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Original Article

Orthopaedics Section

Unipolar Austin Moore's Prosthesis Versus Cemented Bipolar Arthroplasty in Displaced Neck of Femur Fracture, in Elderly Patients

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ABSTRACT

Introduction: The incidence of hip fracture among the Asian population has been on the rise. Due to higher rate of complications in osteosynthesis, arthroplasty is a preferred treatment. Hemiarthroplasty can be done using uncemented unipolar Austin Moore prosthesis and cemented bipolar arthroplasty.

Aim: To assess out the anatomical and functional outcome in elderly patients, treated with unipolar/bipolar prosthesis for displaced fracture neck of femur.

Materials and Methods: A prospective comparative study was conducted, involving 48 patients. Elderly patients between 60 and 75 years of age, with displaced fracture neck of femur, were included. 29 patients were operated with Austin Moore Prosthesis (AMP) and 19 with bipolar prosthesis. Results on continuous measurements are presented on mean value (minimum –maximum) and results on categorical measurements are presented in number (%), variables were correlated wherever relevant. The functional hip score was assessed using Harris Hip Score (HHS). The statistical software SPSS 15.0 (Statistical Package for Social Sciences) was used for the analysis of data and Microsoft's Word and Excel were used to generate tables and figures.

Results: The average duration of time for AMP was 44.97 minutes and for bipolar 53.05 minutes. The total blood loss was 263.1 mL (intraoperative) and 319 ml (postoperative) in the AMP group. The blood loss was about 329.37 ml (intraoperative) and 393.15 mL (postoperative) in bipolar group which showed a statistically significant difference. Harris Hip Score was 60.64 and 70.84 for AMP and Bipolar group respectively at final follow up. There was no significant difference in pain score between the two groups. There were three cases of femoral stem subsidence and two cases of acetabular erosion in the AMP group.

Conclusion: Cemented bipolar prosthesis is a better choice for displaced fracture neck of femur in the elderly.

Keywords: Fracture neck of femur, Hemiarthroplasty, Total hip arthroplasty, Unipolar prosthesis

INTRODUCTION

Hip fracture is one of the common orthopaedic injuries having high mortality and morbidity in elderly patients [1]. The injuries have a bimodal age distribution and more than 97% of the affected are over the age of fifty years. The incidence of hip fractures among the Asian population has been increasing (55%). Over the next forty years, the number of high risk patients is expected to double [2].

There is higher rate of non-union (5%) and osteonecrosis (10%) associated with fracture neck of femur in un-displaced fractures. In displaced fractures following internal fixation, the non-union rate is 10-30 per cent and osteonecrosis is 15-33 percent [3,4]. Even though non-operative treatment can be considered in non-ambulant elderly patients with dementia, there is high rate of complications [5]. Various implants are used for treating fracture neck of femur like cancellous lag screw, sliding hip screw, hemiarthroplasty using Austin Moore prosthesis or Thompson prosthesis or Bipolar prosthesis and total hip replacement [6,7].

Hemiarthroplasty, when compared to internal fixation, showed better functional outcome in elderly patients [8]. It can avoid complications like osteonecrosis and non-union [9]. There is significant reduction in reoperation rate following hemiarthroplasty [10]. According to Boyd HB and Salvatore J "That sacrifice of head and neck and its replacement by a metallic foreign substance is not the answer for majority of patients; in over half, the best available material is in the acetabulum and its indiscriminate removal should be avoided" [11]. Hemiarthroplasty is a more extensive operation, which requires larger exposure resulting in greater blood loss, when compared to internal fixation. The advantages of uncemented Austin Moore Self-Locking Prosthesis (AMP) include less operative time, less blood loss and fewer postoperative complications. It is also cost-effective [12]. The disadvantages are: increased rate of acetabular erosion, sinking of femoral stem and postoperative thigh pain [13-15]. Cemented bipolar prosthesis allows early mobilisation and less postoperative thigh pain. It can be converted into total hip replacement without changing the femoral stem. The disadvantages of bipolar prosthesis are more extensive surgery compared to AMP and more expensive Bipolar implants. One of the most important advantages of bipolar prosthesis is movement between inner and outer bearing; but it is seen that inner bearing motion decreases over a period of time. There is also the risk of osteolysis around the stem due to poly wear particles [16,17].

As the life expectancy is increasing, the aging population in India is also increasing. By 2050, more than 35% of Indian population will be above 50 years of age [18]. As the age increases the incidences of osteoporosis and osteomalacia are also increasing. Both these conditions can predispose to increased incidence of hip fractures. Worldwide, there is an increasing trend towards Total Hip Arthroplasty (THA) for fracture neck of femur [18,19]. In our part of the world, most of the patients cannot afford such expensive treatment option. There are still a lot of hemiarthroplasties being done in elderly patients. There are very few studies which compare the results of uncemented unipolar and cemented bipolar hemiarthroplasty [20-23].

