

**Clinical Article**  
**Orthopaedics**

# COMPARISON OF FUNCTIONAL OUTCOME BETWEEN CEMENTED AND UN-CEMENTED HEMIARTHROPLASTY AMONG THE ELDERLY PATIENTS WITH FRACTURE NECK OF FEMUR

**Kandasamy Ganeshshankar Kandasamy<sup>1</sup>,  
Kandasamy Meenakshi Sundaram<sup>1</sup>, Shankar  
Radhakrishnan<sup>2</sup>**

<sup>1</sup> - Assistant Professor, Department of Orthopaedics,  
Vinayaka Missions Kirubananda Variyar Medical College  
&Hospital, Salem.

<sup>2</sup> - Associate Professor, Department of Orthopaedics,  
Vinayaka Missions Kirubananda Variyar Medical College  
&Hospital, Salem.

**Corresponding Author:**

Dr. Kandasamy Ganeshshankar Kandasamy  
Assistant Professor

Department of Orthopaedics  
Vinayaka Missions Kirubananda Variyar Medical College  
&Hospital, Salem.  
email: kgksamy@gmail.com

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**Abstract:**

**Background:** The most common treatment for a displaced femoral neck fracture in the elderly is hemiprosthes. In the treatment of displaced femoral neck fractures with hemiarthroplasty in elderly patients the use of bone cement is a controversial topic. A cemented hemiarthroplasty has been used in the majority of cases in most countries, but the non-cemented prosthesis is gaining popularity.

**Aim:** To assess and compare the efficacy of cemented and un-cemented bipolar hemiarthroplasty prosthesis in patients with femoral neck fractures.

**Materials and methods:** A prospective longitudinal study was conducted at Vinayaka Missions Kirubananda Variyar Medical College and Hospital in the department of Orthopaedics for a period of two years. All patients with isolated femoral neck fracture and aged above 60 years were included in the study. A total of 60 patients were included in the study and were randomly divided into two groups. Group A patients received cemented prosthesis and group B patients received un-cemented prosthesis. Patients were discharged after two weeks of post-operative period and were followed up at the end of 6 weeks, 3 months and 1 year. During the follow up period in each visit the patient's functional and radiological assessment was made. The functional outcome was measured by using modified Harris hip score.

**Results:** The mean duration of surgery was less in un-cemented hemiarthroplasty (75.4 mins) compared to cemented hemiarthroplasty

(92.8 mins) and the difference in time was found to be statistically significant. Similarly the intra-operative blood loss was more in cemented group than the un-cemented group and the difference was statistically significant. Majority of the patients who had cemented hemiarthroplasty had their modified Harris hip score in the range of good compared to the patients who had un-cemented hemiarthroplasty, where their score was in the range of fair and the difference was found to be statistically significant. The mean score of the patients who underwent un-cemented hemiarthroplasty was 79.8 and for cemented hemiarthroplasty it was 85.5. In the radiological assessment four patients in the un-cemented hemiarthroplasty group showed a varus deformity.

**Conclusion:** The present study concludes that functional outcome of cemented hemiarthroplasty was better than the un-cemented hemiarthroplasty though the operative time and the blood loss was more among the cemented group it had not led to any major complications.

**Key words:** fracture neck of femur, cemented and un-cemented hemiarthroplasty, functional outcome.

## Introduction

The lifetime risk of fracture neck of femur is 9% in a female aged 50 years and above and it rises to 12% at 70 years and 18% by 90 years and it is not so much different among males. The incidence of femoral neck fracture occurs in two different patient populations. A group of young patients subjected to high-energy trauma constitute about 3% to 5%. But the majority of these fractures occur in older patients caused due to a trivial fall from standing position.<sup>1</sup>

The limited and unprotected blood supply to the femoral head, the intra capsular location of these fractures and osteoporosis are the major factors that inhibit healing leading to avascular necrosis of femoral head.<sup>2</sup> Despite continued discussion regarding the treatment of these fractures, controversies continue regarding their optimal treatment, including the choice of implant and fixation method.<sup>3-5</sup>

Surgery is the first choice of treatment for femoral neck fractures. Internal fixation had a high failure rate resulting in nonunion and avascular necrosis. These complications were addressed with the advent of hemiarthroplasty of the femoral neck. Although some authors have reported better results with internal fixation<sup>6</sup>, hemiarthroplasty is still accepted as the optimum treatment for displaced femoral neck fractures in most elderly patients.<sup>7</sup> Total hip arthroplasty is an alternative for active patients with a long life expectancy and arthritic joints.

