



Functional outcome of cemented bipolar hemireplacement arthroplasty in fracture neck of femur in elderly: A prospective observational study

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ABSTRACT

Fractures of neck of femur have always presented great challenges to orthopaedicians and remains in many ways today "The Unsolved Fracture", as was called many years ago by Dickson and Nicoll as far as treatment and results are concerned. A prospective observational study was conducted between September 2012 to August 2014 in which a sample size of 43 patients were included having an isolated fracture of the neck of femur. All patients underwent a cemented bipolar hemireplacement arthroplasty by either Moore's or Hardinge's approach. Patients were followed up monthly for first 3 months and then at 6 months and 12 months. Minimum follow up of 12 months and modified Harris Hip Score was noted and radiographs of the affected hips were taken. Statistical test used was Chi Square test. Out of the 43 patients, there was 1 mortality and 4 were lost to follow up before 1 year duration period. The clinical and radiological outcome of 38 patients were assessed 1 year post-surgery. In this study, the finding of a correlation between Age and Outcome after surgery was seen to be significant [p=.047]. Surgical approach using the Hardinge's approach had slightly better outcomes in terms of Modified Harris Hip Scores during post-op rehabilitation and at 1 year follow up but was not significant [p=0.767].

INTRODUCTION

Hip fractures are the most devastating injuries in the elderly. The impact goes well beyond immediate clinical consideration and extends into the domains of medicine, rehabilitation, psychiatry, social work and medical economics. Hip fractures can broadly be divided into two types; 1. Intra-capsular neck femur fractures, 2. Extra-capsular neck or inter-trochanteric femur fracture. Inter-trochanteric fractures occur in an extra capsular location through well vascularized cancellous bone and fracture union occurs almost invariably. This is quite different an environment than that in which femoral neck fractures occurs, where limited and unprotected bloody supply of femoral head, Intra-capsular location and severe trabecular atrophy are the factors that inhibit fracture healing and leads to osteonecrosis and late segmental collapse of femoral head[1]. Fractures of neck of femur have always presented great challenges to orthopaedicians and remains in many ways today THE UNSOLVED FRACTURE (as was called many years ago by Dickson and Nicoll)[2] as far as treatment and results are concerned. Many surgeons agree that closed reduction and internal fixation is the treatment of choice for femoral neck fractures in young patients. However, there is a lot of divergence as far as the treatment of these fractures in the elderly is concerned. Proponents of hemiarthroplasty note that the rate of non-union increases with age and that the increased need for early re-operation associated with fixation makes replacement a more reliable and definitive treatment option for the elderly patient. The more rapid return of mobility with hemiarthroplasty is especially relevant in these patients and the late problems of loosening and wear are less concerning in patients with less life span. Various prosthesis have been designed which can be broadly divided into two types; 1.Unipolar, 2.Bipolar. Of unipolar prosthesis, the most commonly used are the THOMPSONS and AUSTIN MOORES prosthesis. Main problems with these prosthesis were stem loosening and migration. To overcome these, various strategies were used

such as achieving geometrically stable press fit between bone and implant, stimulating bone ingrowth and use of PMMA cement. Of these use of PMMA cement offers advantages as its use as a grouting agent to replace thinning trabecular bone thus greatly simplifying rehabilitation. Bipolar prosthesis was introduced to prevent and retard acetabular wear. These prosthesis have a 22 to 32 mm head that articulates with ultra-high density polyethylene inner liner which is covered with a polished metal outer head that articulates with the acetabular cartilage. Theoretically hip motion occurs at the prosthetic joint and only secondarily at metal-cartilage interface, minimizing articular wear.

This study was conducted to evaluate the functional result of cemented Bipolar Hemiarthroplasty as a primary treatment of femoral neck fractures in elderly using various factors and comparisons.

MATERIALS AND METHODS

A prospective observational study was conducted between September 2012 to August 2014 in the Orthopaedics Department, KIMS Hospital [Kerala Institute of Medical Sciences] a tertiary Health Care Centre in Trivandrum, South Kerala, catering to a population of 100-150 patients per day. A sample size of 43 patients were included in the study who had to be followed up for a period of 1 year. The inclusion criteria were:

- a) Age 55 years and above,
- b) All isolated fractures neck of femur,
- c) Community/ household ambulators.

Exclusion criteria were:

- a) Non-ambulators,
- b) Patients without X-ray or CT-scan diagnosis,
- c) Patients unwilling for surgery.

