

Cemented Versus Uncemented Hemiarthroplasty of the Hip for Displaced Neck of Femur Fractures: A Prospective Comparative Study

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Abstract

Aim: To study the advantages, complications, morbidity and mortality rates, the recovery to physical independence encountered in cemented and uncemented hemiarthroplasty for displaced neck of femur fractures.

Methodology: The prospective comparative study was conducted in the department of Orthopaedics, Darbhanga medical College and Hospital, Laheriasarai, Darbhanga, Bihar, India from Jan 2019 to December 2019. included 50 cases of intracapsular fracture neck of femur in the elderly aged more than 60 years where 25 patients were treated by hemiarthroplasty using uncemented fenestrated prosthesis whereas 25 patients were treated with hemiarthroplasty using cemented non-fenestrated prosthesis. Follow-up was performed at 6 weeks, 3 months, 6 months, and 1 year after the surgery. The intensity of the pain (based on visual analog scale), hip function (according to Harris hip score), and postoperative complications were recorded. All data including age, sex, type of treatment, intraoperative bleeding volume, the mortality rate (during surgery until discharge), and treatment costs were collected by a questionnaire and checklist and analyzed.

Results: The mean age was 68.87 ± 6.24 years with the cemented cohort and 66.35 ± 7.38 years in the uncemented cohort. Of these, 21 (42%) were men and 29 (58%) were female. The most common mechanism of injury was a trivial fall (90%) as opposed to a road traffic accident (10%). The mean operation time was 98.35 minutes in the cemented group and 62.45 minutes in the uncemented group. The mean of the intraoperative bleeding volume was 286.35 cc and 184.25 cc in cement and uncemented groups, respectively. No significant difference was seen between cemented and uncemented methods in terms of functional outcome (HHS score) and VAS score. The intraoperative and postoperative total complication rate was 20% in cemented cohort and 24% in the uncemented cohort which was not statistically significant ($P < 0.05$).

Conclusion: In this study, no significant difference was seen between cemented and uncemented methods in terms of functional outcome. Cemented hemiarthroplasty results in more blood loss and takes more operative time but is associated with less postoperative pain and complication and better functional outcome.

Keywords: Hemiarthroplasty, femur, fracture.

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Introduction

The fracture neck of the femur is associated with one of the most serious health problems affecting the geriatric population. It is associated with a high risk of morbidity, low quality of life, and premature mortality. It has always presented great challenges for orthopedic surgeons. The incidence of hip fractures is 159/100,000 population in India and out of these 50% are fracture neck of the femur [1]. The incidence of these fractures is expected to be double in the next twenty years and triple by 2050. The prevalence of fracture also doubles for each decade after the fifth decade. With an increase in the geriatric population, the burden of this fracture and its sequelae continue to be on the rise. Incidence of femur neck fracture in young is low and it is due to high-velocity trauma whereas its incidence is high in the elderly and is mainly a result of low energy falls.

Major risk factors associated with fracture neck femur are osteoporosis (particularly in postmenopausal women), female sex, increasing age, tobacco and alcohol consumption, metastatic disease, and metabolic bone diseases. Non-operative treatment of fracture neck of femur includes bed rest with or without traction. This results in the increased incidence of non-union, secondary displacement, and avascular necrosis [2]. Surgical treatment is the open or close reduction and internal fixation using cannulated screws or sliding hip screw. Sometimes this is associated with non-union, AVN, Implant failure. Reconstruction options include hemiarthroplasty (HA) - unipolar or bipolar and total hip arthroplasty [2, 3].

According to the method of implant fixation, hemiarthroplasty prosthesis can be divided into 2 different types: cemented and uncemented hemiarthroplasty. The use

of uncemented components is known to increase the risk of periprosthetic fracture, and recent data from Rogmark [4] showed a greater risk of reoperations for uncemented hemiarthroplasty in patients with a fracture of the hip. Although cemented fixation has been the standard treatment for patients with a femoral neck fracture, there are reports that the process of cementation increases the risk of cardiopulmonary events [5]. Another disadvantage is that revision hemiarthroplasty will be more difficult in cemented hemiarthroplasty. The question is whether these complications could be avoided by using uncemented fixation.