The most common treatment for a displaced femoral neck fracture in the elderly is hemiprosthesis. In the treatment of displaced femoral neck fractures with hemiarthroplasty in elderly patients the use of bone cement is a controversial topic. A cemented

hemiarthroplasty has been used in the majority of cases in most countries, but the non-cemented prosthesis is gaining popularity. Parker et al. concluded that there is only limited evidence from randomised studies that cementing prosthesis in place may reduce the amount of post-operative pain and may lead to improved mobility.<sup>8</sup>

Cementing has potential physiologically adverse side effects. The major side effects cardiac arrhythmias and cardio-respiratory collapse, which occasionally occur upon in cementing are potentially fatal complications are caused either by embolism from marrow contents forced into the circulation or by a direct toxic effect of the cement.<sup>9</sup> Transesophageal echocardiography could be used to monitor emboli during surgery, but logistics prevent this in our centres. Pittoetalin his study had shown severe embolic events and intraoperative pulmonary impairment was minimal during fixation of the cemented than un-cemented femoral component in total hip arthroplasty.<sup>10</sup> Clark et al found a transient but significant reduction in cardiac output and stroke volume for those receiving cemented prosthesis.<sup>11</sup>

In non-cemented prosthesis, bone quality is of importance; this is generally poor in elderly patients. LaPorteetal stated two relative contraindications for non-cemented total hip prosthesis: interference with bone in-growth and inability to achieve a congruent fit; both of these preclude establishment of rigid initial stability.<sup>12</sup>

After the introduction of modular hemiarthroplasty to hip fracture surgery in recent years, a number of prospective trials comparing cemented and uncemented hemiarthroplasty have been published, with almost

similar results for both.<sup>13-15</sup> However, in a recent registry study comparing (mostly modular) cemented and un-cemented hemiarthroplasty, more reoperations were detected in patients treated with uncemented hemiarthroplasty.<sup>16,17</sup> As of today very few studies had compared the cemented and un-cemented prosthesis for hemiarthroplasty in India and so this study would throw some light on the advantages and disadvantages between these two prosthesis.

## Aim

To assess and compare the efficacy of cemented and un-cemented bipolar hemiarthroplasty prosthesis in patients with femoral neck fractures.

## Methodology

A prospective longitudinal study was conducted at Vinayaka Missions Kirupananda Variyar Medical College and Hospital in the department of Orthopaedics for a period of two years between Feb 2014 and Jan 2016. All patients with isolated femoral neck fracture and aged above 60 years were included in the study. Patients aged below 60 years with multiple trauma and history of osteoarthritis of hip joint were excluded from the study. A total of 60 patients were included in the study and were randomly divided into two groups. Group A patients received cemented prosthesis and group B patients received un-cemented prosthesis. Complete Medical evaluation was conducted to rule out underlying medical illness. All the patients were subjected for pre-anesthetic evaluation and adequate amount of blood were arranged during the time of surgery. Patient is then subjected to surgery under appropriate anesthesia. Patients underwent a bipolar hemiarthroplasty with either a

cemented or an uncemented prosthesis. The arthroplasties were performed through a posterior approach with the patient in a lateral decubitus position using spinal anaesthesia.

Postoperative management was done as per the protocol which includes postoperative ICU care, monitoring of vitals, adequate blood transfusion, antibiotic prophylaxis and DVT prophylaxis. Pain management was done by injectable NSAIDs on operative day and oral pain management was started from the 2<sup>nd</sup> postoperative day. Patients were on IV antibiotics till 6<sup>th</sup> post-operative day and suture removal was done on the 10<sup>th</sup> day. In the immediate post op period the hip is positioned in approximately 15° of abduction by using an abduction pillow to prevent postoperative dislocation. Preoperatively all the patients were counseled about the post op rehabilitation viz. to avoid squatting, avoid to sit on the floor cross legged, and to avoid strenuous activity. Static quadriceps exercises were started and patients were made to sit up on the bed from the first postoperative day. Gait training was started on the 3<sup>rd</sup> post-operative day. A walker for balance and stability was used as an aid.

