



## HEMIARTHROPLASTY OF INTRACAPSULAR FEMORAL NECK FRACTURE WITH AUSTIN MOORE PROSTHESIS

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### ABSTRACT:

**Background:** Hemiarthroplasty using Austin Moore Prosthesis of hip for femoral neck fractures is a good option in elderly, most of them obtaining a satisfactory outcome.

**Objectives:** The study was carried out to evaluate the immediate and early results of hemiarthroplasty for intracapsular fractures of neck of femur in elderly.

**Methods:** this was a prospective randomized trial performed on 52 old age patients who had femoral neck fracture. Hemiarthroplasty performed with Austin Moore Prosthesis and Harris hip score was used to evaluate the functional outcomes at 6 weeks, 3 months and 6 months follow up.

**Results:** We operated 65% of patients within first week 96% patients in first 10 days. Very few manageable complications with no operative death observed in our study. 33 patients had varying degree of limping which was slight to severe. 6 patients had positive radiographic results, 2 were having proximal migration and 4 patients showed loosening of prosthesis. Harris hip score was used to evaluate the functional outcome in the present study. Results were rated as – excellent: 90-100 in 27.08%; good: 80-89 in 45.83%; fair: 70-79 in 16.67% and poor: < 70 in 10.42% patients.

**Conclusion:** Operation procedure was simple and with less complicated. Early operation in old patients resulted in pain free, improved physical condition, mobility and lesser complications related to recumbence. Proper selection of cases, preoperative management, routine use of antibiotics and early mobilization minimizes mortality and morbidity. Functional grading excellent to good was seen in 72.91% patients which was a significant outcome.

**Keywords:** Austin Moore Prosthesis, Femoral Neck Fractures, Functional Outcome, Harris Hip Score, Hemiarthroplasty.

### Introduction

Hip fractures are a common problem seen in elderly population with osteopenic bone by trivial trauma, but no age is immune. It has a tremendous impact on both the healthcare system and society in general. The worldwide prevalence of fracture of proximal part of femur is increasing as the average age of the population increases and causes significant morbidity and mortality in elderly.

Femoral neck fracture usually intracapsular and with synovial bathing had lack of periosteal layer angiogenic inhibiting factors in synovial fluids precarious blood supply to femoral head contribute to non union and avascular necrosis.

Management of Femoral neck fracture in elderly patients has been controversial. Though non operative treatment of these fractures has been documented.<sup>1</sup> there are currently very few indications for the same.

Surgical treatment has been established as the gold standard. Femoral neck fractures have been considered 'unsolvable fractures' in the older era of orthopedics. The best treatment for Femoral neck fracture is still to be determined. Studies by Johansson et al,<sup>2</sup> Rogmark et al in 2002 a,b<sup>3,4</sup> Roden et al in 2003<sup>5</sup> have shown a 30-40% rate of reoperation after internal fixation and superior function after primary hemi and total arthroplasty.

Internal fixation was associated with non union and avascular necrosis and need for frequent revision. With the introduction of Austin Moore prosthesis in 1942, the problem of non union and avascular necrosis was improved as the femoral head was replaced by metallic implant. The common complications and mortality in elderly patients with femoral neck fractures are mostly related to their age and other systematic comorbidities. The surgical procedure further adds to their depleting health status.<sup>7,8</sup>

Proponents of esthetic replacement argue that replacement of femoral head eliminates the necessity for revision surgery due to avascular necrosis and nonunion, both of which are serious problems following internal fixation.

It is known fact that the hip is a weight bearing joint and has to perform many functions. A successful operation at the hip joint should provide painless, stable hip with wide range of movements. But none of the accepted procedures have been able to achieve this goal fully. The patient also needs to go through in many instances, multiple surgical procedures and a prolonged rehabilitation in order to preserve his original joint.