There is no long term follow up study comparing the results of Hemiarthroplasty (HA) with THA in the treatment of displaced fracture neck of femur. Even though HEALTH trial involving multicentric, randomised, controlled trial to assess the outcome between HA and THA is made, long term differences in the outcome couldn't be obtained due to a follow up of just two years. In a more recent study, comparing the results of HA versus THA in displaced intracapsular

fracture neck of femur in active elderly patients with mean follow-up of 12 years, it has been found that there is no difference in functional outcomes between the two groups [24].

In this study, it was tried to find out if there is any difference between functional outcomes of cemented bipolar and uncemented unipolar HA, particularly because unipolar HA is less costly.

A prospective comparative study was conducted to find out the differences in functional and anatomical outcomes of elderly patients with fracture neck of femur treated in our institution with cemented bipolar prosthesis and uncemented Austin Moore prosthesis. The intra and postoperative complications in each group were also compared.

MATERIALS AND METHODS

After getting the Institutional Research and Ethical Committee's approval, a prospective comparative study was conducted, using non purposive randomized sampling, from March 2010 to October 2012. Fifty patients with fracture neck of femur treated with HA in the department of orthopaedics, Government Medical College, Kozhikode, Kerala, were selected. Two patients, who died because of other medical illness during the follow up, were excluded. Thus, 48 patients were included in the study. All patients were between the age group 60 to 75 years. Patients with Garden type 2, 3 and 4 were considered [25]. Majority of patients had fracture following slip and fall. The patients with pathological fracture, stress fracture and open injury were excluded. There were no patients with Parkinsonism, hemiplegia or any other neurological disease. 19 patients were treated with cemented bipolar prosthesis and 29 were treated with uncemented AMP. All patients underwent surgery within the first week of admission.

Preoperative skin traction was given routinely for all patients who were not operated within 24 hours of admission. An antibiotic prophylaxis of 1 gm cefazolin was given 30 minutes before start of skin incision. All patients were operated under subarachnoid block. Posterior approach was used in all patients with patients in true lateral position. Postoperatively drain was removed after 24 hours. Antibiotics continued for 48 hours and patients were discharged on the third day. Suture removal was done on tenth postoperative day. By second day all patients were allowed to bear weight with support of walker, by three weeks they were allowed to walk with cane, and, unsupported weight bearing by six weeks. Patients were followed up at one and half, three, and at eight months. Functional outcome was measured using HHS [26] and anatomical outcome by measuring acetabular protrusion and femoral stem subsidence. Pain was graded according to patient's functional status during follow up [27].

Grade 1 - No pain and limp or same as postoperative status of walking;

Grade II - slight pain on extended walk or limp. Patient uses stick for support, but is able to walk even without it;

Grade III - Constant pain on walking and can walk only with support of stick or walker;

Grade IV - Not able to walk or bed ridden.

STATISTICAL ANALYSIS

Descriptive statistical analysis of study data had been carried out. Results on continuous measurements were presented on mean value (minimum-maximum) and results on categorical measurements were presented in number (%), variables were correlated wherever relevant. The statistical software namely SPSS 15.0 (Statistical Package for Social Sciences) was used for the analysis of data and Microsoft's Word and Excel were used to generate table and figures. The results were considered significant, if the p-value was less than 0.05.

RESULTS

The study involved 48 patients with 18 males and 30 females in the age group of 60-75 years. The average age for AMP group was 69.07 years and for cemented bipolar was 68.21 years. There was no statistical significance with regard to age and gender of the patients.

GARDEN Type	CEMENTED Bipolar	AMP	Total
TYPE 2	3	4	7
TYPE 3	12	15	27
TYPE 4	4	10	14

[Table/Fig-1]: Distribution of fracture pattern and method of fixation.

There were seven patients in Garden type 2 (14.6%), 27 patients in Garden type 3(56.25%) and 14 patients in Garden type 4 (29.17%). Among the fracture types, three patients were in type 2, 12 in type 3 and 4 in type 4 were operated with bipolar prosthesis and rest with AMP [Table/Fig-1].

The average duration of surgery from skin incision to wound closure was 44.97 minutes for AMP group and 53.05 minutes for bipolar group with significant p-value ($p<0.0001$). Total blood loss was estimated as the total amount of blood in suction apparatus during intraoperative period and in the suction drain during postoperative period. It was 263.1 mL (intraoperative) and 319 mL (postoperative) in the AMP group. It was about 329.37 mL (intraoperative) and 393.15 mL (postoperative) in bipolar group. The blood loss in AMP group was lower when compared to bipolar group which was statistically significant with $p<0.001$.

