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Retrospective comparative study of fracture neck of femur treated with Uni polar Vs bipolar hemiarthroplasty

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Abstract

Background and Objective: Intracapsular femoral neck fractures are common in the elderly population. To avoid the poor outcome of internal fixation and for early mobilization, hemiarthroplasty is performed. However, there is inadequate evidence to support the choice between unipolar or bipolar hemiarthroplasty. The aim of this study was to compare the outcome of unipolar with the bipolar prosthesis in geriatric patients especially in rural population of kolar.

Methods: sixty patients above 60 years of age and an acute displaced fracture of the femoral neck were randomly allocated to treatment by either unipolar or bipolar hemiarthroplasty, in the Department of Orthopaedics, between September 2009 and October 2012. Functional outcome was assessed and compared using Harris hip score and radiological parameters with a follow-up of one year.

Results: The two groups of patients with mean age of 68.3% in bipolar group and 69.9% in unipolar group did not differ in their pre-injury characteristics and perioperative parameters. There was no significant difference between a Moore's and a bipolar prosthesis regarding hip pain, functional hip scores, rates of acetabular erosion, component migration, revision surgery and complications rates.

Conclusion: Use of the more expensive bipolar prosthesis in elderly and pre-morbidly ambulant patient is not justified especially in rural population.

Keywords: bipolar, AMP, hemiarthroplasty, fracture neck of femur

1. Introduction

Hip hemiarthroplasties are commonly performed for displaced femoral neck fractures. With increasing life expectancy worldwide, the number of elderly individuals is increasing, and it is estimated that the incidence of hip fracture will rise. Fracture treatment should be based on the patient's age, walking ability, comorbidities and life expectancy [1]. Internal fixation (IF) or different types of hip arthroplasties are the available treatment modalities. In patients with undisplaced fractures (Garden I-II) [2], IF is uncontroversial with an acceptable rate of fracture healing complications and a good outcome regarding function and the health-related quality of life [3]. Internal fixation is also considered to be the treatment of choice in young patients with displaced fractures (Garden III-IV) [4].

In elderly patients suffering from a displaced femoral neck fracture, a cemented hip arthroplasty, compared to IF has been shown to reduce the reoperation rate and give better hip function [6-7]. In the healthy, active elderly with a long life expectancy, a total hip arthroplasty (THA) is probably the best treatment [6-8] while a hemiarthroplasty (HA) is generally considered to be sufficient for the most elderly patients with lower functional demands and a shorter life expectancy.

There are two different types of HA: unipolar and bipolar. The theoretical advantage of the bipolar HA is a reduction of acetabular wear due to the dual-bearing system. On the other hand, a potential disadvantage is the risk of polyethylene wear that may contribute to mechanical loosening over time and there is also a risk of interprosthetic dissociation in certain bipolar HAs necessitating open reduction [9]. Hence Bipolar also becomes unipolar over a period of time.

However, dissociation appears to be rare in modern bipolar surgical systems [1] interface. It is thus hypothesized that bipolar prostheses lead to better long-term functional outcomes with less complications. However, evidence from the literature so far has not been supportive of this theory [4, 5]. This is a retrospective randomized study of the short-term results of hemiarthroplasty using Austin Moore unipolar prosthesis and bipolar prosthesis. Outcomes at six weeks, three months, six months and 12 months were analyzed and compared using Modified Harris hip score and radiographs.

2. Materials and Methods

The present study is of intracapsular fracture neck of femur in elderly patients above the age of 60 years, irrespective of gender, treated with hemiarthroplasty using uncemented unipolar Austin Moore's prosthesis (AMP) in 30 patients and bipolar endoprosthesis in 30 patients, in the Department of Orthopaedics RLJH, SDUMC, kolar, selected. All the patients were walking normally before injury. All patients were operated through a southern approach, and received antibiotics. Postoperatively, full weight bearing was allowed with the help of physiotherapists as per their compliance. The patients were assessed post operatively based on Harris hip score at intervals of 4 weeks, six weeks, three months, six months and one year. Sequential radiographs were compared to assess diminishing joint space, acetabular erosion, proximal migration and protrusion of the acetabulum. Loosening, subsidence and angular shift of the femoral stem were also assessed on these radiographs. Data was analysed using Statistical Package for the Social Sciences package (SPSS, Chicago, Illinois). The chi-square test was used to compare the groups with respect to hip pain and patient satisfaction. The Mann-Whitney U test was used to compare Modified Harris hip score. The level of significance was set at $P < 0.05$.

3. Results

Patients who had unipolar prostheses were comparatively older to those with bipolar prostheses (69.9 vs. 68.63). Females constituted 53.3%. Mortality rate was statistically more in bipolar group 10%, due to age related factors. Mean length hospital stay was similar in both groups. 56% of patients had fracture of left side and was similar in both group.