This clinical study presents the short term results of prospective randomized trial of hemiarthroplasty for the treatment of displaced femoral neck in the elderly. Outcomes at 6 weeks, 3 months and 6 months were analysed by Harris hip scoring system and by radiographs taken during follow up.

#### **MATERIAL AND METHODS**

The present study includes 52 cases of intracapsular fracture neck of femur in elderly patients above the age of 60 years of sex treated by hemiarthroplasty using Austin Moore's endoprosthesis, in the department of Orthopedics, Sri Shankaracharya Institute of Medical Sciences, Bhilai, and Chhattisgarh in the year 2017 -2018. Patients were selected on the basis of purposive sampling (Judgment sampling) method. An approval from Institutional ethical committee was taken before initiation of the study.

The study was carried out to evaluate the immediate and early results of hemiarthroplasty for intracapsular fractures of neck of femur in elderly.

Patients with dementia, non ambulatory, pathologic fracture, and additional acute lower extremity fractures were excluded from the study.

Fifty two cases treated by hemiarthroplasty were followed up at least for 6 months. At the end, 2 patients died and 2 patients lost for follow up. The functional results for hemiarthroplasty are therefore analysed for remaining 48 patients.

Once patient admitted to the hospital, all essential information was recorded in the Performa prepared for this study. They were observed regularly during their hospital stay till they get discharged. They were asked

to come for follow up regularly to the outpatient department.

#### **Preoperative management**

All study patients were put on skin traction and 3-5 kg of weight was applied to maintain the length of the lower limb and facilitate subsequent hemiarthroplasty procedure. All physical and radiological assessment was done to optimize patient's fitness for anaesthesia.

#### **Surgical procedure**

All cases were done under regional anaesthesia that included spinal or epidural anaesthesia. The patients were placed in lateral position on the operating table with the affected side facing up. **Moore's Approach:** A curved incision was taken from 10 cm distal to the posterior superior iliac spine, extended distally and laterally, parallel with fibers of gluteus maximus muscle to the posterior margin of the greater trochanter. The incision was then directed distally 10 cm along the femoral shaft. By blunt dissection, the fibers of the gluteus maximus were separated taking care not to disturb the superior gluteal vessels in the proximal part of the exposure. The gluteus maximum muscle was split and short external rotators were exposed. A tenotomy of the short external rotators was done close to their insertion on the inner surface of the greater trochanter. The capsule was incised by a T-shaped incision. Using a head extractor and bone levers, head was delivered out of the acetabulum and the acetabulum was cleared of debris.

The fractured head and neck of the femur was levered out of the acetabulum and size measured using femoral head gauge. The size was confirmed using trial prosthesis by its suction fit in the acetabulum. The acetabulum was prepared by excising remaining ligamentum teres and soft tissue. The femoral shaft was rasped using a broach (rasp) and prepared for the insertion of the prosthesis. Femoral neck if long was nibbled keeping 2 to 2.5 cm of calcar above the lesser trochanter.

The appropriate-sized prosthesis was inserted into the reamed canal taking care to place it in 10-15° of anteversion. Adequate seating of the prosthesis on the calcar was visualized directly. The reduction of the prosthesis was then done using gentle traction of the thigh. After suturing the capsule the external rotators were sutured, the wound was closed in layers over a suction drain, which was removed at the first change of dressing after 48 hours.

**Postoperative management**

Regular follow-up of all cases was done at 6 weeks, 3 months and at the end of 6 months. At each follow-up, patients were evaluated clinically using the Harris hip score and radiologically with appropriate X-rays. Harris hip score was used to evaluate the functional outcome in the present study. Results were rated as – excellent: 90-100; good: 80-89; fair: 70-79; and poor: < 70. Data was analyzed at the end of study.

All the data were analyzed using descriptive statistics. The statistical software used was SPSS 20.0. The results were considered significant at a two-tailed level of 0.05. The Kaplan Meier analysis was used to analyze patients data related to mortality.