All patients were evaluated pre-operatively by a detailed history and clinical examination. All patients were put on skin traction. Associated medical conditions were treated. Blood pressure of hypertensives were controlled and diabetics on oral hypoglycemic agents were shifted on insulin. Pre-operative deep breathing exercises were started from day 1 of admission. All measures were taken so that the patients could be taken up for surgery at the earliest. Patients were kept nil by mouth for six hours prior to surgery. Pre-anesthetic medications and antibiotic protocol (in which a cephalosporin is given 30 minutes before surgery and 2 more doses 8th hourly post-operatively) was given to all patients. Majority of patients were operated under Spinal or combined Spinal Epidural anaesthesia and a few patients were given general anaesthesia. All the patients were operated using either Moore's posterior approach or modified Hardinge's lateral approach. Cemented bipolar hemireplacement arthroplasty was done. Post-operatively, patients were kept in the ward with limbs in wide abduction with help of abduction pillow (for Moore's approach). Adduction, internal rotation and extreme flexion were avoided. Static quadriceps and gluteal exercises commenced from the first day. From the second day, patients were allowed to sit up. Ambulation was started within a week with crutch walking and progressive weight bearing. Suture removal was done on 12th post-operative day. Strengthening exercises consisting of abduction of hip joint and active flexion and extension of knee joint was done under supervision of the surgeon. The main aim of this treatment was to achieve good range of motion of the hip and knee joint along with good quadriceps power. All patients were advised not to sit cross-legged or squat. All patients were followed up monthly for first 3 months and then at 6 months and 12 months. Minimum follow up of 12 months and modified Harris Hip Score[3] was noted and radiographs of the affected hip were taken.

STATISTICAL ANALYSIS USED:

All the cases of cemented bipolar hemireplacement arthroplasty satisfying the inclusion criteria were included in the study. Sample size was calculated as follows:

$$n = \frac{4pq}{L^2}$$

where, p = proportion having excellent/good grades in the Modified Harris Hip score.

q = 1 - p

L = permissible error in the estimation of p (taken as 20% of p)

From the literature, p is taken as 0.7(70%)

L = 20 x 0.7/100 = 0.14, L² = 0.196

Hence, $n = 4 \times 0.7 \times 0.3 / 0.196 = 0.84 / 0.196 = 43$

Hence it was estimated that a sample size of 43 would be sufficient for this study. Data was analyzed using the computer software, Statistical Package For Social Sciences (SPSS) Version 17. Statistical test used: Chi Square test.

RESULTS

Out of the 43 patients, there was 1 mortality and 4 were lost to follow up before 1 year duration period. So the clinical and radiological outcome of 38 patients were assessed in this study. The age-wise distribution of the patients in the study were as in Table 1. All patients in this study were above 55 years. Only 4 patients were above 80 years.

Table 1- Age wise distribution of the patients included in the study.

Age-Group	Frequency	Percent
55-59	3	7.9
60-64	10	26.3
65-69	5	13.2
70-74	6	15.8
75-79	10	26.3
80-84	4	10.5
Total	38	100.0

Out of the 38 patients, 24 were females. There was not much difference between the side of fracture. In this study, 20 patients had left sided fractures. Out of the associated co-morbid conditions, maximum patients had hypertension i.e. 22 patients and 21 patients had diabetes. 8 patients had coronary artery disease, 3 had dementia, 2 were hypothyroid and 1 each had Parkinson’s disease and chronic renal failure. 30 patients were operated using the Moore’s approach and in 8 patients Hardinge’s approach was used. Majority of the patients i.e.28 patients did not have pain 1 year post-surgery. Table 2 shows the relation between the number of patients and associated pain.

Table 2: Pain scores after 1 year of surgery.

Pain	Frequency	Percent
None	28	73.7
Occasional	7	18.4
Mild	3	7.9
Total	38	100.0

Table 3 shows results from Modified Harris Hip Score. Majority had excellent outcomes. This treatment failed in 2 out of 38 patients.

Table 3: showing Modified Harris Hip Scores after 1 year of surgery.

Modified Harris Hip Score	Frequency	Percent
Excellent	17	44.7
Good	4	10.5
Fair	7	18.4
Poor	8	21.1
Failed	2	5.3
Total	38	100.0

Table 4: Co-Relation between Age and Outcome of Study at 1 year follow up.