Patients were discharged after two weeks of post-operative period and were followed up at the end of 6 weeks, 3 months and 1 year. During the follow up period in each visit the patients functional and radiological assessment was made. The functional outcome was measured by using modified Harris hip score which is a 100 point score which measures pain, gait, functional activity, deformity and range of motion. It is graded as score < 70 – poor, 70-79 – fair, 80 – 90 – good, 90-100 – excellent. The radiological assessment was done for assessing

the signs of loosening, migration of the prosthesis and implant failure. Data were entered and analysed by statistical analysis using SPSS version 21. Mean and standard deviation was calculated for all parametric variables and the comparison of the functional outcome between the two groups was analysed by using chi-square test.

## Results

Table 1 shows the age and sex wise distribution of the study population. It is seen from the table that majority of the study subjects were more than 70 years of age and the age group distribution between the two groups were almost equal and in both the groups females were higher in number than the males. The mean age of the study subjects ranged between 71 – 73 years. For majority of the study subjects the time duration between fracture and surgery was 6 – 10 days and it ranged from minimum 1 day to maximum 17 days. There was no statistically significant difference in the time interval between the two groups (table 2). All our patients had acquired the fracture due to trivial trauma and examining their general condition we found 12% of them were anemic, 24% were diabetes and 32% were hypertensives and they were almost equally distributed between the two groups. The mean duration of surgery was less in un-cemented hemiarthroplasty (75.4 mins) compared to cemented hemiarthroplasty (92.8 mins) and the difference in time was found to be statistically significant. Similarly the intra-operative blood loss was more in cemented group than the un-cemented group and the difference was statistically significant (table 3) and so maximum blood transfusion was given for the patients who underwent

cemented hemiarthroplasty.

Taking into consideration of the five factors namely pain, gait, functional activity, deformity and range of motion we calculated the modified Harris hip score for all the patients during the time of follow-up and it was compared with their base line score. It is seen from the table 4 that during their first follow-up period there was a slight reduction in the score in both the groups but in the subsequent follow-up the score had shown a statistically significant improvement in both the groups. But when comparing between the two groups for majority of the patients who had cemented hemiarthroplasty had their modified Harris hip score in the range of good compared to the patients who had un-cemented hemiarthroplasty, where their score was in the range of fair and the difference was found to be statistically significant ( $p < .05$ ) (table 5).

There was no abnormality detected in radiological examination during the follow-up period among the patients who underwent cemented hemiarthroplasty, whereas 4 (13.3%) patients in the un-cemented hemiarthroplasty group showed a varus deformity in their radiological assessment during their follow-up and the difference was found to be statistically significant (table 6).

**Table 1: Age and sex wise distribution of the study population**

Age group	Cemented hemiarthroplasty (n=30)		Un-cemented hemiarthroplasty (n=30)		Chi-square value	P value
	Male	Female	Male	Female		
60-65	1 (11.1%)	4 (19%)	0	3 (15.7%)	4.213	0.219
66-70	3 (33.3%)	5 (23.8%)	3 (27.2%)	4 (21%)		
70-75	5 (55.5%)	0 (47.6%)	6 (54.5%)	9 (47.3%)		
>75	0	2 (9.5%)	2 (18.1%)	3 (15.7%)		
Total	9 (100%)	2 (100%)	1 (100%)	1 (100%)		
Mean age ± SD	71.8 ± 3.6	72.6 ± 4.2	72.1 ± 4.8	73.4 ± 4.1		

**Table 2: Distribution of study subjects based on duration between time of fracture and surgery**

Time from fracture to surgery	Cemented hemiarthroplasty (n=30)	Un-cemented hemiarthroplasty (n=30)	Chi-square value	P value
1 - 5 days	12 (40%)	14 (46.6%)	2.365	0.515
6 - 10 days	11 (36.6%)	10 (33.3%)		
11-15 days	5 (16.6%)	6 (20%)		
>15 days	2 (6.6%)	0		
Total	30 (100%)	30 (100%)		

**Table 3: Duration of surgery and the amount of blood loss between the two groups**

Variable	Cemented hemiarthroplasty (n=30)	Un-cemented hemiarthroplasty (n=30)	P value
Mean duration of surgery (in mins)	92.8 ± 10.4	75.4 ± 11.8	<.0001*
Blood loss of more than 300 ml	24	4	<.0001**

\*p value derived by applying student 'T' test

\*\*p value derived by applying chi-square test.

