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Research Article

# UNIPOLAR VERSUS BIPOLAR UNCEMENTED MODULAR HEMIARTHROPLASTY IN PATIENTS WITH DISPLACED FEMORAL NECK FRACTURES: A THREE-YEAR FOLLOW-UP

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**ABSTRACT**

**Objective:** Fractures of neck of femur are common fractures in the elderly. To keep up an imperative distance from the poor results of internal fixation and early ambulation of patients, hemiarthroplasty is performed. There is a lacking evidence to bolster the choice between unipolar or bipolar hemiarthroplasty, let alone the modularity of modern components. The objective of this study was to assess and look at the consequences of modern unipolar and the modern bipolar prosthesis in terms of clinical outcome.

**Methods:** This was an observational study comprising 39 patients above 60 years of age with fracture of the femoral neck. Patients were distributed randomly to surgical treatment by either unipolar or bipolar hemiarthroplasty, using modular components, in the department, between December 2013 and September 2015. Outcome was assessed and analyzed primarily using Harris hip score (HHS) and radiological parameters with a follow-up of 6 months.

**Results:** The mean HHS at 6 months in bipolar and unipolar divisions was 75.82±2.37 and 77.00±2.59 points. Range of movement median was 175° and 166° with bipolar and unipolar groups, respectively. Weight bearing mobilization and daily activities were earlier in the bipolar unit. Complications such as prosthesis dislocation were experienced in the modular bipolar unit compared to high-grade infection with the modular unipolar unit.

**Conclusion:** Both groups of patients were associated with comparative mean HHSs. There were no additional clinical or functional advantages for either prosthesis. The complications were limited in both groups. Our outcomes are in coincidence with previously done studies using cemented prostheses.

**Keywords:** Hemiarthroplasty, Modular, Modern, Uncemented, Femur neck, Orthopedic surgery.

## INTRODUCTION

Among the most well-known orthopedic traumas in elderly are femoral neck fractures. The frequency is expanding and it has been assessed that the number of femoral neck fractures comes with up to 6.26 million by the year 2050. The point of treatment for the neck of femur fracture is to empower them to walk not long after surgery on a steady, functional, and stable hip. The treatment for non-displaced intracapsular femoral neck fractures in active patients is osteosynthesis with screws. In displaced femoral neck fractures, the treatment among elderly patients stays disputable. Hemiarthroplasty, whether unipolar or bipolar, has been proven clinically more successful and practical than reduction and internal fixation in elderly patients [1-9].

In hemiarthroplasty, the late results are regularly defaced by acetabular erosion, proximal migration of prosthesis, and diminishing in the movement range. The bipolar idea was introduced in an effort to upgrade joint activity, mechanically through an enhanced friction system which decreased the amount of acetabular erosion [10]. Nonetheless, a few studies have demonstrated that the internal bearing loses mobility with time and this favorable position may be lost [11,12]. Reports of polyethylene wear and resulting osteolysis have likewise been distributed [11-13].

In this regard, outcome studies have been performed, but most have been retrospective in design, have had been based on the registry, or several femoral components between study groups. More recent studies with prospective, randomized design have been published with short-term results. But, all have been used with cemented components or have been based on the now outdated Austin Moore or Thompson's prosthesis. Nevertheless, the results of these studies show that differences between unipolar and bipolar hemiarthroplasty are minor. The differences include a better range of motion and difference in cumulative percent revisions, for example, no difference in hip scores, less acetabular erosion in bipolar hemiarthroplasties, or no differences at all [14-17].

The objective of the study was to evaluate whether uncemented modern bipolar hemiarthroplasty would give a better result which was thought about than that of unipolar hemiarthroplasty and in this way legitimize its normal use in developing countries where economic cost is a concern. Most of the previous studies which have been done have used modular cemented prostheses or non-modular prostheses. This is the first study using modern uncemented prosthesis comparing the unipolar and the bipolar group. To accomplish this objective, we conducted an observational study contrasting unipolar and bipolar hemiarthroplasties in elderly patients more than 60-year-old with displaced femoral neck fractures. The fundamental point was to assess the patient practically in view of the Harris hip score (HHS). We chose HHS as the main basis of the study believing that to a patient, mobilization and returning to daily living is more important than radiological features and also in a developing country where the average life expectancy though increasing is lesser.

## METHODS

This observational, controlled trial was performed between July 2013 and October 2015. The Institutional Ethics Committee cleared the study. Patients were included after receiving oral and written information before providing their written consent for participation.

