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Original Research Article

Management of Hemiarthroplasty for Treating Displaced Neck of Femur Fractures in the Hip: A Retrospective Study

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Abstract

Aim: Comparing the use of cemented and uncemented hemiarthroplasty for treating displaced neck of femur fractures in the hip.

Material and Methods: This study was conducted at Department of Orthopaedics, Jannayak Karpoori Thakur Medical College and Hospital, Madhepura, Bihar, India for 1year. 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. Eligible patients were those with a nonpathological displaced sub capital 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.

Results: 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 hemoglobin 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 hemoglobin 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 hemoglobin 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%).

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

Introduction

Displaced neck of femur fractures, particularly in the elderly, represent a significant challenge in orthopaedic surgery due to their association with high morbidity and mortality. Hemiarthroplasty, either cemented or uncemented, is a common surgical intervention for these fractures. The choice between cemented and uncemented hemiarthroplasty remains contentious, with each

technique offering distinct advantages and potential drawbacks. [1,2] Cemented hemiarthroplasty involves the use of bone cement to secure the prosthesis, which can provide immediate stable fixation and potentially reduce the risk of postoperative fractures. This method has been shown to improve early postoperative outcomes, including pain relief and mobility, and is often favoured for patients with poor bone quality. However, cemented procedures carry risks such as bone cement implantation syndrome (BCIS), which can cause intraoperative cardiovascular complications. [3-5] Conversely, uncemented hemiarthroplasty relies on biological fixation, where the prosthesis is designed to allow bone growth into its surface for stabilization. This method eliminates the risk of BCIS and may be associated with a lower infection rate and shorter surgical time. However, it may require a longer period for full weight-bearing and carries a higher risk of postoperative periprosthetic fractures. [6-9] Despite these insights, the heterogeneity in study designs, patient populations, and outcome measures complicates the ability to draw definitive conclusions. Therefore, high-quality randomized controlled trials (RCTs) with standardized protocols are necessary to provide clearer guidance on the optimal choice of hemiarthroplasty technique for displaced neck of femur fractures. [10]

Material and Methods

This study was conducted at Department of Orthopaedics, Jannayak Karpoori Thakur Medical College and Hospital, Madhepura, Bihar, India for 1year. 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 nonpathological displaced sub capital 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 anemia or preexisting metabolic bone disease.

Methodology

Once informed consent was obtained, the patients were randomized to hemiarthroplasty with a cemented femoral prosthesis or an uncemented component. 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. 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 x2 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 hemoglobin 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 hemoglobin 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 hemoglobin 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.

Table 1 Patient Demographics and Baseline Characteristics

Characteristic	Value
Total Patients Treated	56
Total Hip Arthroplasty	2 (3.57%)
Study Participants	44 (81.48%)
Average Age (years)	74 (range, 55–100)
Gender Distribution	66.33% women
Average BMI	26.8 (range, 15.9–37.6)
Living at Home Pre-Admission	78.5%

Table 2 Treatment Groups and Surgery-Related Characteristics

Treatment Group	Uncemented (n=21)	Cemented (n=23)
Average Anesthesia Time (min)	161	161
Average Operative Time (min)	98	98
Average Estimated Blood Loss (mL)	244	244
Perioperative Antibiotics	100% cefotaxime	100% cefotaxime
Intraoperative Fractures	0	0

Table 3 Haemoglobin Levels and Blood Transfusions

Time Point	Value (Mean ± SD)
Admission Haemoglobin (g/dL)	10.9 ± 1.6
Preoperative Haemoglobin (g/dL)	11.4 ± 1.5
Discharge Haemoglobin (g/dL)	10.4 ± 1.1

Table 4Complications and Mortality

Complication/Mortality	Number of Patients (%)
Acute Complications	7 (15.90%)
Transferred to ICU	4 (9.09%)
Wound Infections	2 (4.54%)
Reoperations	1 (2.27%)
Cerebral Vascular Accidents	0 (0%)
Major Hemorrhage	0 (0%)
Thromboembolic Events	0 (0%)

In-hospital Mortality	0 (0%)
Mortality within 30 Days	1 (2.27%)
Mortality within 60 Days	2 (4.54%)
Mortality within 1 Year	5 (11.36%)

Table 5 Functional Outcomes and Patient Satisfaction

Outcome	Cemented Group	Uncemented Group
Harris Hip Score	No statistically significant difference	
Patient Satisfaction	Similar at 30 days, 60 days, and 1 year	

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 anesthesia 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 anesthesia staff was aware of the patient's group assignment (uncemented or cemented) and allowed them to independently choose their anesthetic agents. [5,6]

Recent studies have examined outcomes such as mortality rates, functional outcomes, complication rates, and long-term survivorship of cemented versus uncemented hemiarthroplasty. For instance, a systematic review by Fenelon et al. (2022) concluded that cemented hemiarthroplasty provides better early functional outcomes and pain relief compared to uncemented implants, although the long-term differences in revision rates and overall survivorship were minimal. [1] Similarly, a 2023 meta-analysis by Parker et al. highlighted that while cemented hemiarthroplasty is associated with better initial postoperative outcomes, the risk of intraoperative complications must be carefully considered. [2] 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. [11]

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.

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.

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