



MANAGEMENT OF UNSTABLE INTERTROCHANTERIC FRACTURE FEMUR USING LONG STEM CEMENTLESS ARTHROPLASTY SINGLE ARMED CLINICAL TRIAL

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Abstract

Background: fractures of trochanteric region of femur are common in elderly. Internal fixation of these fractures is a standard practice. But, Nowadays we encounter failures require reoperation. In fresh comminuted fracture through porotic bone in elderly with medical comorbidities or symptomatic ipsilateral degenerative hip disease, replacement preferred to allow early full weight bearing mobilization. arthroplasty using long-stem is a surgical method that helps patients relieve pain, facilitate early rehabilitation, limit long-term complications, and improve quality of life for patients. Hip fracture treatment in elderly patients remains challenging.

Aim: The aim of our study is to detect functional outcomes and complications after usage of cementless hip arthroplasty with long femoral stem for management of intertrochanteric femur fractures.

Materials and Methods: We followed 20 patients were treated with long-stem cementless arthroplasty due to intertrochanteric femur fractures. The mean age was 72.9 ± 5.79 years and the mean follow-up period was 12.8 months. The patients underwent either bipolar or total hip arthroplasty. Outcomes were evaluated with the Harris hip score (HHS).

Results: At the last follow-up, the mean Harris hip score was 81.2 points. There were no cases of osteolysis. All stems were stable without significant changes in alignment or progressive subsidence. Superficial infection was observed in one patient and was treated medically. Implant loosening and periprosthetic fractures were not noted.

CONCLUSION: Primary cementless long stem arthroplasty is one of good choices in treatment unstable ITF in elderly patients, helped patients improve the quality of life.

Key Words: intertrochanteric fractures, arthroplasty, cementless, long-stem.

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INTRODUCTION

Fractures of trochanteric region of femur are common in elderly. Internal fixation of these fractures is a standard practice. But, Nowadays we encounter failures require reoperation. So, it is still debatable whether we should treat unstable intertrochanteric femur fracture with hip arthroplasty or internal fixation. Replacement with either bipolar or total hip is considered mainly for failed fixation. In fresh comminuted fracture through porotic bone in elderly with medical comorbidities or symptomatic ipsilateral degenerative hip disease, replacement preferred to allow early full weight bearing mobilization. ^(1,2) Excessive sliding or medialization (loss of offset) has been one of major problems in

PATIENTS AND METHODS

Long stem cementless arthroplasty was performed on 20 patients with intertrochanteric fractures, 10 males and 10 females, 8 patients had right side

sliding hip screw, while varus deformity and shortening in cephalomedullary nail. In addition, conversion hip arthroplasty after failed osteosynthesis with intramedullary nail of pertrochanteric fracture would be difficult. Treatment with prosthetic replacement can make it possible to restore hip mechanics as normally as possible. ^(3,4) We should aim regain preinjury walking ability and function as soon as possible. Arthroplasty was chosen because it allowed early full weight bearing and rehabilitation without any concern of healing complication such as malunion, nonunion and osteonecrosis. ⁽⁵⁾

This study evaluated the clinical and radiological outcomes of long stem cementless arthroplasty in patients with unstable intertrochanteric fractures.

intertrochanteric femur fractures and 12 patients had left side intertrochanteric femur fractures, circulage wires used for trochanter fixation in 17 patients from the 20 patients The mean age was 72.9 ± 5.79 years

and the mean follow-up period was 12.8 months (range 10-18 months). Whole operation done by lateral approach, 10 cases cementless long stem over bipolar hemiarthroplasty and 10 cases over total hip.

The follow up post-operative start from hospital (hospital stay and start weight bearing) then follow up outside hospital clinically and radiologically.



Figure (1): Preoperative X-ray

Surgical Technique: spinal anesthesia is indicated. May be combined with regional epidural anesthesia, mainly for postoperative analgesia. Prophylactic antibiotics are administered intravenously at least 30 min before skin incision e.g., a second generation cephalosporin. A Foley catheter is used to monitor fluid balance. Lateral position on a wellpadded hip table. The pelvis is secured with padded anterior (pubic) and posterior (sacral) post supports to secure the patient so the ASIS is perpendicular to the plane of the floor and not rotated. An inflatable shoulder float is placed below the axilla to avoid injury to the axillary nerve and reduce postoperative shoulder discomfort. The back is also stabilized with a posterior thoracic support to prevent any forward or backward rolling of the body. All of the bony prominences are padded. The nonsurgical leg is secured with a belt in a position of slight hip flexion and 90° of knee flexion.

