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## Original Article

### Evaluation of Functional Outcome of Cemented Hemiarthroplasty in Osteoporotic Unstable Intertrochanteric Fracture

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#### ABSTRACT

**Background:** Factors which define instability in inter-trochanteric fractures are posteromedial comminution, reverse obliquity, cases with minimal contact between proximal and distal fragments have a tendency of medial migration of the shaft, leading to failure of most implants. The aim of this study to assess the functional outcome of patients with unstable osteoporotic inter-trochanteric fractures treated with cemented bipolar prosthesis. **Material & Methods:** The prospective study included all the patients of unstable osteoporotic inter-trochanteric fractures treated with cemented modular bipolar prosthesis in Dr S.N. Medical College, Jodhpur, Rajasthan, India. Fracture was classified as per AO classification of trochanteric fractures. Reattachment of fracture fragment with screw by posterior approach surgically. At each follow up patients were evaluated clinically and radiologically to ascertain implant position and any sign of implant loosening. Results were assessed using Harris Hip Score. **Results:** The age of the patients in the present study was in the range of 65-90 years with an average age of 74.2 years. There was a preponderance of females in the present study. 9 (50%) patients had no increase in dependency on walking aid as compared to pre-fracture status while 9 patients (50%) had increased dependency on walking aid after surgery. 61% of patients could walk for unlimited distance after surgery. Final results of the study were assessed by modified Harris Hip Score taken at the last follow up of patents. We had 79% (excellent / good) results. **Conclusion:** We concluded that majority of patients with intertrochanteric fractures can be successfully managed with osteosynthesis, older patients with severe osteoporosis and associated comorbidity may benefit from prosthetic replacement.

**KeyWords:** Bipolar prosthesis, Inter-trochanteric fracture, Harris Hip Score, Functional outcome

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#### INTRODUCTION

Conventional methods of management for inter-trochanteric fractures were essentially conservative, consisting of either skeletal traction or skin traction. However, conservative mode of management of these fractures involved prolonged recumbency, which is poorly tolerated by these elderly patients. Moreover, the results have not been consistently good with significant number of malunions and sometime nonunions. Thus conservative treatment resulted in poor anatomical and functional outcome, lesser certainty of union, delayed ambulation, difficult nursing care, bed sores, foot drop, deep vein thrombosis and consequent increased mortality. As a result, emphasis has gradually but definitely shifted towards surgical treatment of these fractures<sup>1</sup>. The need for internal fixation and early mobilization of patients with pertrochanteric fracture femur is now thus widely accepted<sup>2</sup>. However, most patients with intertrochanteric fractures

have severe osteopenia and this along with comminution in elderly osteoporotic patients renders internal fixation difficult. In addition comminution along calcar and posterior cortex leads to varus malpositioning of the fracture fragments<sup>3</sup>. Rigid nail plate devices used initially for stabilization of these fractures caused mechanical complications like nail penetration and breakage of plate component, especially in unstable per-trochanteric fracture that collapsed into more stable position. Now a days Dynamic Hip Screw or its variants including gamma nails are used for internal fixation. However cutting out of implant from the femoral head continues to be an important cause of mechanical failure with these implants though its incidence is determined by factors like fracture subtype, quality of reduction, implant position and bone density<sup>4</sup>. With unstable intertrochanteric fractures, internal fixation achieves satisfactory initial fracture site reduction but late fracture collapse into varus during weight bearing especially in osteopenic individuals can lead to high failure rates<sup>5</sup>. Factors which define

instability in inter-trochanteric fractures are posteromedial comminution, reverse obliquity, cases with minimal contact between proximal and distal fragments have a tendency of medial migration of the shaft, leading to failure of most implants<sup>6</sup>. Typical patient with hip fracture is characterized by - old age, severe osteoporosis and severe co-morbidity. Our primary concern is to try and perform an operation on patient that will, give him greatest opportunity for early mobilization<sup>7</sup>. Failed treatment of intertrochanteric fractures, such as non union, post traumatic osteoarthritis, perforation of acetabulum by an internal fixation device and rarely avascular necrosis of femoral head leads to profound functional disability and pain. In such cases, attempt to preserve host femoral head is preferred in young patients, but salvage treatment with hip hemiarthroplasty should be increasingly considered for selected older patients with already poor bone quality.<sup>8</sup> The aim of this study to assess the functional outcome of patients with unstable osteoporotic inter-trochanteric fractures treated with cemented bipolar prosthesis.

