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Functional Outcome of Unstable Comminuted Intertrochanteric Fractures in Elderly Treated with Primary Bipolar Hemiarthoplasty: An Observational Study

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ABSTRACT

The aim of the present study was to evaluate the clinical and functional outcomes of cemented bipolar prosthesis in unstable intertrochanteric fractures in the elderly. We conducted a prospective study in which we included 50 patients who presented to Orthopedic Outpatient Department with inter-trochanteric femoral fractures. We got ethical committee approval to conduct a prospective study. The average age of the study population was 72.8±4.26 years, with 52% being female. 26 (52%), had left extremities involvement. Fifty percent of patients experienced road traffic accidents, 30% had height falls and 20% had mild trauma from walking falls that caused fractures. 32 patients had type 31-A2.2 trochanteric area fractures and 18 had type 31-A2.3 fractures, according to the AO/OTA classification. The SI found grade III osteoporosis in 27 individuals (54%), grade II in 18 (36%) and grade I in 5 (10%). Many patients experienced age-related issues. In 15 individuals, hypertension was present and 11 had diabetes. The average period from admission to surgery was 6.64±1.46 days. Four individuals needed 2 U of postoperative blood transfusion, but most required 1 U. The average procedure lasted 84 minutes, ranging from 55-105. The mean blood loss was 272 ml and ranged from 200-400. The dislocation rate in our investigation was nil. The mean Harris hip score improved with time. Older women are more likely to have femur intertrochanteric fractures. We recommend Cemented Bipolar Hemiarthroplasty for freely mobile senior patients over 60 with intertrochanteric femoral fractures, according to our findings. Hemiarthroplasty for senior femur intertrochanteric fractures brought early mobilisation, restoration to pre-injury levels, improved quality of life and a long-term solution. Immobilisation, rehabilitation, deformities and revision procedures are avoided with early full weight bearing following hemiarthroplasty.

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Key Words
Cemented bipolar prosthesis, elderly, harris hip score, internal fixation, unstable intertrochanteric fracture

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INTRODUCTION

A hip fracture is a significant and possibly serious event in a person's medical history[1]. An intertrochanteric fracture is a prevalent health issue among the elderly, with a significant one-year death risk of up-20%. The prevalence of these fractures rose from 1.66 million in 1990 to an anticipated 6.26 million by 2050 due to a rise in life expectancy and a sedentary lifestyle[4]. These fractures often develop in older individuals due to minor injuries, most frequently sideways falls from a standing position[5]. Osteoporosis is a significant risk factor for these fractures, with a higher likelihood of affecting females compared to men[4,5].

Intertrochanteric Fractures are Managed by Two Methods: conservative treatment and surgical intervention. Currently, the conservative approach is only used in individuals who are at a heightened risk of anaesthesia and surgery, as well as in non-ambulatory patients who have minor discomfort after a fracture. An effective surgical procedure for an unstable intertrochanteric fracture should result in a stable hip joint that is free from discomfort and has a satisfactory range of motion. The use of angled blade plate, dynamic hip screw and cephalomedullary nailing for osteosynthesis of these fractures in osteoporotic bone presents several challenges. These include difficulties in stabilising the fracture due to its unstable geometry, the risk of screws becoming dislodged, inadequate grip of the screws, the potential for the fracture to collapse inward and a slow healing process. Prolonged bed rest during the recovery period, which can last for months, may lead to the development of a decubitus ulcer, upper respiratory tract infection, or pneumonia. These complications have been reported in previous studies[6-8].