In cemented hemiarthroplasty, polymethylmethacrylate bone cement is used during surgery to create a solid bone-implant interface. Cemented bipolar prosthesis is associated with less post-operative thigh pain, as the prosthesis is firmly fixed within the femur [3]. Bone Cement Implantation Syndrome (BCIS) is side effect of using cement. The syndrome is potentially life threatening and is characterized by hypoxia and/or hypotension in combination with an unexpected loss of consciousness. However, advantages are early ambulation.

Uncemented hemiarthroplasties are placed press-fit in the femur. In the weeks after the surgery, the bond between the femur and the stem is dependent on osseous integration. However, bone quality is generally poor in the elderly, which may lead to periprosthetic fractures during press fit placement or inadequate bony ingrowth post-operatively [4], loosening of the implant, pain, and gait abnormality. This study has been carried out to study the advantages, complications, morbidity and mortality rates, the recovery to

physical independence encountered in each of the procedure and to draw a conclusion based on study results as to which of the above type of implant and type of fixation would be better in the management of fracture neck of the femur.

Methodology:

The prospective comparative study was conducted in the department of Orthopaedics, Darbhanga medical College and Hospital, Laheriasarai, Darbhanga, Bihar, India from Jan 2019 to December 2019. included 50 cases of intracapsular fracture neck of femur in the elderly aged more than 60 years where 25 patients were treated by hemiarthroplasty using uncemented fenestrated prosthesis whereas 25 patients were treated with hemiarthroplasty using cemented non-fenestrated prosthesis. Patients of age more than 60 years with the closed displaced neck of femur fracture were included in this study. Patients with basicervical neck femur fracture, valgus impacted fracture, pathological fracture, associated with other fractures such as ipsilateral shaft femur fracture and acetabulum fracture, active infection around the hip, and surgically unfit patients were excluded from the study. Written informed consent was obtained from patients participating in the study.

Follow-up was performed at 6 weeks, 3 months, 6 months, and 1 year after the surgery. The intensity of the pain (based on visual analog scale), hip function (according to Harris hip score), radiological signs of patient's x-ray (the presence or absence of acetabular erosion, loosening of the prosthesis, heterotopic ossification), and postoperative complications were recorded. All data including age, sex, type of treatment, intraoperative bleeding volume, the mortality rate (during surgery until discharge), and treatment costs were collected by a questionnaire and checklist and analyzed.

Results:

The mean age was 68.87 ± 6.24 years with the cemented cohort and 66.35 ± 7.38 years in the uncemented cohort. Of these, 21 (42%) were men and 29 (58%) were female. The most common mechanism of injury was a trivial fall (90%) as opposed to a road traffic accident (10%). The mean operation time was 98.35 minutes in the cemented group and 62.45 minutes in the uncemented group. The mean of the intraoperative bleeding volume was 286.35 cc and 184.25 cc in cement and uncemented groups, respectively ($P < 0.05$).

Table 1: Demographic and operative variables of two groups of study patients

Variables	Uncemented (N=25)	Cemented (N=25)	P-value
Age(year) (Mean \pm SD)	66.35 \pm 7.38	68.87 \pm 6.24	0.046
Male (%)	11 (44)	10(40)	0.842
Female (%)	14 (56)	15(60)	
Right side (%)	12 (48)	09 (36)	0.503
Left side (%)	13 (52)	16 (64)	
Garden Type 3	10 (40)	08 (32)	0.633
Garden Type 4	15 (60)	17 (68)	
Injury due to fall	22 (88)	23 (92)	0.710
Injury due to RTA	03 (12)	02 (08)	
Blood Loss (in ml)	184.25 \pm 11.64	286.35 \pm 20.43	0.001
Operative Time (in min)	62.45 \pm 5.25	98.35 \pm 7.27	<0.001

In the uncemented cohort, the average vas score is 2.87 at 6 weeks, at 6 months is

1.69 and at 12 months is 1.12 whereas, in the cemented cohort, the average vas score

at 6 weeks is 2.58, at 6 months is 1.35 and at 12 months is 1.04. There was no statistical significance at 6 weeks and 12 months.

Harris hip score (HHS) assesses the overall function of the hip following bipolar hemiarthroplasty. In the

uncemented cohort, the average HHS score is 66.14 at 6 weeks, at 6 months is 72.96 and at 12 months is 80.22 whereas, in the cemented cohort, the average HHS score at 6 weeks is 69.73, at 6 months is 76.33 and at 12 months is 85.18. No statistical significance is observed.