**RESULTS**

This was an analytical study performed on 52 patients of femoral neck fracture. In this context the average age of the patients was 70.96 years in case of males 70.00 years in case of females. Majority of the patients were between 60-75 years. Male preponderance was found to be higher i.e. 61.54% in our study. The elderly females are more prone to fracture of femur due to osteoporosis. The left sided hip was fractured in 32 patients (61.54%) of our series

Depending on the anteroposterior radiographic view available they were grouped into subcapital and transcervical type. In our series 75% patients had subcapital fracture and 25% had transcervical type of fracture. All the fractures in our series belonged to

displaced fractures of Garden Type III and IV. Depending on the anteroposterior radiographs available, we could group 33 patients (63.46%) into type III and 19 patients (36.54%) into Garden Type IV.

Most common prosthesis used in males were 45-51mm and in females 39-45mm. in our study males required larger sized prosthesis compared to female. One of patients had Colle’s fracture and two female patients had Colle’s fracture after trivial fall. Minor abrasions were present in one patient. Another patient involved in vehicular accident had lacerated wound over the scalp.

In our study hospital stay ranges from 7-23 days with a mean average of 11.7 days. We operated 65% of patients within first week 96% patients within first 10 days. Those patients who had no operative or post operative complications were discharged after reduction of pain swelling. Two patients had superficial wound infection in first week. Patients who developed complications such as infection, bedsore etc. in the post operative period had to stay longer in the hospital. No operative death observed in our study.

33 patients had varying degree of limping which was slight to severe. 6 patients had positive radiographic results, 2 were having proximal migration and 4 patients showed loosening of prosthesis. Harris hip score was used to evaluate the functional outcome in the present study. Results were rated as – excellent: 90-100 in 27.08%; good: 80-89 in 45.83%; fair: 70-79 in 16.67% and poor: < 70 in 10.42% patients.

**Table 1: Age and sex distribution**

Age group in years	sex		Total
	Male	Female	
60-70	15(46.88%)	12(60.0%)	27(51.92%)
71-80	13(40.62%)	6(30.0%)	19(36.54%)
81-90	4(12.5%)	2(10.0%)	6(11.54%)
<b>Total</b>	<b>32(100%)</b>	<b>20(100%)</b>	<b>52(100%)</b>

**Table 2: details of fracture**

Variable	Group	Frequency	%
Side of fracture	Right	20	38.46
	Left	32	61.54
Mode of injury	Trivial fall	43	82.69
	RTA	6	11.54
	Fall (moderate height)	3	5.77
Type of fracture	Subcapital	34	65.38
	transcervical	18	34.62

**Table 3: associated injuries and other medical problems**

Problem		Frequency	%
Associated injuries	NIL	45	86.54
	Colle’s fracture	3	5.77
	Abrasion	1	1.92
	Lacerated wound	1	1.92
	Old fracture on opposite hip	2	3.85
Associated medical/ surgical problems	HTN	16	
	DM	6	
	COPD	3	
	CVA	4	
	Anaemia	5	
	IHD	6	
	BPH	2	
	Inguinal hernia	2	

**Table 4: hospital stay**

Hospital stay	Days	Frequency	%
Pre operative	5	27	51.92
	6-10	23	44.23
	11-15	2	3.85
	15<	0	0
Post operative	5	26	50.0
	6-10	25	48.08
	11-15	1	1.92
	15<	0	0
Total	<10	19	36.54
	11-15	29	55.76
	16-20	2	3.85
	21<	2	3.85

**Table 5: post operative complications**

Complications	Frequency	%
Death	2	3.85
Peri prosthetic fracture	1	1.92
Prosthetic dislocation	1	1.92
Superficial infection	2	3.85
Bed sore	2	3.85
Nil	44	84.61

