

Original research article

A Prospective Study on Bipolar Hip Arthroplasty in Fractures of Femur in Adults Patients

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Abstract

Background: There is still controversy about the choice of treatment of displaced fractures of the neck of femur which leads the best clinical and functional outcomes. Treatment options include internal fixation, unipolar or bipolar hemiarthroplasty, or total hip replacement.

Aim: The aim of this study is to find out which treatment option can lead to the best clinical and functional outcomes.

Material and Methods: Fifty one consecutive patients study conducted from (Jan 2020 to Oct 2020) at Department of Orthopaedics, Moti Lal Nehru Medical College, Prayagraj. ,were selected. Preoperative and operative data was retrieved from inpatient hospital files.

Results: Postoperatively, Thirty three patients (89.2%) either returned to the functional level that they had had before the fracture or used only a cane, which they had not needed before.

Conclusion: In our study, the bipolar hemiarthroplasty has served us well. Two-year results of total hip replacement appeared to be better than those of bipolar hemiarthroplasty, but this finding was based on relatively small numbers of patients.

Keywords: Hemiarthroplasty ,Neck of femur

Introduction

Fracture of the neck of femur is among the most serious medical problems affecting older group. Economically, these fractures constitute a large burden on healthcare[1]. The incidence of fracture of the neck of femur increases dramatically after the age of 70 years. Also the overall number is increasing because of increase in the mean age of the population[2,3]. Significant mortality during the first year after a fracture of the neck of femur is documented. The aim of most methods of treatment should be early mobilization to avoid complications of recumbency[4]. There is still controversy about the choice of treatment of displaced fractures of the neck of femur[5]. Internal fixation either by multiple screws or sliding plate is associated with less operative trauma but complications such as displacement of the fracture, non-union,

and avascular necrosis may require revision subjecting the already high-risk patients to further revision surgery[6]. Some studies recommend internal fixation only in frail patients[5]. These complications led most surgeons to treat these fractures by hemiarthroplasty to allow full weight bearing day one after operation[7]. The results of hemiarthroplasty are initially better, but if the patient survives longer, then the function deteriorates. Failure in the form of infection, dislocation, and perioperative death happens early while increasing pain, loosening, and erosion of the acetabulum constitute the late complication[8]. The role of total hip arthroplasty for the treatment of displaced intracapsular fractures of the proximal femur in active patients is controversial. Some authors have shown that such patients, when treated with a bipolar or unipolar hemiarthroplasty, are at increased risk of developing acetabular erosion that might require later revision to a total hip replacement[8]. In fact, the results of some authors were not substantially different from those reported for elective total hip arthroplasty and were better than results reported for hemiarthroplasty[9]. However, other authors have strongly recommended avoiding total hip replacement in active elderly patients without pre-existing acetabular disease[10,11]. There have been only few studies, which have addressed the clinical, functional and the radiological follow up outcome of patients receiving bipolar prosthesis for fracture neck of femur. This study is designed to evaluate functional, clinical, and radiological outcomes following bipolar arthroplasty for neck of femur fractures.

Material and Methods:

Fifty one consecutive patients study conducted from (Jan 2020 to Oct 2020) at Department of Orthopaedics, Moti Lal Nehru Medical College, Prayagraj, were selected. Preoperative and operative data was retrieved from inpatient hospital files. The patients then were interviewed to fill a questionnaire form. Radiological data was retrieved from inpatient hospital files and outpatient files upon latest follow up visit in clinic. Functional outcomes were assessed with use of Harris hip score. The main clinical measures were mortality and a reoperation.

Results

Fifty one patients were enrolled in the study. All patients had a unilateral intracapsular hip fracture after falling from standing position to ground level. The mean age (years) of the patients was (77.43 ± 7.66), all patients were at least sixty years old. Thirty five patients (68.6%) were females. Thirteen patients (25.5%) used a walking aid (cane or walker) for long distances (>1 km) prior to fall down. Thirty one patients (60.8%) were taking some form of regular medication prior to the fracture. The mean duration from admission to surgery (days) was (1.11 ± 2.16). Forty one patients (80.4%) received block anesthesia. All patients received the same cemented femoral component. Most operations were performed through a transgluteal lateral approach (92.2%) with use of so-called second-generation techniques.