All patients over 60 years who have sustained a femoral neck fracture and undergoing hemiarthroplasty were included in the study. Exclusion criteria included those having pathological fractures, fracture of neck of femur with ipsilateral shaft involvement, and bilateral femoral neck fractures.

A senior consulting orthopedic surgeon determined patient inclusion in the trial after classification of the fracture. Patients qualified for the study on the premise of consideration criteria would be at first surveyed preoperatively on the premise of clinical presentation, examinations, preinjury HHS, and followed up postoperatively between interims of 10-1.5 months, 5-7 months on the premise of HHS.

All patients were enlisted in the study within 24 hrs of hospital admission. Patients were consequently evaluated for fitness for surgery from a physician and a cardiologist.

In our study, posterior–Moore's and modified lateral McFarland Osborne approaches were utilized for hip exposure. We have utilized modular unipolar and modular bipolar prostheses with the same uncemented stem component utilizing the posterior and lateral approaches. An uncemented stem with suitable size, neck length, and neck angle was utilized as a part for patients. Unipolar or bipolar heads were accessible in sizes from 37 to 53 mm. In bipolar heads, the span of the inner head of the bipolar prosthesis was 22 mm with the neck size ranging from +4, 0, and −4 mm. There were various surgeons performing the operations, the senior consultant did 96% of the surgeries. Spinal anesthesia was used in most cases and one dosage of pre-operative prophylactic intravenous injection cefuroxime 1.5 g was given. If there arise an occurrence of cefuroxime sensitivity, the combination of piperacillin and tazobactam 4.5 g was infused 30 minutes preceding the surgery. All patients were given low-molecular weight heparin for 4 weeks postoperatively aside from those with other heart conditions for which they were on medications.

Patients were mobilized to full weight bearing as tolerable from the main post-operative day. The primary outcome was clinical and effect of patients' daily activities on the basis of the HHS. Secondary end points included mortality, categories of ambulatory ability, general complications, and radiographic analysis. Patient characteristics that were recorded included age, gender, number of associated comorbidities, abnormal laboratory findings at the time of admission, drug intake, previous fractures, and ambulatory status.

Pre-fracture HHS information was likewise gathered from patient meetings done in person immediately after admission. Hospital data were obtained with a form filled out in the operating room by orthopedic resident or attending physician and a form completed on discharge relating specific details of the patient's hospital stay. Pre-operative and immediate post-operative data included operation time, estimated blood loss, drainage discharge, and prosthesis characteristics.

Radiographs were taken post-operatively and at 1 month and 6 month follow-up. About 38 patients, 18 in bipolar group and 17 in unipolar visited the outpatient facility. 35 out of the 38 patients finished and comparable radiographs were obtained. Three patients expired attributable to comorbid conditions. The patients were additionally reached by phone and met for finishing of standard questionnaires concerning general fulfillment and ambulatory status. Mean follow-up was 6 months. Sample size. With an alpha of 0.05, 80% power and with a confidence interval of 95% the given sample size was chosen. We anticipated that would lessen the complication by 5% between various groups, with a standard deviation risk of 10%.

Data were analyzed utilizing chi-square test. The level of significance was set at p=0.05. We utilized SPSS 19.0 for Windows for all examinations. Age, sex, body mass index, number of abnormal lab findings, ambulatory ability, and number of comorbidities exhibited typical distribution, advocating the utilization of values for the examinations.

## RESULTS

A total of 39 cases selected in the study, 19 cases were treated with unipolar and 18 were treated with bipolar prosthesis. Normal age frequency in our study was comparable in both the groups (67 and 69). No huge contrasts were found between the two groups in the operative time, blood loss, transfused blood units, intra-operative complications, hospital stay, death rate, or post-operative complications. About 2 instances of superficial infection were present, 1 in unipolar and 1 in bipolar. 1 instance of deep infection was found in unipolar. All recuperated after antibiotic treatment as indicated by culture and sensitivity. The most common complication seen was superficial disease. 3 patients died amid the post-operative and follow-up stage for the most part credited to systemic complications. One patient had dislocation in the bipolar group. One patient had foot drop in the unipolar group.

The normal span of hospital stay was slightly more for the unipolar group than for bipolar. Early mobilization brought about better clinical results regarding HHS by a mean difference of 4 points.

The mean HHS at 6 weeks for modular unipolar prosthesis was 63.76±3.33 and for modular bipolar prosthesis, it was 64.18±2.50, which is statistically insignificant (p=0.493). The mean HHS at 6 months for modular unipolar prosthesis was 77.00±2.59 and for modular bipolar prosthesis, it was 75.82±2.37, which is statistically insignificant (p=1.000). About 31 patients (79.48%) had no complications, 2 cases had superficial infection, and 1 case had foot drop in unipolar group. 3 patients died; 2 in unipolar and 1 in the bipolar group. One case had dislocation in bipolar group and one patient had a deep infection in unipolar group, both of these cases were lost to follow-up (Table 1).

