data set (generalizable), the contributions of different practices may confound the results. This effect may account for the equivalent operative and anesthesia times and may also speak to the estimated blood loss as a function of surgical duration rather than the type of prosthesis.

Because no difference was found between the 2 groups, no difference likely exists between uncemented and cemented hemiarthroplasty. A type II error cannot be excluded, however, in a similar investigation of functional outcomes after hemiarthroplasty. Figved *et al.* 6 addressed the issue of sample size using an equivalence criterion and the Harris Hip Score.

In this prospective randomized trial comparing cemented and uncemented hemiarthroplasty for displaced femoral neck fractures, the outcomes demonstrate comparable morbidity, mortality, and functional recovery. These equally good results afford orthopaedic surgeons a guide in selecting their treatment of displaced femoral neck fractures.

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