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Functional outcome of cemented versus uncemented modular bipolar hemiarthroplasty in proximal femoral neck fractures

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Abstract
The study was carried out to compare the intraoperative events, complications, recovery to physical independence & functional outcome based on Harris hip score encountered in each of the cemented & uncemented hemiarthroplasty groups to draw a conclusion regarding which was the better in the management of fracture neck of femur on elderly. This study included 40 cases of fracture neck of femur in elderly aged more than 50 years, divided into 2 groups with 20 patients in each group which were assigned randomly and followed up for 6 months. 1 group of the patients was treated by uncemented prosthesis whereas the other group was treated with cemented prosthesis. The intraoperative parameters like blood loss & duration of surgery were noted & functional evaluation was done at the end of 6 months. At the end of 6 month follow up, there was no statistical difference in the Harris hip scoring, (P = 0.589) between the two groups. The complications were distributed in both the cemented & uncemented groups & were insignificant. The difference in the duration of surgery & the amount of blood loss was significant between the groups considering the age & associated morbidity with the patients (P = 0.0001). The difference in the duration of surgery & the amount of blood loss was significant between both groups. The complications were distributed in both uncemented & cemented group & were statistically insignificant.

Keywords: Modular, bipolar, hemiarthroplasty, Harris hip score

Introduction
Proximal femoral fractures are devastating injuries that most commonly affect the elderly. These fractures include fracture neck of femur and trochanteric fractures. The elderly have poor bone quality and decreased healing potential as well as associated co-morbidities which may not warrant multiple surgeries if the primary osteosynthesis fails; hence the elderly are treated with Hemiarthroplasty [1].

Hemiarthroplasty can be divided into Unipolar and Bipolar. Bipolar hemiarthroplasty is done using a low friction, total prosthesis that has motion at two bearings unlike the Unipolar prosthesis. The movements in the inner and outer bearings are complementary to each other and thereby providing increased range of motion postoperatively [2].

In the present era, the elderly are forced to do high demand jobs like washing their clothes, lifting heavy weights, riding bicycle etc even after surgery. The implants are subjected to severe stress and increased cyclical loading which may cause early acetabular erosion and femoral stem loosening leading deterioration of function in the replaced hip. In the long term acetabular erosion is reduced by using bipolar prosthesis [2].

The most common treatment for a displaced femoral neck fracture in the elderly is hemiarthroplasty which can be either cemented into the femoral canal or uncemented with press-fit technique [3]. Orthopaedic surgeons are divided as to the relative merits of cemented versus uncemented fixation. Cementing the prosthesis provides more secure fixation and results in less residual pain and better function. However, the insertion of cement into the medullary canal of the proximal femur increases the morbidity of the operation and carries the risk of cardiovascular collapse [4]. The continued use of a mixture of uncemented and cemented prostheses reflects uncertainty as to the relative advantages and disadvantages of using bone cement. There is a long-standing debate on the superiority between the two

methods [3]. In this context we undertook the present study in our institution to evaluate the immediate results of comparative study of a uncemented modular bipolar hemiarthroplasty with cemented modular hemiarthroplasty in the geriatric population.

Methods

This is a study of patients with fracture neck of femur treated with either uncemented hemiarthroplasty or with cemented hemiarthroplasty in age group 50 years and above attending Orthopaedic Surgery Department at Railway Hospital, Perambur, Chennai and ethical clearance was obtained for the study.

This study includes 40 cases of hip fractures (displaced fracture neck of femur and trochanteric fractures) in elderly above 50 years of age of both sex treated by bipolar hemiarthroplasty during September 2014 to December 2015. All patients treated with bipolar hemiarthroplasty were selected randomly which included 18 males and 22 females. The age ranged from 50 years to 90 years, average being 70.03 years. Inclusion criteria were all patients with X-ray proven proximal femoral neck fractures above the age of 50 years treated with bipolar hemiarthroplasty with radiological evidence of intra capsular fracture neck of femur and are willing for surgery and life style changes required post operatively. Exclusion criteria were patients with preexisting sepsis and were bedridden before injury for some other cause and hence treated non-operatively.

Results

40 elderly patients with displaced femoral neck fractures were treated surgically of which 20 patients had cemented prosthetic hemireplacement and the other 20 had uncemented prosthetic hemireplacement. The average age of the patients in our series is 70.03 years with a range of 50 to 90 years. In our series there were 22 female patients and 18 male patients. This shows preponderance of females over male patients. Out of 40 cases 24 cases (60%) were on the left side and 16 cases (40%) are on the right. Majority (97.5%) of the patients had minimal trauma most of them slipped and fell down on flat ground or in bathroom and were not able to walk or stand. Only one patient was involved in road traffic accident. Asociated disorders like Diabetes Mellitus, Hypertension, Chronic Obstructive Pulmonary Disease, Cerebrovascular Accident, Ischaemic Heart Disease, Anaemia, were present in about 23 cases (57.5%). In the uncemented group about 15 patients (75%) got operated within 7 days of admission; 5 patients (25%) got operated between 7-14 days of admission; whereas in the cemented group 12 patients (60%) got operated within 7 days of admission; 8 patients (40%) got operated between 7-14 days of admission. In neither of the groups did the surgery got delayed more than 14 days from admission.

In the uncemented group the mean duration of surgery was 70min with a mean amount of blood loss of 148ml, where as in the cemented group the mean duration of surgery was 113.5min and mean amount of blood loss being 287.50ml. The assessment was done as per the Harris Hip scoring system. In the uncemented group 4 patients (20%) had excellent results ; 14patients (70%) had good results and 2 patients (10%) had fair results ; whereas in the cemented group 3 patients (15.79%) had excellent results ; 10 patients (52.63%) had good results; 5 patients (26.32%) had fair results and one patient (5.26%) had poor functional result.