There was no difference in survivorship between the groups. No patients had dislocation in the unipolar group and one in the bipolar group; the distinction was statistically insignificant. One patient had dislocation that was not reducible by the method for closed reduction, and open reduction was done. There was one deep infection requiring correction surgery in the form of removal of unipolar prostheses. One patient in unipolar group developed foot drop which later recovered.

Three patients died while in hospital, two in unipolar group, and one in bipolar group, all immediately.

Post-operatively, the quantity of general complications barring mortality did not vary between groups. In the unipolar hemiendoprostheses (HE) bunch, there was one foot drop which recovered. In bipolar and unipolar HE groups, there was one cardiac arrest each post-operatively; both the patients had renal comorbid conditions. There was one patient in the unipolar group who had a periprosthetic fracture.

There was no distinction in mortality between the 2 groups before 6 months. There were no distinctions in mortality in the unipolar and bipolar patients, though the period was short.

About 20 patients after surgery had an unlimited walking distance, of which 9 were in unipolar group and 11 in the bipolar group. 9 patients could walk up to 6 blocks, of which 6 were in unipolar and 3 were in bipolar groups. 1 patient in the bipolar group could walk 2 blocks and 1 patient in unipolar group could stay inside.

About 19 patients did not require any support, of which 11 were from the unipolar group and 8 were from the bipolar group. 12 patients required canes for support, of which 5 were from the unipolar group and 7 were bipolar group. 1 patient from every group required a walker for support.

About 6 patients had a slight limp, of which 5 were from the unipolar group and 1 was from the bipolar group. The rest of the patients had no limp.

**Table 1: HHS at 6 weeks and 6 months**

| Prosthesis | Pre-operative | HHS 1 | HHS 2 |
|---|---|---|---|
| Modular unipolar | 96.47 | 63.76 | 77.00 |
| Modular bipolar | 96.33 | 64.18 | 75.82 |

HHS: Harris hip score

Postoperatively, the quantity of general intricacies barring mortality did not contrast between the groups. On general intricacies, one patient had a chest infection, which later recuperated. 3 patients died amid the intrahospital period, two in unipolar group and 1 in bipolar. One patient in each group had heart and renal comorbidities. One patient in unipolar group had psychiatric disease.

Cases were followed up after 6 months, no acetabular erosions were observed. There were no sinking or loosening of the prostheses. One patient from the bipolar group had a dislocation of the prosthesis.

## DISCUSSION

Debate regarding the best surgical management to treat elderly patients with displaced femoral neck fractures has been continuing for a long time. Among elderly patients with displaced femoral neck fracture, larger part of the published data concludes that endoprosthetic replacement is better than internal fixation with osteosynthesis. In any case, if endoprosthetic replacement is chosen, it is not clear if unipolar, bipolar, or total hip prosthesis ought to be picked. Total hip arthroplasty has the best motion and function, yet experiences higher complication, higher revision rate, and a higher economic burden. Modern unipolar or bipolar hemiarthroplasty is broadly utilized as a standard choice, particularly in elderly dislocated hip fracture patients. In our study, both unipolar and bipolar hemiarthroplasty had equivalent functional results. By and large, the outcomes demonstrate that uncemented hemiarthroplasty performed with unipolar or bipolar heads is safe method of treatment of femoral neck fracture in elderly even in the hands of a less experienced surgeon. The goal of this study was to report short term follow-up results in looking at modern uncemented unipolar and modern uncemented bipolar hemiarthroplasty as treatment of femoral neck fracture in elderly in a randomized setting with short term follow-up. Consideration was taken to minimize the internal bias in the study. The groups that we analyzed were fundamentally the same at baseline, and the outcome was assessed with utilization of the reliable HHS [18]. This is one of only a handful few studies that uses same femoral component in both groups and to our knowledge, this is the first study in regard to using uncemented modern prostheses for hemiarthroplasty considering the good results seen in total hip replacements with modern uncemented prostheses. All the patients followed a similar post-operative rehabilitation protocol that consisted of early mobilization with weight bearing as tolerated.