HHS	Excellent	Good	Fair	Poor
AMP	0	0	0	29
Bipolar	0	0	0	19

[Table/Fig-2]: HHS at six weeks follow up. ($p<0.001$)

HHS	Excellent	Good	Fair	Poor
AMP	0	0	4	25
Bipolar	0	0	9	10

[Table/Fig-3]: HHS at three months follow up. ($p<0.000$)

HHS	Excellent	Good	Fair	Poor
AMP	0	0	9	20
Bipolar	0	1	12	6

[Table/Fig-4]: HHS at final follow up (eight months). ($p<0.001$)

The mean HHS for AMP group was 53 at 6 weeks, 58 at 3 months and 60.64 [Table/Fig-2] at final follow up (8 months) whereas, for the bipolar group the HHS was significantly higher; 59.2 at 6 weeks, 67.21 at 3 months and 70.84 at final follow up (8 months) with significant p-value ($p<0.001$) [Table/Fig-2-4].

Regarding the pain score at final follow up there was no significant difference in both the groups ($p=0.143$) [Table/Fig-5]. There was no significant intraoperative complication in either of the groups. One case of postoperative dislocation occurred in AMP group. In the uncemented group there were three cases of femoral stem subsidence and two cases of Acetabular erosion and acetabular

Pain	Grade I	Grade II	Grade III	Grade IV
AMP	1	10	14	3
Bipolar	1	13	4	1

[Table/Fig-5]: Pain score at final follow up (eight months). ($p=0.143$)

subsidence at final follow up (8 months) and these complications were not seen in cemented group. This was statistically significant with p-value less than 0.035. The three patients with femoral stem subsidence have been revised to Total hip arthroplasty. The two

patients with acetabular erosion were asymptomatic.

DISCUSSION

Rapid restoration of pre-injury functional and ambulatory status of elderly patients with fracture neck of femur is the ultimate objective with any treatment. Arthroplasty is the common treatment for the displaced fracture neck of femur in elderly patients (>60 years). There is no conclusive evidence regarding the type of arthroplasty to be chosen in fracture neck of femur in elderly, even though cemented arthroplasty do well with regard to postoperative pain and improved mobility [28]. According to Kuokkanen H et al., hemiarthroplasty for displaced fractures should be reserved for elderly patients with short life expectancy [29]. Austin Moore prosthesis is a choice in displaced neck of femur fracture in elderly, who are limited or non-ambulatory with low demand. Even though there are reports of more than 20 years' survival of AMP, there are many disadvantages due to poor femoral fixation and acetabular erosion [30]. In hemiarthroplasty there is a tendency for femoral neck resorption and sinkage of stem into the medullary cavity [31]. In uncemented group there were three cases of femoral stem subsidence and two cases of acetabular subsidence. There is reduced risk of dislocation and better postoperative ambulatory function in cemented bipolar patients [32]. The dislocation rate is higher in patients, who were operated with posterior approach [33]. In our series also there was one patient with dislocation in the postoperative period who was operated with AMP by posterior approach. Uncemented stem was preferred in patients with significant cardiovascular risk and Total Hip Arthroplasty was preferred in active elderly patients, while unipolar prosthesis was used in medically infirm and low demand patients [34]. The use of bipolar prosthesis in elderly patients with displaced fracture neck of femur had relatively few complications and low mortality rate [35]. Cemented prosthesis have much better results in elderly osteoporotic patients with proximal femoral fractures, as bone cement reinforces the bond between the implant and bone [12,34]. Bone Cement Implantation Syndrome (BCIS) due to medullary fat embolisation during cement pressurization is a known intraoperative complication during cemented arthroplasties and patients with cardiovascular disease are prone to BCIS [36,37]. No such complication was noticed in the present study group.

Lo WH et al., reported that cemented replacement require relatively more time and hence more blood loss compared to uncemented hemiarthroplasty [35]. Other studies show no significant difference in operative blood loss and operative time [22,23]. In this study, blood loss and surgery time were significantly higher for bipolar prosthesis group. No significant difference in pain score between unipolar and bipolar group in our study. This was similar to observation made in other study by Raia FJ et al., and Stoffel KK et al., [38,39]. According to Malhotra R et al., a comparative study of unipolar vs bipolar hemiarthroplasty showed a significant improvement of pain in the latter group [40]. In the present study, the functional outcome assessed using HHS was better for cemented group at final follow up (8 months), but there were certain studies unable to prove the theoretical advantage of bipolar prosthesis in terms of functional outcome. This may be due to age related neuromuscular changes, lack of proper balancing by coordination of various muscles and decreased pain tolerance in elderly. But Jeffcote B et al., reported a significant difference in functional outcome for bipolar group at three months, when compared to unipolar group in contrast to the result obtained in this study [41].

LIMITATION

The present study had a few limitations such as small sample size, lack of randomization in treatment leading to selection bias and short follow-up period.

CONCLUSION

Bipolar prosthesis is a better choice for displaced fracture neck of femur in elderly patient because it provides better stability, better pain relief, less acetabular erosion, less femoral stem subsidence. But compared to uncemented Austin Moore prosthesis, cemented bipolar prosthesis has more total blood loss and duration of surgery. HA is still a very good option for treating fracture neck of femur in elderly patients especially in developing countries like India. AMP is the choice of implant in less active patients.

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