**Table 6: functional outcome**

Function	Criteria	Score	Frequency	%
Pain	None	44	18	37.5
	Slight	40	20	41.67
	Mild	30	6	12.5
	Moderate	20	3	6.25
	Marked	10	1	2.08
Limping	None	11	16	33.33
	Slight	8	21	43.75
	Moderate	5	11	22.92
Use of support	None	11	20	41.67

	Cane for long walks	7	19	39.58
	Cane most of the time	5	9	18.75
	One crutch	3	0	0
	Two canes	2	0	0
<b>Walking distance</b>	Unlimited	11	17	35.42
	6 blocks	8	19	39.58
	2-3 blocks	5	6	12.5
	Indoor only	2	6	12.5
<b>Sitting</b>	Comfortable in ordinary chair for 1 hour	5	39	81.25
	Comfortable on a high chair for 1/2 hour	3	8	16.67
	Unable to sit	0	1	2.08
<b>Staire climbing</b>	Without using railing	4	16	33.33
	Use of railing	2	23	47.92
	Any manner	1	6	12.5
	unable	0	3	6.5

## DISCUSSION

Fracture neck of femur is common and a major problem in geriatric population. How to treat this fracture effectively and in a most excellent way is still controversial. Conservative treatment is fraught with all the complications of prolonged recumbence viz. chest infections, formation of pressure sores and disuse osteoporosis. Non operative management may be preferable for non ambulatory, institutionalized patients with marked dementia who experience minimal discomfort within the first few days after the injury.<sup>1</sup> such patients “return to pre injury level of function” is better accomplished without surgery. However, early mobilization is essential to avoid the associated complications. The number of patients falling into this category is usually quite small.<sup>1</sup>

Internal fixation has its own demerits of failure and increase reoperation rate due to non union and avascular necrosis of head of femur. Anthroplasty either hemi or total hip replacement is considered for patients with short life expectancy. Total hip replacement is more costly, extensive procedure with increase morbidity and mortality, therefore hemiarthroplasty is routinely done in developing countries.<sup>12</sup>

Over past few years a broader consensus has been reached as regards treatment of Fracture neck of femur in active, independent, elderly patients, they benefit from a primary artroplasty.

Austin Moore prosthesis is especially indicated in patients with relatively shorter life expectancy. In this context the average age of the patients was 70.96 years in case of males 70.00 years in case of females. Majority of the patients were between 60-75 years.

Similar distribution is reported by other authors. Saxena and saraf<sup>51</sup> had age distribution 45-90 years (mean 66 years), Arwade 54-86 9 (72 years),<sup>12</sup> Bavadekar and Manelkar (1987)<sup>36</sup> had mean age group in fresh fractures was 75 years whereas in old cases it was 62 years. AP Jadhav<sup>52</sup> and SS Kulkarni (1995)<sup>32</sup> had age distribution 50-82 years (average age 65.7) Marya S,<sup>29</sup> showed 78.0 years.

Male preponderance was found to be higher in our study similar to the study conducted by D’Acry and Devas in 1976<sup>24</sup> (91.4%), Mukhrjee and Puri in 1986<sup>38</sup> (58.3%), Bavadekar and Manelkar in 1987<sup>36</sup> (60.9%).

The elderly females are more prone to fracture of femur due to osteoporosis. Choudhary and Mohite<sup>37</sup> in 1987, Moore<sup>14</sup> in 1957 showed 62.5%, Sikroski and Barrington<sup>16</sup> in 1981 showed 66.7%, Arwade<sup>12</sup> in 1987 showed 68.3%, AP Jadhav and SS Kulkarni<sup>26</sup> in 1995 showed 75% and Dinesh Dhar<sup>28</sup> reported 67.35 in their studies.

In our study 61.54% of the patients were males. The probable cause of male preponderance in our study was due to higher activity level in comparison to females of same age group.

The left sided hip was fractured in 32 patients (61.54%) of our series. This has been a subject of limited studies. Boyd and Salvatore in 1964 reported 55% fractures on left side. D’Acry and Devas<sup>24</sup> in 1976 similarly found 55.4% fracture in left hip.