Results	Age								Total	
	Below60		60-69		70-79		80-89		Count	%
	Count	%	Count	%	Count	%	Count	%		
Excellent	2	66.7%	9	69.2%	3	18.8%	3	50.0%	17	44.7%
Good	0	.0%	2	15.4%	2	12.5%	0	.0%	4	10.5%
Fair	0	.0%	1	7.7%	6	37.5%	0	.0%	7	18.4%
Poor	0	.0%	1	7.7%	4	25.0%	3	50.0%	8	21.1%
Failed	1	33.3%	0	.0%	1	6.3%	0	.0%	2	5.3%
Total	3	100.0%	13	100.0%	16	100.0%	6	100.0%	38	100.0%

Co-relation between age and outcome of the study as measured according to the Modified Harris Hip score was found to be significant. Number of excellent outcomes in patients below the age of 70 was found to be significant. [p=.047(significant)] as shown in Table 4.

The co-relation between approach used and outcome according to Modified Harris Hip Score was insignificant as shown in Table 5. [Chi square=1.8, p=.767].

Table 5: shows results of co-relation between approach of surgery used and outcome according to Modified Harris Hip score.

Results	Approach				Total	
	Moore's		Hardinge's		Count	%
	Count	%	Count	%		
Excellent	12	40.0%	5	62.5%	17	44.7%
Good	3	10.0%	1	12.5%	4	10.5%
Fair	6	20.0%	1	12.5%	7	18.4%
Poor	7	23.3%	1	12.5%	8	21.1%
Failed	2	6.7%	0	.0%	2	5.3%
Total	30	100.0%	8	100.0%	38	100.0%

The co-relation between surgical approach used and the use of walking aid at 1 year after surgery- it was found that 75% of patients required no walking aid after Modified Hardinge's approach as compared to 26.7% in Moore's approach. [Chi square=6.7, p=.084] [Table 6]

Table 6: shows results of co-relation between surgical approach used and requirement of a walking aid at 1 year post surgery.

Walking Aid	Approach				Total	
	Moore's		Hardinge's		Count	%
	Count	%	Count	%		
2 crutches	12	40.0%	1	12.5%	13	34.2%
2 canes	4	13.3%	0	.0%	4	10.5%
Cane for long time walks only	6	20.0%	1	12.5%	7	18.4%
No support	8	26.7%	6	75.0%	14	36.8%
Total	30	100.0%	8	100.0%	38	100.0%

Complications associated with the surgery are as listed in Table 7 [Figure 1 and 2]. Major complications were radiological i.e. improper cement mantle and valgus malalignment of the stem.

Table 7: showing associated complications after surgery-both clinical and radiological.

SR.NO	COMPLICATIONS	NO. OF PATIENTS
1.	FRACTURE FEMORAL SHAFT	0
2.	FRACTURE GREATER TUBEROSITY	0
3.	VARUS MALALIGNMENT	1
4.	VALGUS MALALIGNMENT	5
5.	IMPROPER CEMENT MANTLE	15
6.	EARLY SUPERFICIAL INFECTION	1
7.	EARLY DEEP INFECTION	0
8.	DISLOCATION	0
	LATE COMPLICATIONS AT 1 YEAR	
9.	CEMENT LOOSENING	2
10.	SINKING OF PROSTHESIS	0
11.	PROTRUSIO ACETABULAE	0
12.	BREAKAGE OF STEM	0
13.	CALCIFICATION OF SOFT TISSUE	2
	SYSTEMIC COMPLICATIONS IMMEDIATELY AFTER SURGERY	
14.	DEEP VEIN THROMBOSIS	0
15.	PULMONARY EMBOLISM	1
16.	CHEST INFECTION	2