All operations were performed by surgeons with similar level of training. The mean operative time (minutes) was (94.21 ± 30.10) (Table 1). Thirty five patients (68.6%) needed blood transfusion preoperatively. Thirty five patients (68.6%) were ambulated by physiotherapist day one after surgery. The rest were ambulated on the second and third days after surgery. Two patients (3.9%) ambulated after three months due to medical complications postoperatively. The mean duration from surgery to discharge from hospital (days) was (6.35 ± 2.95). Postoperatively six patients developed deep vein thrombosis (DVT). Two patients developed DVT one month after surgery, one patient two months after surgery, two patients three months after surgery, and one patient six months after surgery. These six patients were all treated medically without any further complications. Two patients (3.9%) developed type I postoperative infection and received medical treatment in the form of IV and oral antibiotics. No patient developed hip dislocation. No patient underwent additional hip surgery.

Table 1: Shows the characteristics of the patients and details of the procedures performed. Data is presented as mean \pm SD (standard deviation) or number (percentage %) as appropriate.

Total number of patients	51
Age	77.43 \pm 7.66
Gender	
Female	35 (68.6%)
Male	16 (34.4%)
Prefracture mobility	
Unaided	38 (74.5%)
Cane	10 (19.6%)
Walker	3 (5.9%)
Past medical history	
None	20 (39.2%)
Hypertension	14 (27.4%)
Diabetes	3 (5.8%)
Hypertension & Diabetes	10 (19.6%)
Coronary artery disease	2 (4.0%)
Renal failure	2 (4.0%)
Duration from admission to surgery (days)	1.11 \pm 2.16
Anesthesia	
BA	41 (80.4%)
SA	4 (7.8%)
GA	6 (11.8%)
Approach	
Posterior	4 (7.8%)
Lateral	47 (92.2%)
Operative time (minutes)	94.21 \pm 30.10

The mortality rate after one year from surgery was 15.7%. At the time of latest follow up, (>1000 days), fourteen patients were dead of causes unrelated to the hemiarthroplasty leaving thirty seven patients for latest functional and radiological analysis.

The results of the patient questionnaires completed at latest follow up are summarized in [Table 2](#).

Table 2: Functional outcome of patients at latest follow up. Data is presented as mean \pm SD (standard deviation) or number (percentage %) as appropriate.

Pain	
None	17 (45.9%)
Slight	8 (21.6%)
Mild	7 (18.9%)
Moderate	4 (10.8%)
Marked	1 (2.7%)
Support	
None	19 (51.4%)
Cane (long walks)	7 (18.9%)
Cane (most of time)	7 (18.9%)
walker	4 (10.8%)
Distance walked	
Unlimited	21 (56.8%)
Six blocks (30 minutes)	6 (16.2%)
2-3 blocks (10-15 minutes)	3 (8.1%)
Indoors only	4 (10.8%)
Bed and chair only	3 (8.1%)
Limp	
None	18 (48.6%)
Slight	11 (29.7%)
Moderate	5 (13.5%)
Severe or unable to walk	3 (8.1%)
Activities-shoes, socks	
With ease	10 (27%)
With difficulty	15 (40.5%)
Unable to fit or tie	12 (32.4%)
Stairs	
Normally without using a railing	12 (32.4%)
Normally using a railing	17 (45.9%)
In any manner	1 (2.7%)
Unable to do stairs	7 (18.9%)
Public transportation	
Able to use transportation	20 (54.1%)
Unable to use transportation	17 (45.9%)
Sitting	
Comfortable, ordinary chair for one hour	32 (86.5%)
On a high chair for 30 minutes	3 (8.1%)
Unable to sit comfortable on any chair	2 (5.4%)
Harris score	72.25 (19.82)

Cementing grade was assessed on the immediate postoperative radiographs according to the criteria of Barrack et al. Thirty patients (81.1%) had Grade A. Seven (18.9%) patients had grade B. Radiographic data available at the latest follow up after a mean duration of twenty four months showed no detectable femoral stem subsidence or migration. Acetabular erosion (Grade 1) was seen in twelve patients (32.4%).

Table 3: Comparisons of morbidity and mortality rates.