Depending on the anteroposterior radiographic view available they were grouped into subcapital and transcervical type. In our series 75% patients had subcapital fracture and 25% had transcervical type of fracture.

Klenerman and Marcuson<sup>15</sup> in 1970 defined subcapital fracture as the one that occurs immediately beneath the articular surface of the femoral head along the old epiphyseal plate and a transcervical fracture was referred to the fracture passing across the femoral neck between the femoral head and greater trochanter. Klenerman and Marcuson<sup>15</sup> in 1970 and Garden<sup>30</sup> in 1974 suggested that this differentiation cannot be made distinctly in radiographs. They could not find transcervical fractures in their series and all were subcapital type on operation. We have similar findings which also revealed comminution of the posterior surface of the neck in 38 patients (63.3%). These findings are in accordance with that of Scheek<sup>14</sup> in 1959 and Banks<sup>31</sup> in 1962 who reported it in about half of their patients.

All the fractures in our series belonged to displaced fractures of Garden Type III and IV. Depending on the anteroposterior radiographs available, we could group 33 patients (63.46%) into type III and 19 patients (36.54%) into Garden Type IV. G. S. Kulkarni<sup>32</sup> in 1987 had grouped type III and type IV into one group of displaced fractures and reported in 82.5% of his patients. Sanchetti et al<sup>36</sup> in 1987 reported 30% Garden Type III and 22.5% Garden Type IV in a series distributed between 20-80 years of age. Mukhrjee and Puri<sup>38</sup> in 1986 had 85% patients of Garden Type III and IV fractures.

The type or displacement is not taken as the criteria to choose the procedure for the management of fracture neck of the femur. The age of the patient<sup>25,38,18</sup> and time since fracture<sup>12,35,16</sup> are taken into consideration while selecting hemiarthroplasty for the management of fracture of neck of femur. Bavadekar and Manelkar<sup>37</sup> in 1987 emphasized not to choose hemiarthroplasty in Garden Type I and II fractures even in old individuals. We have followed the same philosophy while selecting the patients for hemiarthroplasty.

Most common prosthesis used in males were 45-51mm and in females 39-45mm. in our study males required larger sized prosthesis compared to female; similar findings have been elucidated in studies done by Hinchey and Day<sup>21</sup> in 1964 and Bartoska R.<sup>39</sup> in 2009.

78% of our patients had trivial trauma and rest of the cases of fractures were due to severe trauma like fall from height or vehicular accidents. This is in accordance with majority of the series reported.<sup>9,33,40</sup> and several other authorities believe that the

intracapsular fractures through pathological bone secondary to osteoporosis or osteomalacia.

One of patients had Colle's fracture and two female patients had Colle's fracture after trivial fall a well known injury among the elderly. He was treated by closed manipulation and plaster of paris cast. Minor abrasions were present in one patient. Another patient involved in vehicular accident had lacerated wound over the scalp and was treated by primary suturing. Boyd and Salvatore<sup>12</sup> in 1964 reported 1.5% Colle's fractures in their series where other fractures also were found in 3% of the patients. Hinchey and Day<sup>21</sup> in 1964 reported 5.4% associating fractures.

46.15% patients had one or more systemic disorder such as hypertension, diabetes mellitus, ischemic heart disease, anemia, bronchial asthma. Hinchey and Day<sup>21</sup> in 1964 reported similar problems in 84.6% of their patients, whereas rest also had slight anaemia and mild hypertension with good health.

In our study hospital stay ranges from 7-23 days with a mean average of 11.7 days. Stinchfield and Cooperman<sup>19</sup> in 1957 reported 31.5 days hospital stay. Bartoska R.<sup>39</sup> in 2009 reported 38 days.

We operated 65% of patients within first week 96% patients within first 10 days. Those patients who had no operative or post operative complications were discharged after reduction of pain swelling.