**Table 4: Functional outcome measurement between the two groups by using modified Harris hip score during the follow-up period**

Type of hemiarthroplasty	Baseline score	End of 6 weeks	3 months	12 months	P value
Cemented	78.3	74.2	79.8	85.5	<.0001
Un-cemented	77.6	76.8	78.2	79.8	0.03

P value derived by using Chi-square test

**Table 5: Functional outcome of the study subjects at the end of 1 year**

Modified Harris hip score	Un-cemented	Cemented	P value
Excellent	0	1 (3.3%)	<.001
Good	11 (36.6%)	24 (80%)	
Fair	19 (63.3%)	5 (16.6%)	
Poor	0	0	

P value derived by using Chi-square test

**Table 6: Radiological assessment of the study subjects at the end of 1 year**

Radiological feature	Un-cemented	Cemented	P value
Varus deformity	4	0	<.0001
No abnormality detected	26	30	
Total	30	30	

P value derived by using Chi-square test

**Discussions**

Our series is no exception to the fact that the fractures of the neck of femur are more common in elderly population. The global epidemiology of these fractures also admits this fact. Unfortunately the exact epidemiological factors among Indian population have not been documented well in the literature. In our study majority of the patients were aged 70 years and above with a mean age of 72 with female preponderance, which is mainly due to the fact that osteoporosis is one of the main risk factor for fracture neck of femur, which is more common among females. Khan etal<sup>18</sup> and Santini etal<sup>19</sup> also noted the same age group and sex.

Because of high complications and mortality rate with nonoperative treatment, recent studies are on the introduction of operative treatment that has the lowest cost and complications and results in better functional outcome in older people. Among the available surgical procedure hemiarthroplasty is more preferred.<sup>20</sup> This method can be performed with both unipolar and bipolar prosthesis. Among the two, bipolar prosthesis is commonly used as it causes less erosion and protrusion in acetabulum (outer bearing). Moreover, femoral neck length and head size are variable and can be converted to THA. Therefore some studies have shown better outcomes with this prosthesis for femoral neck fracture treatment in elderly. Recently, some studies have evaluated the indications for performing hemiarthroplasty with or without the use of cement which had different results.<sup>21,22</sup>

Majority of our study patients sustained the injury due to a trivial trauma like tripping or slipping. This is a very common occurrence in elderly population where poor vision and lack of neuromuscular coordination is a problem and it was almost in par with the study done by TS Raghvendra etal.<sup>23</sup>

In the current study it was proven that intraoperative blood loss and the duration of surgery was more among the cemented group than the un-cemented group which was found to be statistical significant and similar type of results was also shown in the studies done by Haidukewych etal<sup>24</sup> and Drinker and Murray<sup>25</sup> but few studies did not show any difference between the two groups.<sup>26,27</sup>

Deep vein thrombosis, pulmonary emboli, fat emboli and displacement of fracture of femoral neck are few post-operative complications reported in the previous studies which was more common among cemented hemiarthroplasty but in our study we did not experience any kind of these complications.<sup>15,26,27</sup>

In our study we found improved functional outcome in terms of reduction in pain, gait stability and range of movements in both the groups over a period of 1 year, but when assessed through modified Harris hip score we found the mean score was 85.5 among the cemented group and it was 79.5 among the uncemented group at the end of 1 year and the difference was found to be statistically significant and many of the studies done previously are almost in par with our study.<sup>18,26,28,29</sup> Other researches suggested that there was no clinically or statistically significant difference in the postoperative hip function recovery.<sup>19,30</sup> Whereas a study done by Gjertsen et al<sup>31</sup> had shown that the risk of revision hemiarthroplasty in cemented group was 2.1 times higher compared to uncemented.

Radiological assessment in the present study had shown that 4 patients in the uncemented group had developed varus deformity whereas in cemented group none of the patients had developed and a similar type of result was also observed in a study done by Jameson SS et al<sup>32</sup> in which he found reoperation was warranted among the uncemented group than the cemented group.

### Conclusion

The present study concludes that functional outcome of cemented hemiarthroplasty was better than the uncemented hemiarthroplasty though

the operative time and the blood loss was more among the cemented group it had not led to any major complications. One of the limitation of our study is we had not evaluated the degree of intra-prosthetic motion at the inner-bearing because of lack of facilities in our institution, as few studies had claimed that the motion at the inner-bearing reduces over time and most prostheses behave as unipolar prostheses over a period of time.

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