## MATERIAL & METHODS:

The prospective study included all the patients of unstable osteoporotic inter-trochanteric fractures treated with cemented modular bipolar prosthesis in Dr S.N. Medical College, Jodhpur, Rajasthan, India.

### Inclusion Criteria

1. Patients above 60 years
2. Osteoporotic bones
3. Comminuted and unstable fractures after trival trauma
4. Failed osteosynthesis in unstable inter-trochanteric fractures

### Exclusion Criteria

1. Active Infection
2. Stable fractures in young patients
3. Associated fractures that might affect the final functional outcome
4. Patients that were nonambulatory before injury
5. Patients with psychiatric disorders

### History And Examination

On arrival detailed history with respect to the age, sex, occupation, mode of injury, date of injury, limb affected and other associated injuries was recorded. Type of treatment if any, prior to admission was also recorded. The patient's ambulatory status before sustaining a fracture was also taken. History of any medical or surgical illness was also taken. Two standardized radiological views (AP and lateral) - of the affected limbs were done to assess the fracture. Fracture was classified as per AO classification of trochanteric fractures. Radiographs of the patient's contralateral hip was obtained preoperative and used to make simple estimation of bone density. 3D reconstruction CT scan of hip joint was obtained if required for treatment plan and surgical approach.

### Operative Procedure

#### Approach - Posterior Approach

**Incision was given 8-10** cm curved from 4.5 cm distal and lateral to PSIS, continue along posterior edge of greater trochanter for 5

cm. help of wire so the gluteus medius, greater trochanter and vastus lateralis apparatus was maintained. The canal was rasped with a reselected, appropriately sized broach and trial prosthesis was inserted. The implant's transverse support flange should seat itself on the upper femoral fracture line cortex after only minor bone trimming. If the center of femoral head is above the trochanter's apex, the limb will be too long and if it is lower, it will be too short.

Following an acceptable trial fit, the head was redislocated and a permanent prosthesis was cemented into the femur at the proper level. After reattachment of the short rotators to the greater trochanter, the wound was closed over drains in the usual manner.

### Post Operative Management

Immediate postoperative radiographs were used to assess the position of prosthesis, patient was advised to keep the limb abducted and elevated. Negative suction drain was removed after 24 hours. Patients were given 1 dose of preoperative antibiotic and post operative antibiotics cover for 5 days. Patients was advised to do static quadriceps exercises, knee bending at the edge of bed, active toe movements of and ankle mobilization **exercise** from 1<sup>st</sup> post operative day so as to improve circulation and decrease edema. Patient was mobilized with partial weight bearing after 5<sup>th</sup> day. Stitches were removed 14<sup>th</sup> day postoperatively.

### Follow Up

- At stitch removal (14<sup>th</sup> day post operatively)
- 1 month interval for 6 months
- 3 months interval for 1 years

At each follow up patients were evaluated clinically and radiologically to ascertain implant position and any sign of implant loosening. Results were assessed using Harris Hip Score.

### RESULTS

The age of the patients in the present study was in the range of 65-90 years with an average age of 74.2 years. Most patients were in 7<sup>th</sup>, 8<sup>th</sup> and 9<sup>th</sup> decade of their life. There was a preponderance of females in the present study (table 1). Majority of the patients in the present study had associated co-morbidities, 67% of patients had some form of associated illness (table 2). Average duration of hospital stay postoperatively being 7 days in our study. No case of clinically evident deep vein thrombosis urinary tract infection, chest infection and decubitus ulcer was observed in the present study. Sinking of prosthesis occurred in 1 patient (table 3). In the present study 67 patients complained of no pain while 20% patients complained of slight pain. Limp was unnoticeable in 73% patients of this study while severe limp was seen in one patient. One patient in this study remained bedridden after surgery. All 18 patients (100%) were successfully ambulated with or without support in present study. 9 (50%) patients had no increase in dependency on walking **aid as compared to pre-fracture status while 9 patients (50%)** had increased dependency on walking aid after surgery. 61% of patients could walk for unlimited distance after surgery. Final results of the study were assessed by modified Harris Hip Score taken at the last follow up of patents. We had 79% (excellent / good) results (table 4).