	Our study	Hemiarthroplasty[12]	Internal fixation[1]	Total hip replacement[1]	P-value
Total number of patients	51	111	118	69	
Blood transfusion					
No	16 (31.4%)	93 (84%)	89 (75%)	46 (67%)	
Yes	35 (68.6%)	18 (16%)	29 (25%)	23 (33%)	<0.0001
1 Unit	9 (25.7%)				*+§
2Units	26 (74.3%)				
DVT	6 (11.8%)	0	4 (3%)	4 (6%)	0.074 § 0.004 + 0.298 +
Infection	2 (3.9%)	4 (4%)	8 (7%)	3 (4%)	0.999 *§
Septicemia	1 (2%)	1 (1%)	2 (2%)	1 (1%)	0.999*+§
Stroke	1 (2%)	3 (3%)	4 (3%)	2 (3%)	0.999*+§
Myocardial infection	3 (5.9%)	4 (4%)	1 (1%)	2 (3%)	0.043 + 0.471 *§
Pulmonary disease	2 (3.9%)	5 (5%)	2 (2%)	1 (1%)	0.552* 0.313+§
Others	2 (3.9%)	3 (3%)	7 (6%)	4 (6%)	0.999* 0.552+§
Hip dislocation	0	3 (3%)	5 (4%)	3 (4%)	<0.05*+§
Additional hip surgery	0	6 (5%)	46 (39%)	6 (9%)	<0.05*+§
Deaths	14 (27.5%)	18 (16%)	18 (15%)	6 (9%)	0.0001 *+§

* Test result between our study and Hemiarthroplasty. + Test result between our study and internal fixation. § Test result between our study and Total hip replacement.

Table 4: Functional outcome of patients undergoing hemiarthroplasty compared to those undergoing total hip replacement.

	Our study	Total hip replacement[12]	P-value
Total number of patients	37	99	
Pain			
None	17 (45.9%)	77 (77.8%)	0.0001
Slight	8 (21.6%)	15 (15.2%)	
Mild	7 (18.9%)	3 (3%)	
Moderate	4 (10.8%)	4 (4%)	
Marked	1 (2.7%)	0 (0%)	
Support			
None	19 (51.4%)	81 (82%)	0.0001
Cane (long walks)	7 (18.9%)	13 (13%)	
Cane (most of time)	7 (18.9%)	2 (2%)	
walker	4 (10.8%)	3 (3%)	
Social dependence			
Independent in own home	25(67.6%)	82 (83%)	0.0001
Own home support	12 (32.4%)	13 (13%)	
Sheltered housing	0	4 (4%)	

Table 5: Functional outcome of patients undergoing hemiarthroplasty compared to those undergoing internal fixation and total hip replacement.

	Our study	Hemiarthroplasty [12]	Internal fixation [12]	Total hip replacement [12]	P-value
Pain	37	65	110	66	
	20.5 (23.3)	20.5 (5)	19.7 (6)	20.9 (5)	0.999
					0.837
Walking					0.918
	24.3 (34.1)	16.2 (6)	16.5 (6)	19.3 (6)	0.155
					0.168
Function					0.379
	22.2 (32.0)	19.3 (5)	20.1 (4)	21.2 (4)	0.585
					0.691
					0.835

**Fig.1:** Showing treated with bipolar hemiarthroplasty

Discussion

Displaced intracapsular fracture of the femoral neck can be treated with internal fixation, unipolar or bipolar hemiarthroplasty, or total hip replacement[12]. The trend in our hospital is to treat any type of intracapsular hip fracture with bipolar arthroplasty. In a meta-analysis, Bhandari et al. concluded that arthroplasty was associated with lower revision rates but a higher prevalence of infection, greater blood loss, and longer operative time when compared with internal fixation. In this report, no distinction was made between the use of hemiarthroplasty and total hip replacement[13]. When our results were compared to “reduction and fixation” of intracapsular fracture of the femoral neck, this latter was associated with a high rate of revision surgery (39%; $p < 0.05$) and an inferior functional outcome (20.1 ± 4)[12–14]. Other recent randomized studies have also demonstrated high reoperation rate (34% to 43%) following reduction and fixation of displaced intracapsular hip fractures[15–17]. The most common reasons for the reoperations were fixation failure and nonunion. Although osteonecrosis is a