Table 2: Average VAS score and average Harris Hip Score of both the groups

Variable	Type of group	6 weeks	6 months	12 months
Average VAS Score	Cemented	2.58	1.35	1.04
	Uncemented	2.87	1.69	1.12
Harris Hip Score (HHS)	Cemented	69.73	76.33	85.18
	Uncemented	66.14	72.96	80.22

In the uncemented cohort, 5 patients (20%) had excellent results; 7 patients (28%) had good results and 8 patients (32%) had fair results and 5 patients (20%) had poor results; whereas in the cemented cohort, 8 patients (32%) had excellent results; 11 patients (44%) had good results; 3 patients

(12%) had fair results and 3 patients (12%) had poor functional result. The intraoperative and postoperative total complication rate was 20% in cemented cohort and 24% in the uncemented cohort which was not statistically significant ($P < 0.05$)

Table 3: Comparison between total functional outcomes at 12 months.

Criteria	Uncemented		Cemented	
	Frequency	Percentage	Frequency	Percentage
Excellent	5	20	8	32
Good	7	28	11	44
Fair	8	32	3	12
Poor	5	20	3	12
Total	25	100	25	100
P value	0.077 – statistically insignificant			

Table 4: Distribution of complications in both the groups

Complications	Uncemented		Cemented		P-value
	Frequency	Percentage	Frequency	Percentage	
Death	0	0	0	0	>0.05
Periprosthetic fracture	1	4	0	0	
Deep Infection	0	0	0	0	
Superficial Infection	2	8	1	4	
Dislocation	0	0	1	4	
Bedsore	3	12	2	8	
BCIS	0	0	0	0	
Sciatic Neuropraxia	0	0	1	4	

Discussion:

Hemiarthroplasty is the most commonly used treatment for displaced femoral neck

fractures in the elderly. Although the number of randomized trials is increasing, there are still problems with diversity of implants that are studied, short follow-up

time, and interpretation of functional results versus reoperation and, maybe most important, rates of subsequent fractures [7-9]. The most common fixation method of the femoral stem has been cementing with PMMA bone cement. However, this method has some disadvantages. The duration of surgery is longer than in uncemented techniques and blood loss is also more in cemented than in uncemented techniques.

In the most recent Cochrane report on arthroplasties for proximal femoral fractures, the authors conclude that there is reasonable evidence to indicate that cemented prostheses will reduce pain and result in improved mobility. However, they also state that it is possible that these differences may not exist for a hydroxyapatite-coated uncemented prosthesis. They also conclude that trials of older hemiarthroplasties like Thompson and Austin Moore are of less relevance today [8].

In our study, improvement in terms of functional outcome (HHS) and pain score (VAS) was observed from 6 weeks to 12 months in both cemented and uncemented hemiarthroplasty but was not found to be statistically significant. However better HHS and VAS are observed in cemented hemiarthroplasty. Figved et al [10] found after comparing a cemented hemiarthroplasty with an uncemented, hydroxyapatite-coated implant that mean Harris hip score showed equivalence between the groups throughout the follow-up period of 1 year. In the uncemented group, the mean duration of surgery was shorter and the mean intraoperative blood loss was found to be less. The Barthellu Index and EQ-5D scores did not show any differences between the groups. The rates of complications and mortality were similar between groups. They concluded that both arthroplasties may be used with good results after displaced femoral neck fractures.

Previous studies reported a longer operation time in patients with cemented stems, comparable to our study, or revealed no difference in outcome after cemented versus cementless BHA.

[11-14]

The difference in operation time in the present study seems to be attributable to cement manipulation time, and this may differ depending on surgeon's technical skills. Despite the difference in operation time, there was no significant difference in intraoperative blood loss volume between the two groups, while a significant difference was observed in the postoperative volume of blood drained ($P < 0.05$). The result showing no difference in intraoperative blood loss between two groups can be interpreted that cement manipulation had insignificant influence in surgical procedure to bring changes in intraoperative blood loss under condition that patients in two groups have the same bleeding tendency, and this may also differ depending on surgeon's surgical skills. Postoperative blood loss volume was significantly greater in the uncemented group, and this outcome was comparable to the finding of Park et al. [14,15] On the other hand, Ng and Krishna and Figved et al. reported a higher intraoperative bleeding volume in the cemented group.

[12, 13]

Conclusion:

In this study, no significant difference was seen between cemented and uncemented methods in terms of functional outcome. Cemented hemiarthroplasty results in more blood loss and takes more operative time but is associated with less postoperative pain and complication and better functional outcome.

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