**Table 1: Distribution of age & Gender**

Age (years)	No. of patients	Percentage
61-70	7	39%
71-80	7	39%
81-90	4	22.22
>90	0	0
<b>Gender</b>		
Male	6	33%
Female	12	67%

**Table 2: Morbidity profile of patients**

Morbidity profile	No.	Percentage
Cardiological insufficiency	0	0
Pulmonary insufficiency	1	5%
Diabetes	1	5%
Hypertension	4	23%
Anaemia	6	34%
None	8	44%

**Table 3: Local complication of patients**

Local complication	No.	Percent age	
Hematoma	0	0	
Superficial infection	0	0	
Dislocation	0	0	
Sinking of prosthesis	1	5%	
Shortening	<5 mm	1	5%
	>5 mm	1	5%
Discrepancy	Lengthening <5 mm	13	72%
	5-10 mm	3	16%

**Table 4: Final results with modified Harris hip score**

Result	Score	No. of patients	Percentage
Excellent	91-100	5	29%
Good	81-90	9	50%
Fair	71-80	3	16%
Poor	<70	1	5%

**DISCUSSION**

Intertrochanteric fractures in elderly osteopenic patients especially those who cannot follow limited weight bearing instructions, continue to vex orthopaedic surgeons. The best treatment for intertrochanteric fractures in such patients remains controversial. The discussion about ideal implant still continues and the variety of methods available attest to the difficulty encountered in the treatment of this fracture. Many surgeons have recommended that the hip be protected throughout the healing period inpatients who have intertrochanteric or subtrochanteric fractures that have major comminution, osteoporosis, or poor fixation of screws. The poor mechanical properties of weak and porotic bones in these elderly patients do not usually provide a firm purchase for the screws. Though fracture healing and functional restoration are important but are secondary to the overall welfare of the patient. This summarises our philosophy in the treatment of intertrochanteric fractures in elderly patients with hemiarthroplasty. Nonunion, malunion, metal breakage or impingement are of no concern with the prosthesis.

Most of the patients in this study were in 7<sup>th</sup>, 8<sup>th</sup> and 9<sup>th</sup> decade of their life. Average age of patients is 74.2 years which is in close proximity with the average age of patients reported in literature as shown in following table.

Authors	No. of patients	Average age (years)
Stern, Goldstein <sup>9</sup>	29	79
Stuart Green <sup>5</sup>	20	82.2
Present study	18	74.2

This high incidence of intertrochanteric fractures in elderly population reflects high incidence of osteoporosis in these patients. Most of the patients in present study were osteoporotic. Moreover there are many other factors which may be responsible for high incidence these fracture in advancing age like defective vision, impaired walking capability, lack of balancing or protective response, medications that impair balance and gait. Skin, fat and muscles surrounding the hip can absorb large amount of energy from an impact. Age related decline in muscle mass around hip might also account for the increased incidence of intertrochanteric fractures with ageing.

The comorbid illnesses did delay the surgical fitness of patients, thereby resulting in some delay in surgery. This indicates significant influence of comorbidities on mortality in elderly patients. George Haidukenych J et al<sup>10</sup> reported that four or more comorbidities increased the risk to die by 78%. The average hospital stay of patients in presents study post operatively is slightly lower than those reported n literature as shown in following table.

Authors	Postoperative hospital stay (days)	No. of patients.
Pho et al <sup>11</sup>	18	8
Present study	7	18

This is because these authors instituted physiotherapy of their patients in hospital only. A longer postoperative stay is useful in

rehabilitation of patients and ensuring a supervised physiotherapy. However such prolonged hospital stays are possible in institution where separate rehabilitation beds are available so as to avoid burdening the main hospital beds. Since the facility of separate indoor rehabilitation unit did not exist in our institution, the patients were discharged early after any immediate postoperative complications were ruled out. The patients were discharged after being trained to walk with walker with full weight bearing. The patients were told exercises to strengthen muscles and increase range of motion.