Table 1: Outcome and functional scores

	AMP (N=30)	Bipolar (N=27)	P value
No Or Mild Pain	20 (66.6%)	19 (70.3%)	0.76
Satisfied With Operation	22 (73.3%)	20 (74.07%)	0.94
Harris Hip Score	85.56	86.59	0.616

Harris Hip Score	Bipolar (%)	AMP (%)
Failure (<60)	0	0
Poor (60-69)	2(7.4)	2(6.6)
Fair (70-79)	3(11.1)	6(20)
Good (80-89)	8(29.6)	8(26.6)
Excellent (90-100)	14(51.8)	14(46.6)
Total	27	30
Not recorded	3(10)	0

All cases were analyzed based on the Harris hip score and patient satisfaction. The outcomes of pain and satisfaction with operation were categorised as yes or no. The total score was tabulated and graded as excellent, good, fair, poor and

failure (Table II). Mean Harris hip score in AMP was 85.56 whereas in BIPOLAR it is 87.29 with p value 0.616 and is not significant (Table I). pain and satisfaction level for patients in both group were comparable and was found to be statistically insignificant (Table I).

3 Superficial infection was recorded in bipolar group and 2 in unipolar group, 2 of cases operated with unipolar had bed sores but no incidence of deep infections, 2 patients in bipolar group developed deep infection (Table III).

86.6% of patients sustained fracture due to fall. Both unipolar and bipolar group had 14 cases each with excellent result, 2 cases with poor result and 8 cases with good result. 6 (20%) cases in unipolar had fair result compared to 3 in bipolar group (11.1%) but 3 case were lost to follow-up from bipolar group whereas none was lost from unipolar group. Hence both group showed similar results with 46.66% and 51.8% excellent result.

Complications	AMP (%)	Bipolar (%)
Superficial Infection	1(3.3)	1(3.7)
Gaping	1(3.3)	-
Painful Hip	1(3.3)	1(3.7)
Deep infection	1(3.3)	2(7.4)
Periprosthetic Fracture	0	0
Acetabular erosion	0	0

4. Discussion

Comparison between 30 cases of bipolar hemiarthroplasty and 30 cases of Austin-Moore prosthetic replacement for femoral neck fractures in elderly patients over a one year period has shown that patients in both the group have similar functional outcomes in terms of range of motion, ability to use public transport and ability to cut toe nails. Mean Harris hip score was similar in both the group with p value 0.616 and hence was not significant statistically. But incidence of deep infection was more in bipolar group (Table III). Even pain and patient satisfaction level were statistically insignificant in this study.

Lunceford Jr [7] felt that the pain following hemiarthroplasty should not be the reason for condemning the procedure. He listed the following causes for pain: infection, improper prosthetic seating, metallic corrosion and tissue reaction, improper sized femoral head, contractures, periarticular ossification, toggle or acetabular wandering and redundant ligamentum teres. Limping is a common consequence of hemiarthroplasty in adults. Alteration in the abductor mechanism due to a marginally greater excision of neck is the most probable cause [8]. Cornell *et al.* [9] reported that patients with bipolar prosthesis did better on walk tests and had better range of motion at six months.

Rates of postoperative morbidity were comparable between the 2 groups with no statistically significant differences (Table 3). Many studies in the literature also support our findings. Hudson *et al.*, in an 8-year retrospective review of 90 unipolar and 48 bipolar hemiarthroplasties showed no statistically significant differences in the rates surgical or medical complications [11]. Calder *et al.*, in a prospective and randomised 2-year trial comparing unipolar and bipolar prosthesis in octogenarians, found no difference in the complication rates as well [10].

All studies have found that bipolar hemiarthroplasty has a higher cost than unipolar hemiarthroplasty [13, 14]. With rising medical costs, this adds to the economic burden of caring for hip fracture patients. Our results have not shown a significant difference between a Moore's and a bipolar prosthesis

regarding hip pain, functional hip scores, rates of acetabular erosion, component migration, revision surgery and complications rates. Studies conducted thus far concur with our findings. In addition, an evidence-based review of this topic conducted by Parker and Gurusamy concluded that the present literature demonstrated no difference between unipolar and bipolar hemiarthroplasty.^[19] This suggests that the use of the more expensive bipolar prosthesis in elderly and pre-morbidly ambulant patient is not justified, particularly in our price sensitive population.

In recent years, there is also an increasing trend towards total hip arthroplasty for displaced femoral neck fractures.¹⁵ In a study by Gebhard *et al.*^[20] involving 166 displaced femoral neck fractures, total hip arthroplasty demonstrated superior longevity when compared with hemiarthroplasty with and without cement.

There are several limitations to this study. First, it is a retrospective study with all the problems associated with this methodology. Although the 2 groups appear similar in terms of demographic data, the patients were not randomly assigned to one of the implant groups. Hence, unmeasured confounders may exist that could have biased the results. Second, number of patients included is less compared to all other studies. Third, the mean duration of follow-up was only slightly more than 1 year. Clearly, a longer follow-up is required to determine rates of acetabular erosion, component migration and revision surgery.

5. Conclusion

Based on the results of our study, there appears to be no statistical difference between the two groups, that is both bipolar and AMP have similar results for short term period. The results of our study showed that the incidence of complications were lower after bipolar hemiarthroplasty. Disadvantage of bipolar prosthesis is that it is more expensive and for elderly patients from the rural populations like the one we did study on (kolar). Unipolar prosthesis had more patient satisfaction since they are more concerned about surgery expenditure and are not keen on long term effects of surgery. Hence rationale of choosing the implant can be based on patients affordability, especially in rural elderly population.

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