Bipolar hemiarthroplasty is a favourable implant for treating unstable intertrochanteric fractures due to its ability to circumvent the phases of bone healing and address the associated limitations[9]. It enables prompt mobilisation, reduces hospitalisation duration, and facilitates a wide range of motion[8-11]. This procedure may be performed as the primary treatment or as a secondary option after the failure of conservative or internal fixing methods[10-12]. Osteosynthesis yields favourable outcomes in stable intertrochanteric fractures, however it is a challenge in unstable intertrochanteric fractures because to the poor quality of the bone. Fixation of all pieces is challenging because to the comminuted intertrochanteric fractures occurring in the cancellous region. The presence of the posteromedial void often results in a high degree of instability in the fracture[13]. A contemporary method for stabilising these fractures involves the use of fourth-generation intramedullary nails, such as proximal femoral nails[14]. Immobilisation is necessary even in these implants. The use of primary hemiarthroplasty in managing such instances allows for early mobilisation, hence preventing the majority of problems associated with delayed mobilisation in these patients[15].

The objective of this research was to assess the clinical and functional results of using a cemented bipolar prosthesis for treating unstable intertrochanteric fractures in older individuals.

MATERIALS AND METHODS

We conducted a prospective study in which we included 50 patients who presented to Orthopedic Outpatient Department with inter-trochanteric femoral fractures. We got ethical committee approval to conduct a prospective study.

Inclusion Criteria:

- Patient with age group >60 years of either sex who are able to walk before injury.
- Intertrochanteric fracture classified as unstable fracture according to Boyd and Griffin classification (type II, III, IV).

Exclusion Criteria:

- Polytrauma patients.
- Patient <60 years of age.
- Compound intertrochantric fractures.
- Patients medically unfit for surgery.
- Patients with immunocompromised status.

Operative Technique:

Patient Positioning: Position the patient with the affected hip upward in lateral position. Prepare the skin over the hip and square off the lateral aspect of the hip from the iliac crest to the proximal thigh with towels and drapes. All patients were operated by the same surgeon. We used the posterior approach in lateral position.

Subcutaneous tissue is divided along with a skin incision in a single plane down to fascia Lata and fascia covering gluteus maximus superiorly. Fascia is divided in line with the skin wound over the center of the greater trochanter., gluteus maximus is bluntly split proximally in the direction of its fibers. Short external rotators and posterior edge of the gluteus medius were exposed. Fracture fragments were exposed and proper assessment was done without cutting short external rotators. Femoral head is dislocated posteriorly and removed after taking high cut in the neck. When the lesser trochanter is found as a separate fragment with neck, both of them are tied to the shaft using steel wires. In cases of greater trochanter fracture en masse, it is attached to the main shaft using steel wires. In cases in which the greater trochanter is coronally split, a tension band wiring is

used. In cases in which the greater trochanter is severely comminuted, Ethibond sutures are used to suture together the inter-trochanteric pieces and the soft tissues to make a stable construct. After proper neck cut, the femoral canal is broached with adequate anteversion. After trial reduction, we inserted a cemented bipolar prosthesis by using first generation cementing technique.

Rehabilitation Protocol: The patients were allowed to sit up on the bed hanging legs by the side on the second day. Quadriceps strengthening exercises, knee flexion, and extension exercises were started from the second day and patients were allowed full weight-bearing walk with a walking aid after the third day and/or as the pain and discomfort were tolerated. Adduction and abduction exercises of the hip started after 1 week, after which the patient was allowed to roll by the sides. Squatting and sitting cross-legged was totally restricted and patients were encouraged to leave their walking aids as soon as possible. Postoperative hip function was evaluated using the Harris hip-scoring system. Mean follow-up period was 3.5 years (2-5 years).

RESULTS AND DISCUSSIONS

Table 1: Patient characteristics

Variables		Frequency (n)	Percentage
Age (years)		72.8 ± 4.26	
Sex	Male	21	42
	Female	29	58
Side involved	Right	24	48
	Left	26	52
Mode of injury	RTA	25	50
	Fall from a height	15	30
	Fall while walking	10	20
Type of fracture	AO/OTA type 31-A2.2	32	64
	AO/OTA type 31-A2.3	18	36
Grading of osteoporosis	Grade I	5	10
(Singh index)	Grade II	18	36
	Grade III	27	54
Associated comorbidities	Diabetes mellitus	11	22
	Anaemia	10	20
	Hypertension	15	30
	Chronic kidney disease	2	4
	Asthma	8	16
	COPD	5	10
	Ischemic heart disease	2	4
Interval between the injury and surgery (days)		6.64 ± 1.46	