well recognized complication of this fracture, it is not the most common cause of reoperations[12]. Our results were associated with greater blood loss ($p < 0.0001$), longer operative time (94.21 ± 30.10), but lesser prevalence of infection ($p = 0.298$). This trend was particularly evident for younger patients (sixty to seventy-four years old). Although reduction and fixation had the lowest acute-admission costs (with less expensive implants, shorter operative time, and shorter initial hospital stays), the greatly increased need for readmissions and reoperations resulted in this management option having the highest costs overall[12]. Other randomized studies included patients with limited mobility or cognitive function, and it is often assumed that healthy older patients have a lower complication rate following reduction and fixation. However, in a study of a healthy group of patients, reduction and fixation had a failure rate similar to those reported in the other studies.

The poorer functional outcome was particularly marked in the younger patients. Whereas fixation failures commonly occurred soon after the surgery, there might be disproportionately larger numbers of failures of the arthroplasties beyond the current follow-up period of two years. An additional potential confounding variable is the experience of the surgeons who performed the internal fixation procedures compared with that of the surgeons who did the arthroplasties[12]. In our study, the bipolar hemiarthroplasty has served us well. Postoperatively, Thirty three patients (89.2%) either returned to the functional level that they had had before the fracture or used only a cane, which they had not needed before. The bipolar hemiarthroplasty provided a functional range of motion and adequate motor power. Only one patient (2.7%) had major pain in the hip at the time of follow-up.

It must be noted that in our study the length of follow up averaged thirty six months, and the longest that any patient was followed was eighty-five months[18]. Thus, we cannot compare our results with those of studies in which the hips were followed for five to ten years. Still, there has been no significant deterioration in our results in terms of hip score, maintenance of joint space, and absence of protrusio acetabuli. Radiographic data available at the latest follow up after a mean duration of thirty six months showed no detectable femoral stem subsidence or migration. Factors such as the patient's age, the length of follow-up, the patient's level of activity, the position of the stem, and the cementing technique all play a role in such results. In terms of morbidity, the rates in our study were consistent with those of previous studies on hemiarthroplasty[12] except for DVT (11.8%) and need for perioperative blood transfusion (68.6%; $p < 0.0001$). The rate of dislocation and reoperation was zero in our study which is significant ($p < 0.05$) compared to previous studies on hemiarthroplasty[12] (3% and 5%, respectively).

The mortality rate was high in our group of patients (27.5%) compared to previous studies on hemiarthroplasty[19] (16%) at two years after surgery. Relief of pain and early mobilization and restoration of function were achieved. Loosening and loss of acetabular bone were not major problems. When our results were compared to those following total hip replacement[19] for management of intracapsular hip fractures, the functional outcome at two years was significantly better following total hip replacement (0.0001) but the rate of dislocation and reoperation was higher (4% and 9% respectively; $p < 0.05$).

Conclusion:

In our study, the bipolar hemiarthroplasty has served us well. Two-year results of total hip replacement appeared to be better than those of bipolar hemiarthroplasty, but this finding was based on relatively small numbers of patients.