Delay in some patients was due to uncontrolled medical problem, in which physician consultation was made and patients were taken for operation after controlling medical problems by proper medication. There was minor delay in anaemic patients who required preoperative blood transfusion. Patients who developed complications such as infection, bed sore etc. in the post operative period had to stay longer in the hospital.

The complications following the hemiarthroplasty for fracture neck of femur is reported in varying incidences. Moore<sup>14</sup> in 1957 reported 16.6% mortality, Stinchfield and Cooperman<sup>19</sup> in 1957 reported 4% dislocation, 6% fracture of proximal femur. Temporary mental confusions was the commonest complication in the immediate post operative period of Hinchey and Day in 1964 series.<sup>21</sup> Salvatti et al<sup>35</sup> in 1973 reported 14.3% mortality, 8.3% superficial infection in their patients.

No operative death observed in our study. One patient died post operatively due to myocardial infarction. Another female died after six weeks, cause was unknown. In previous studies mortality rate varies between 10%-40%.<sup>21,35</sup> Hinchey and Day in 1964<sup>21</sup> had one intraoperative and 10 post operative deaths.

Low mortality is probable due to proper selection of cases, proper management of the associated medical problems preoperatively and use of antibiotics routinely and early mobilization.

Two patients had superficial wound infection in first week.

Salvatti et al in 1973,<sup>35</sup> Moore<sup>14</sup> in 1957, and Wood et al<sup>18</sup> in 1980 have reported extremely high mortality following infection of the prosthesis.

Dislocation of prosthesis was seen in one patient found on 28<sup>th</sup> postoperative day which was successfully reduced by Stimpson's method under GA. This finding was not statistically significant.

Hinchey and Day<sup>21</sup> in 1964 emphasize that all fractures occur when the surgeon attempts to reduce the prosthesis preoperatively. We did not have such fracture.

Ten patients required pain treatment which was relieved by analgesics. Previous studies also mentioned that pain was the main criteria for assessing the functional results.<sup>16,21,24,25,38</sup>

33 patients had varying degree of limping which was slight to severe. Alteration in the abductor mechanism due to excision of little more neck is the most probable cause.<sup>39,51</sup> all the patients were asked to use a cane till get enough endurance.

Other studies also mentioned use of cane regularly like Stinchfield and Cooperman<sup>19</sup> in 1957 reported 14%, and Saraf and Saxena<sup>25</sup> reported 52.7% in their series.

6 patients had positive radiographic results, 2 were having proximal migration and 4 patients showed loosening of prosthesis. Scheke in 1980<sup>11</sup> reported that the hip pain may be present with prosthetic loosening or proximal migration of the prosthesis.

Total functional results following hemiarthroplasty was assessed by good range of flexion, abduction, adduction and external rotation at the hip and full flexion in the knee. Walking with or without support and the movements at the hip are the major factors determining results. Harris hip score was used to

evaluate the functional outcome in the present study. Results were rated as – excellent: 90-100 in 27.08%; good: 80-89 in 45.83%; fair: 70-79 in 16.67% and poor: < 70 in 10.42% patients. Data was analyzed at the end of study. Which were similar to the previous studies.<sup>17,21,25,35,38</sup>

## CONCLUSION

Hemiarthroplasty using Austin Moore Prosthesis of hip for femoral neck fractures is a good option in elderly, most of them obtaining a satisfactory outcome.

Operation procedure was simple and with less complicated. Early operation in old patients resulted in pain free, improved physical condition, mobility and lesser complications related to recumbence. Proper selection of cases, preoperative management, routine use of antibiotics and early mobilization minimizes mortality and morbidity. Functional grading excellent to good was seen in 72.91% patients which was a significant outcome.

As our study had only 52 patients, exact conclusion cannot be made. More advanced studies with higher number of patients required to get a definite conclusion.

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