Table 1: Distribution of sample by criteria of total functional results by Harris Hip Score at 6 Months

Harris Hip Score At 6 Months Results				
	Un Cemented		Cemented	
Criteria	**Frequency**	**Percentage**	**Frequency**	**Percentage**
Excellent	4	20%	3	15.79%
Good	14	70%	10	52.63%
Fair	2	10%	5	26.32%
Poor	0	0	1	5.26%
Total	20	100%	19	100%
Pvalue	0.589 – statistically insignificant			

The complications were distributed in both groups. There were no incidences of periprosthetic fractures in both the groups. One case (5%) of superficial infection which responded to antibiotics with regular dressing & one case of bed sore which was superficial grade 1 were noted. In the cemented group we had one case (5%) of dislocation on the 4thpostoperative day, for which closed reduction was done under general anaesthesia. There was single death (5%) in the group as a result lost to follow up after 6 month of the procedure, cause of which is myocardial infarction.

Discussion

In the uncemented group the mean duration of surgery was 78.25 min with a mean amount of blood loss of 176 ml, where as in the cemented group the mean duration of surgery was 111.5 min and mean amount of blood loss being 310.50 ml. The difference in the duration of surgery and the amount of blood loss was significant (P= 0.0001) between the groups considering the age and associated morbidity with the patients. Wender Figved[5], *et al* reported duration of 70.2 min with a blood loss of 300 ml in uncemented group and 82.6 min with a blood loss of 390 ml in the cemented group. Jaimo Ahn, Li-Xing Man [6] *et al*, in their study recorded two operative parameters of blood loss and surgical times were lower for the uncemented cohorts. The weighted average blood loss was 476 mL for the cemented and 338 ml for the uncemented groups. Surgical time was greater for the cemented cohort than the uncemented (95 minutes versus 80 minutes, respectively) [6].

In our study there was no statistical difference in the pain scoring (p value=0.088) between the cemented and uncemented groups, which matches with the other similar studies like, Jaimo Ahn, Li-Xing Man [6] *et al*, who noted persistence of pain did not reach statistical significance between groups. Wender Figved [5], *et al* reported there were no differences in pain scores and use of analgesics. Hansen *et al* did not find any statistically significant difference in pain score between the groups [7]. Where as in some studies like M. I. Parker [8], *et al* concluded that degree of residual pain was less in those treated with a cemented prosthesis (p<0.0001) three months after surgery. R.J. Khan [9] *et al*, by prospective assessment revealed a highly statistically significant greater deterioration in pain (P=0.003), walking ability (P=0.002), use of walking aids (P=0.004) and activities of daily living (P=0.009) in the uncemented group

The results in our study did not show any statistical difference in the evaluation of limp (P= 0.088), ability to walk (P = 0.439) and use of walking aids (P = 0.270) which matches with other similar studies like Jaimo Ahn, Li-Xing Man [6], *et al* ; Wender Figved [5], *et al* ; Hansen [7], *et al*. Whereas R.J. Khan [9], *et al*. by prospective assessment revealed a highly statistically significant greater deterioration in pain (P=0.003), walking ability (P=0.002), use of walking aids (P=0.004) and

activities of daily living (P=0.009) in the uncemented group.
In the uncemented group 4 patients (20%) had excellent results; 14 patients (70%) had good results and 2 patients (10%) had fair results with the mean Harris hip score of 85; whereas in the cemented group 3 patients (15.79%) had excellent results; 10 patients (52.63%) had good results; 5 patients (26.32%) had fair results and one patient (5.26%) had poor functional result, with the mean Harris hip score of 81. There was no statistically significant difference in the functional outcome (P = 0.589) between the two groups in our study. And our study results match other similar studies mentioned below.

Table 2: Showing mean Harris hip scores at 6 months in the comparable clinical studies

Clinical Studies	Mean Harris Hip Functional Scoring	
	Uncemented	Cemented
Wender Figved [5], *et al*.	79.8	78.9
Our Study	85	81

In the study done by Wender Figved [5], *et al*, for Harris hip scoring, the results were equivalent and there were no differences in ability to walk, use of analgesics, or place of living. In another study done by Jaimo Ahn, Li-Xing Man[6] *et al*, postoperative mortality rates, overall complications, and pain were similar between the two cohorts. There was no significant difference between the 2 groups of patients regarding most variables. S. Santini, *et al* [10], Hansen[7] *et al* compared complications, reoperations and mortality and they did not find any statistically significant difference between the groups. Deangelis JP [11] *et al* found that in the treatment of nonpathologic displaced femoral neck fractures, the use of cemented and uncemented femoral components is associated with similar functional outcome at 6 months. At 30-day, 60-day, and 1-year follow-ups, no clinically or statistically significant differences were found in mortality, disposition, need for assistance with ambulation.
M. I. Parker [8], *et al*, in their study noted no statistically significant difference between the cemented and the uncemented groups with regard to mortality, implant-related complications, re-operations or post-operative medical complications.
To conclude both cemented and uncemented hemiarthroplasty are equally good options in the treatment of proximal femoral fractures in the elderly. The duration of surgery and intraoperative blood loss were less in the uncemented group as compared to cemented hemiarthroplasty group. The complications were distributed in both cemented and uncemented hemiarthroplasty group and were statistically insignificant.

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Declarations
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