References

1. Hayes WC, Myers ER, Robinovitch SN, Van Den Kroonenberg A, Courtney AC, McMahon TA. Aetiology and prevention of age-related hip fractures *Bone*. 1996 Jan;18(1 Suppl):77S–86S.
2. Papadimitropoulos EA, Coyte PC, Josse RG, Greenwood CE. Current and projected rates of hip fracture in Canada *CMAJ*. 1997 Nov 15;157(10):1357–1363.
3. Johnell O. The socioeconomic burden of fractures: today and in the 21st century. *Am J Med* 1997. 1997 Aug;103(2A):20S–25S. discussion 25S-26S.
4. Jaglal SB, Sherry PG, Schatzker J. The impact and consequences of hip fracture in Ontario. *Can J Surg*. 1996 Apr;39(2):105–111.
5. Parker MJ, Khan RJ, Crawford J, Pryor GA. Hemiarthroplasty versus internal fixation for displaced intracapsular hip fractures in the elderly: A randomized trial of 455 patients. *J Bone Joint Surg Br*. 2002 Nov;84(8):1150–1155.
6. Parker MJ. The management of intracapsular fractures of the proximal femur. *J Bone Joint Surg Br*. 2000 Sep;82(7):937–941.
7. Wick M, Muhr G, Rincon R, Lester D. Press fit bipolar hemiarthroplasty for displaced subcapital hip fractures via a minimally invasive approach. *Klinische und radiologische Ergebnisse Unfallchirurg*. 2005;108(3):215–222.
8. Rodriguez-Merchan EC. Displaced intracapsular hip fractures: hemiarthroplasty or total arthroplasty. *Clin Orthop Relat Res*. 2002 Jun;(99):72–77.
9. Healy WL, Iorio R. Total hip arthroplasty: optimal treatment for displaced femoral neck fractures in elderly patients. *Clin Orthop Relat Res*. 2004 Dec;(429):43–48.
10. Bezwada HP, Shah AR, Harding SH, Baker J, Johanson NA, Mont MA. Cementless bipolar hemiarthroplasty for displaced femoral neck fractures in the elderly. *J Arthroplasty*. 2004;19(7 Suppl 2):73–77.
11. Gardner MJ, Lorich DG, Lane JM. Osteoporotic femoral neck fractures: management and current controversies. *Instr Course Lect*. 2004;53:427–439.
12. Keating JF, Grant A, Masson M, Scott NW, Forbes JF. On behalf of the Scottish Orthopaedic Trials Network. Randomized Comparison of Reduction and Fixation, Bipolar Hemiarthroplasty, and Total Hip Arthroplasty. Treatment of Displaced Intracapsular Hip Fractures in Healthy Older Patient. *J Bone Joint Surg Am*. 2006;88:249–260.
13. Bhandari Mohit, et al. Internal Fixation Compared with Arthroplasty for Displaced Fractures of the Femoral Neck: A Meta-Analysis. *J Bone Joint Surg Am*. 2003;85:1673–1681.
14. Bhandari Mohit, et al. Operative Management of Displaced Femoral Neck Fractures in Elderly Patients. An International Survey. *J Bone Joint Surg Am*. 2005;87:2122–2130. doi:10.2106/JBJS.E.00535.
15. Davison JN, Calder SJ, Anderson GH, Ward G, Jagger C, Harper WM, Gregg PJ. Treatment for displaced intracapsular fracture of the proximal femur. A prospective, randomised trial in patients aged 65 to 79 years. *J Bone Joint Surg Br*. 2001;83:206–212.
16. Rogmark C, Carlsson Å, Johnell O, Sernbo I. A prospective randomised trial of internal fixation versus arthroplasty for displaced fractures of the neck of the femur. Functional outcome for 450 patients at two years. *J Bone Joint Surg Br*. 2002;84:183–188.
17. Tidermark J, Ponzer S, Svensson O, Soderqvist A, Tornkvist H. Internal fixation compared with total hip replacement for displaced femoral neck fractures in the elderly. A randomised, controlled trial. *J Bone Joint Surg Br*. 2003;85:380–388.
18. Bochner RM, Pellicci PM, Lyden JP. Bipolar Hemiarthroplasty for Fracture of the Femoral Neck. Clinical review with special emphasis on prosthetic motion. *J Bone Joint Surg*. 1988;70:1001–1010.
19. Baker RP, Squires B, Gargan MF, Bannister GC. Total hip arthroplasty and

- hemiarthroplasty in mobile, independent patients with a displaced intracapsular fracture of the femoral neck. A randomized, controlled trial. *J Bone Joint Surg Am.* 2006 Dec;88(12):2583–2589.
20. Berry DJ, von Knoch M, Schleck CD, Harmsen WS. Effect of femoral head diameter and operative approach on risk of dislocation after primary total hip arthroplasty. *J Bone Joint Surg Am.* 2005;87:2456–2463.
21. Bhandari M, Devereaux PJ, Swiontkowski MF, Tornetta P, 3rd, Obrebsky W, Koval KJ, Nork S, Sprague S, Schemitsch EH, Guyatt GH. Internal fixation compared with arthroplasty for displaced fractures of the femoral neck. A metaanalysis. *J Bone Joint Surg Am.* 2003;85:1673–1681.