Patients were trained to begin walking with walker earlier (average 5.3 days) in this study so as to reduce postoperative complications of prolonged recumbency like pneumonia, bed sore, DVT etc. 100% patients in this study were successfully ambulated after surgery. 50% of patients maintained their prefracture ambulatory status while 50% had increased dependency of walking aids but were successfully mobile. These results are comparable to previous studies.

Authors	Percentage of patients successfully ambulated	Percentage of patients with same prefracture ambulatory status
Pho et al <sup>11</sup>	75%	-
Stern et al <sup>7</sup>	94%	-
Stuart Green et al <sup>5</sup>	75%	-
Present study	100	50%

The patients who were ambulatory at discharge gradually improved over follow up period and were able to transition from walker to cane and few patients without support. Age, gender, prefracture health status and social dependency before fracture are important factors determining functional recovery after surgery. This indicates the importance of following of strict physiotherapy regime for good outcome of surgery in patients. Majority of patients gained good range of motion with physiotherapy. There was no significant incidence of general complications in the present study. This is on account of the fact that most of the patients had very short period of recumbency following surgery-Our aim was not range of motion but basically it was ambulation in a painless hip. There were no infections and dislocations in present study which is comparable to previous studies.

Authors	No. of patients with dislocation	Percentage of patients
Pho et al <sup>11</sup>	1	13%
Stern et al <sup>7</sup>	0	0
Present study	0	0

The greater diameter of the prosthetic head in bipolar arthroplasty might explain the decreased tendency to dislocate. Besides all patients in our study were strictly advised not to squat and sit cross-legged. In all patients preservation and closure of hip capsule as well as reattachment of external rotators was done meticulously. In present study at final follow up, 67% patients had no pain and 22% had slight pain. One of the patient had moderate pain up to 3 months after surgery. In this patient greater trochanter was

fractured and was reattached with encirclage wire. The pain disappeared with union of greater trochanter. In 22% patients who continued to have slight pain, no sign of infection was found and removal of prosthesis was not required so far. This slight occasional pain may be explained by loosening of stem of prosthesis in canal. In study by Green et al 4 out of 20 patients were left with hip pain on ambulation and of these two had greater trochanter nonunion. Stern et al reported one patient with painful prosthesis every time he walked because tip of stem was rubbing against femoral cortex in bowed femur. They also reported another patient with pain subsequent to acetabular erosion. In present study, sinking of prosthesis was seen in one patients leading to shortening of limb and patient developed equinus deformity subsequently to compensate for shortening and further developed flexion deformity at hip. Limb length discrepancy was minimal (<5 mm) in 72% of cases in present study and 16% had limb lengthening between 5-10 mm. Some may say that one set of problems associated with internal fixation (loss of fixation, hardware cut out) are being traded with another set of problems in arthroplasty (limb lengthy discrepancy), but if center of prosthesis is taken at level of greater trochanter tip then appropriate limb length can be maintained. In cases where greater trochanter is fractured, a surgeon can still make the length determination by repositioning the fractured greater trochanter anatomically and observing the tension on fascia over the gluteus medius. Anteversion and retroversion of the prosthesis can be determined with the use of posterior aspect of lateral femoral condyle as a guide. Modified Harris Hip Score was used at our hospital for assessing the final functional outcome of patients in present study. This score takes into account pain, limp, support, distance walked, climbing of stairs, putting on shoes and socks, entering public transportation, limb length discrepancy, deformity and range of motion. The total score is 100, with outcome graded as excellent, good, poor and fair. Excellent or good results were observed in 79% of the patients in this study. Stern and Goldstein<sup>7</sup> reported excellent results in 94% of patients. Given the few complications and comparable functional recovery in this small study, we think that using standard cemented hemiarthroplasty is a reasonable alternative to sliding hip screw in intertrochanteric fractures. We would like to emphasize the careful selection of cases for this technique. The potential advantage of hemiarthroplasties for the treatment of intertrochanteric fractures warrants additional larger studies to be compared with a matched control group treated with sliding hip screw.

**CONCLUSION**

We concluded that majority of patients with intertrochanteric fractures can be successfully managed with osteosynthesis, older patients with severe osteoporosis and associated comorbidity may benefit from prosthetic replacement. Most patients report good pain relief and very few serious orthopaedic complications are associated with this procedure.

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