The average age of the study population was 72.8±4.26 years, with 52% being female. 26 (52%), had left extremities involvement. Fifty percent of patients experienced road traffic accidents, 30% had height falls and 20% had mild trauma from walking falls that caused fractures. 32 patients had type 31-A2.2 trochanteric area fractures and 18 had type 31-A2.3 fractures, according to the AO/OTA classification. The SI found grade III osteoporosis in 27 individuals (54%), grade II in 18 (36%) and grade I in 5 (10%). Many patients experienced age-related issues. In 15 individuals, hypertension was present and 11 had diabetes. The average period from admission to surgery was 6.64±1.46 days.

Table 2: Other parameters

Parameters	N %
Blood transfusion required (Number of units)	
One	40 (80)
Two	10 (20)
Mean duration of surgery (min)	84 (55-105)
Mean blood loss (ml)	272 (200-400)
Limb length discrepancy	7 (29)
Average shortening (cm)	1.2 (0.5-1.8)
Postoperative dislocation	None
Superficial infection	5 (10)
Harris hip scores at follow-up (mean score) Time of follow-up	
Third day	46.34
Second week	57.63
3 months	76.14
6 months	79.81
12 months	82.92

Four individuals needed 2 U of postoperative blood transfusion, but most required 1 U. The average procedure lasted 84 minutes, ranging from 55-105. The mean blood loss was 272 ml and ranged from 200 to 400. The dislocation rate in our investigation was nil. The mean Harris hip score improved with time. The mean score on the third day was 46.34, rising to 57.63 at 2 weeks and 76.14 and 79.81 at 3 and 6 months. Average Harris hip score at last follow-up was 82.92.

Intertrochanteric fractures account for about 45%-50% of hip fractures in elderly individuals[16], about 50%-60% of individuals are categorised as unstable[17]. Intertrochanteric fractures that are unstable are a significant issue in elderly individuals because to the high morbidity and death rates associated with them[18]. The preferred therapy for stable hip fractures is intramedullary nailing. Intramedullary nailing procedures include making a tiny incision and safeguarding the integrity of patients' bone structure. Intramedullary nailing decreases the occurrence of surgical problems, minimises blood loss and lowers the risk of infection[19]. Therefore, the less invasive technique known as intramedullary nailing is regarded as the most suitable option for elderly people. Managing unstable intertrochanteric fractures in elderly individuals is difficult due to their low bone quality and elevated risk of morbidity and death[20]. Osteoporosis and instability are key determinants of suboptimal therapy results[21,22].

Elderly individuals with unstable intertrochanteric fractures exhibit osteoporosis, extensive comminution, and displacement. Patients with osteoporotic and/or comminuted fractures may have challenges in maintaining proper alignment of the fractured bones throughout the healing process. In order to expedite the healing process, dynamic devices are substituted with static ones. Biomechanical studies indicate that dynamic implants possess greater weight-bearing capability compared to static implants[23-25]. It is advised that the screw should be positioned in the center[26] of the femoral head, as this reduces the risk of cut-out to

around 13%. The average age of the patients was 77 years, with a range of 65-85 years.