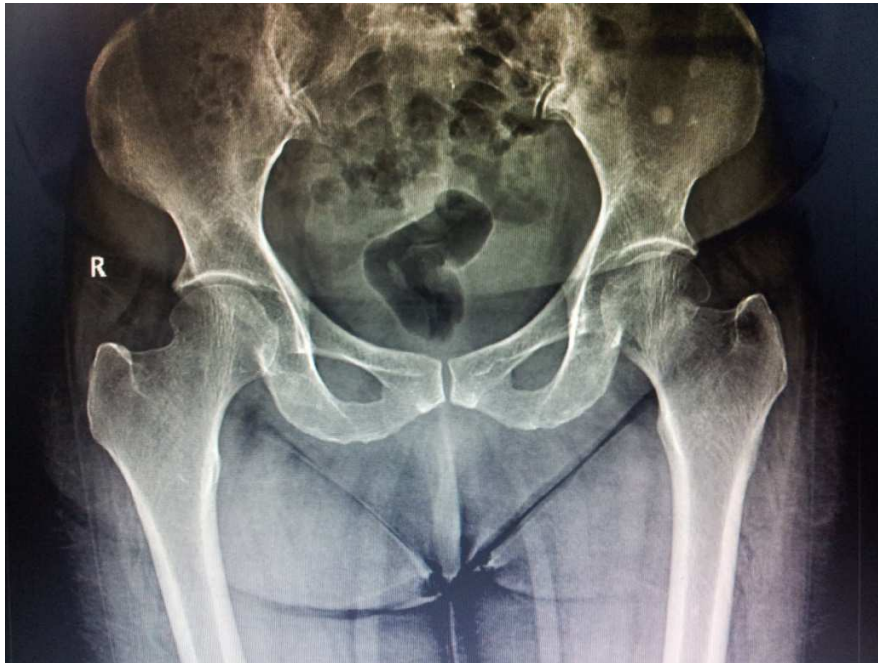


Fig-1: showing a Pelvis both hips radiograph of a patient with a left sided fracture neck femur.



Fig-2: showing left hip antero-posterior radiograph of the above patient taken 1 year post-operatively showing the cemented bipolar prosthesis in situ.

DISCUSSION

The incidence of fracture neck femur occur in 2 different patient populations. A very small group 3%-5% are very young patients subjected to high energy trauma. The remainder occurs in elderly population and approximately 90% of these injuries are the result of simple fall from standing height. It is observed that age specific risk of hip fractures doubles every 5-6 years after age 30 in women reaching 18 fractures per 1000 per year in women over 85[4]. In our study, 43 cases of fracture neck of femur were treated with cemented Bipolar prosthesis in age groups above 55 years and 38 cases were followed up for 1 year.

Earlier, The Austin - Moore endoprosthesis has been widely used in the treatment of these fractures of femoral neck. However, anterior thigh pain and acetabular protrusion are complication of the use of this prosthesis. At present, hemiarthroplasty is used widely for the management of these fractures.

In this study, 28 patients (73.7%) had no pain in the operated hip. This is comparable to results obtained from other studies like Calder *et al*[5](1986) with 65% and Sherwani *et al*[6](1999) with 88%. This confirms that bipolar prosthesis provides a pain free hip in most of the patients.

Superficial infection was encountered in 1 patient (2.63%) in this study. In the reported series, Lestrage[7](1990) had 83 patients with 2.8% infection rate. There were no deep wound infections in this study. Nottage and McMaster[8](1990) reported deep wound infection in 3.9% and superficial wound breakdown in 3.9%. Femoral stem varus malalignment was observed in only 1(2.63%) which was far less than that observed by Gallinaro[9]in 1990. No Subsidence of Prosthesis was seen in this study which was less as seen by Moshein[10](8%) in 1990. In this study, 44.7% patients had excellent and 10.5% had good results compared to Sherwani *et al*[6](1999) who had 36% excellent and 46% good results and Moshein *et al*[10]who had 40% excellent and 25% good results. As compared to Austin-Moores prosthesis, Surya Bhan[11](1993) had 90.6% excellent to good results in bipolar and 77.8% in Austin Moore group.

LIMITATIONS OF THIS STUDY:

- It is a prospective observational study.
- Study population is small (43 patients). Out of 43, only 38 could be followed up till 1 year after surgery.
- Period of study was only 1 year which is less.
- The surgeries were done by 3 different surgeons in the same hospital.
- Comparison between modular and non-modular bipolar prosthesis could not be done due to unequal sample sizes.

STRENGTH OF THIS STUDY:

- In this study, finding of a correlation between Age and Outcome after surgery was seen to be significant.
- In this study, surgical approach using the Hardinge's approach had slightly better outcomes in terms of Modified Harris Hip Scores at 1 year follow up and post-operative rehabilitation but was not significant.

CONCLUSION

In the present study, 43 patients with intracapsular fracture neck femur were surgically managed with cemented hemiarthroplasty by bipolar endoprosthesis and 38 patients were followed up till 1 year period. The following conclusions were made: a) Cemented bipolar hemiarthroplasty can be safely performed in elderly population with satisfactory results. The co-relation with Age and Outcome of Surgery was significant in this study. Number of excellent outcomes in patients below the age of 70 was found to be significant, b) patients with Hardinge's approach had slightly better outcomes according to the Modified Harris Hip Score but the co-relation between approach used and outcome was insignificant.

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