The present study was a short term follow-up and relied on clinical outcome. The inclusion criteria clearly define the population, which resembles the population where it can be generalized. The designated groups were practically identical at the start of the study. A limitation of the study is that radiological assessment was done at short-term follow-up. Thus, acetabular disintegration could not be appreciated in any of the cases. Bipolar hemiarthroplasty was produced to lessen this danger and the need to change to total hip arthroplasty if demonstrated. In one latest report, just 0.6% of the bipolar prosthesis embedded was changed over to total hip arthroplasty because of groin pain [19]. In Australian registry, unipolar had a higher revision rate over bipolar hemiarthroplasty [16]. In our outcomes, we did not have any distinctions in acetabular dislocation between two groups following 6 months. A few planned, randomized studies have been distributed to look at the practical results of patients getting either unipolar or bipolar hemiarthroplasty. Calder *et al.* distributed a forthcoming, randomized study comparing now obsolete unipolar Thomson prosthesis and the bipolar Monk prosthesis in patients more than 80 years. In a 2-year follow-up, the main statistically significant difference they found was that patients with unipolar prostheses will probably come back to their preinjury functional state than patients with bipolar prostheses [20]. Davison *et al.* analyzed about unipolar, bipolar hemiarthroplasty, and internal fixation with compression hip screws in patients somewhere around 65 and 79 years. They found no distinction in practical results in the middle of unipolar and bipolar hemiarthroplasties [2]. Cornell *et al.* distributed a 48-patient series in which same femoral stem was utilized and just distinction was the prosthesis head outline. Patients with bipolar prostheses improved on walk tests and had better range of movements at 6 months; however, the patient-arranged hip scores did not vary at 6 months between the unipolar and bipolar groups, a finding which coincides with our study [14]. Raia *et al.* analyzed the adequacy of unipolar versus bipolar hemiarthroplasty in elderly patients with displaced femoral neck fractures in terms of quality of life and functional outcomes. They found no contrast between the groups when assessing the blood loss, length of hospital stay, death rate and number of dislocations, post-operative complications, or ambulatory status at 1 year in their 115 patient arrangements [17]. In a later publication, Hedbeck *et al*. reported short-term results with an advanced Exeter prosthesis consolidated with unipolar or bipolar heads. They discovered equivalent clinical results following 1 year; however, higher acetabular disintegration was noted in the unipolar group [15]. In the present study, the extent of patients fulfilling the independent mobilization was comparable in unipolar and bipolar groups, separately. Notwithstanding, despite the fact that the outcomes did not reach statistical difference, it is noteworthy that more patients achieved the status of more active living, mobility, and range of movements in the bipolar HE group returning to active exercise. This is in understanding with Hedbeck's results where there was a pattern toward better health-related quality of life at 4 months in the bipolar hemiarthroplasty gathering despite the fact that they seem to lose the benefit with time [15]. Controlling elderly patients with any strategy or questionnaire is testing. The reason we chose the HHS as the major basis is for the simple reasoning that matters to a patient after sustaining a lower limb trauma is ability to walk again, return to daily activity, being independent, and return to work if feasible for which HHS is compliable.

Posterior approach gives a certain risk for dislocations, which in our series was seen in a single case of bipolar hemiarthroplasty. The dislocation rate in the literature varies in the writing somewhere around 0% and 16% and our outcomes did not vary from the results reported [15,21-25].

In our study, we had a single case of periprosthetic fracture. Austin Moore has been reported to have a periprosthetic risk of 2.3-7%. Polished wedge-type stems have also been shown to have an elevated risk of periprosthetic fractures in hip fracture patients, for example, Exeter has a fracture risk of 0.5-3% [26].

The present study shows that uncemented hemiarthroplasty accompanied with unipolar or bipolar heads is a predictable method of treatment of femoral neck fracture in elderly even in inexperienced hands, and both the endoprosthesis are very comparable as far as the clinical outcome is concerned in terms of restoring patients lifestyle prior to fracture. The study also helps us to conclude that early mobilization gives a better result in patients operated for neck of femur fractures with hemiarthroplasty as the surgical procedure.

## CONCLUSION

In our study, we did not have any periprosthetic fractures. There was no statistical difference in returning home after fracture or in ambulatory ability. Unlike other studies, though non-significant, lower rate of dislocations favors unipolar. A dislocation always leads to an invasive procedure and treatment in the hospital, thus affecting negatively to a fragile patient and should therefore be avoided. Whether unipolar or bipolar prosthesis should be used remains controversial. But, looking at previous studies and including the present study, using fixed bipolar or unipolar prostheses, the ones using modern prosthesis, the authors would, as a conclusion, with evidence, like to put forward the belief that both unipolar and bipolar with a modern uncemented femoral component provide elderly patients with the same good results on the basis of variables which matter the most to a patient.

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