The mean age of the study cohort was 72.8±4.26 years, with females comprising 52% of the population. The predominance of women in this research may be attributed to the higher prevalence of osteoporosis and reduced bone density in women after menopause. 26 individuals (52%) had involvement of the left side extremities. 50% of the patients had road traffic accidents, 30% had a previous record of falling from a height and 20% received minor injuries from falling on the ground while walking, which led to fractures. This further indicates that the majority of intertrochanteric fractures in older individuals are caused by minor and insignificant injuries, likely owing to their low bone density. Based on the AO/OTA classification for trochanteric area fractures, there were 32 patients with type 31-A2.2 fractures and 18 patients with type 31-A2.3 fractures. As to the SI, grade III osteoporosis was the predominant kind, seen in 27 patients (54%)., grade II osteoporosis was present in 18 patients (36%), while grade I osteoporosis was found in 5 individuals (10%). A significant number of patients had comorbidities that were associated with their age. Fifteen individuals had hypertension, whereas eleven patients had diabetes mellitus. The mean duration from admission to surgery was 6.64±1.46 days. Hemiarthroplasty has been used for unstable intertrochanteric fractures since 1971[27], but with fewer frequency than for femoral neck fractures[28]. The primary use of this approach was to rescue cases when pinning or other difficulties had failed[29]. Tronzo said that he was the pioneer in using elongated, uncurved artificial limbs as the main approach for treating intertrochanteric fractures[30]. Rosenfeld, Schwartz and Alter had favourable outcomes while using the Leinbach prosthesis[31]. Subsequently, several research have shown favourable outcomes with this methodology.

The majority of patients needed a single unit of postoperative blood transfusion, whereas four instances necessitated two units. The average time of the procedure was 84 minutes, with a range of 55-105 minutes. The average blood loss was 272 ml and varied from 200-400 ml. We observed a complete absence of dislocations in our investigation. The average Harris hip score showed a steady improvement throughout the course of the follow-up period. The average score on the third day was 46.34, which rose to 57.63 after 2 weeks. Subsequently, the scores were 76.14 and 79.81 at 3 and 6 months, respectively. The ultimate mean Harris hip score at the most recent follow-up was 82.92. Primary therapeutic options for these fractures have evolved due to high failure rates, difficulties related to internal fixation and the utilisation of hemiarthroplasty and total hip arthroplasty. Tronzo[32] was the first to introduce the use of prosthesis as the main method of therapy for comminuted intertrochanteric fractures. Stern and Goldstein[33] used the Leinbach prosthesis to treat 22 intertrochanteric fractures and determined that prompt mobilisation and rapid return to preinjury condition are clear benefits. In a study conducted by Rodop[34], primary bipolar arthroplasty was performed on 37 elderly patients with unstable intertrochanteric fractures. After 12 months, the researchers observed that 17 patients (45%) achieved outstanding outcomes, while 14 patients (37%) achieved satisfactory results based on the Harris hip-scoring system. Haentjens[35] conducted a comparison between internal fixation and hemiarthroplasty and found that the hemiarthroplasty group had a considerably lower occurrence of pneumonia and pressure sores. Bipolar hemiarthroplasty has a lower incidence of problems compared to unipolar implants, including as loosening, dislocation, protrusion and acetabular wear. The presence of dual bearing surfaces in a prosthesis has many benefits, including the distribution of motion across the two surfaces. This results in a decrease in overall wear and erosion at the interface of the acetabular joint. Furthermore, there is an increase in the overall range of motion at the joint. Located inside the spacious femoral canal The use of cemented fixation provides the implant with strong stability, allowing patients with unstable intertrochanteric fractures to walk early with full weight bearing. This helps them quickly return to their prefracture level of activity, preventing complications such as pressure sores, pneumonia, atelectasis and pseudoarthrosis.

CONCLUSION

Intertrochanteric fractures of the femur are prevalent in elderly people, with females being more often afflicted. Based on our findings, we conclude that Cemented Bipolar Hemiarthroplasty is the preferred treatment for senior patients over the age of sixty with a femur fracture in the intertrochanteric region. Early mobilisation and hemiarthroplasty treatment in senior patients with intertrochanteric fractures of the femur resulted in higher quality of life and long-term solutions, allowing for an early return to their pre-injury level. Early postoperative full weight bearing after Hemiarthroplasty prevents prolonged immobilisation, the need for rehabilitation, the development of abnormalities and the requirement for revision procedures in the long run.

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