The patient was positioned in lateral position and the hip was approached laterally. longitudinal incision

centered over tip of greater trochanter and extends down the line of the femur about 8cm. Split fascia lata, expose tendon of gluteus medius, detach fibers of gluteus medius that attach to fascia lata using sharp dissection, split fibers of gluteus medius longitudinally starting at middle of greater trochanter, do not extend more than 3-5 cm above greater trochanter to prevent injury to superior gluteal nerve, extend incision inferior through the fibers of vastus lateralis, develop anterior flap and expose anterior joint capsule. With hip moderately flexed, externally rotated and slightly abducted so as not to disengage the trochanteric fracture, the femoral neck was transected leaving fractured trochanteric area untouched and the femoral head was removed.⁽⁶⁾ Temporary cerclage wiring was performed through posteromedial and posterior fragment of trochanteric area then preparation of femur and insertion of femoral component done.



Figure (2): Postoperative X-ray

RESULTS

The follow up post-operative start from hospital (hospital stay and start weight bearing) then follow up outside hospital clinically and radiologically. The hospital stay range from three to five days, all cases started early assisted weight bearing after operation, sixteen of them in the day after operation and four patients started two days after operation. One patient walk un assisted after two months, the mean of duration for walking un assisted was 3.70 months, the last of them was after 6months from operation. Whole patients were followed clinically and radiologically for alignment, limb length, fragments

union and possible complication and Harris hip scale for pain, function, absence of deformity and range of motion 12 months after operation. The results of HHS range from 72 to 85, eight patients had fair score and twelve had good score, with mean 81.2.

None of them needed reoperation or dislocated, only one case had superficial infection treated during first two weeks after arthroplasty and did not need further intervention. There were no cases of osteolysis. All stems were stable without significant changes in alignment or progressive subsidence. Implant loosening and periprosthetic fractures were not noted.

Table (1): Demographic data:

		Minimum	Maximum	Mean	SD
Age		62.00	80.00	72.90	5.79
		N		%	
Sex	Male	10		50.0%	
	Female	10		50.0%	

Table (2): Side

		N	%
Side	Right	8	40.0%
	Left	12	60.0%

Table (3): Operative data:

		Minimum	Maximum	Mean	SD
Blood loss (ml)		250.00	500.00	380.00	59.38
		N		%	
Management	Total hip	10		50.0%	
	Bipolar	10		50.0%	
Approach	Lateral	20		100.0%	
Duration of operation (hours)	1.50	8		40.0%	
	2.00	12		60.0%	
Intraoperative assisted procedures	No	3		15.0%	
	Cerclage wire	17		85.0%	
Intraoperative complication	No	20		100.0%	

Table (4): Follow up data:

		Minimum	Maximum	Mean	SD
Follow up (months)		10.00	18.00	12.80	2.12
hospital stay (days)		3.00	5.00	3.65	.75
full weight bearing unassisted (ms)		2.00	6.00	3.70	1.03
		N		%	
Gait (days)	Next day	16		80.0%	
	2 days post-operative	4		20.0%	

Table (5): Post-operative assessment:

		N	%	
Radiological assessment		Good	20	100.0%
Clinical assessment (limb length)		Equal	20	100.0%
Clinical assessment (HHS) after 6ms		fair	8	40.0%
		good	12	60.0%

None of them needed reoperation or dislocated, only one case had superficial infection treated during first two weeks after arthroplasty and did not need further intervention.

Table (6): Post-operative complications:

Postoperative complications		N	%
	No	19	95.0%
Wound infection	1	5.0%	

CASE PRESENTATION

Case 1

i. Patient's profile: Male patient, 68 years old, fracture of the right intertrochanteric femur, follow up for 12 months.

ii. Operative data: total hip arthroplasty cementless done with diaphyseal fitting stem and circlage wires done, through the lateral approach, blood loss: 450

ml, operation time: 2 hours and intraoperative complications: None.

iii. Postoperative data: postoperative complications: None, follow up: 12 months, radiological evaluation, x-ray pelvis anteroposterior and x-ray hip anteroposterior and lateral and Clinical evaluation (according to Harris Hip Score): good.



Figure (3): Preoperative imaging of case 1.



Figure (4): Postoperative imaging of case 1.

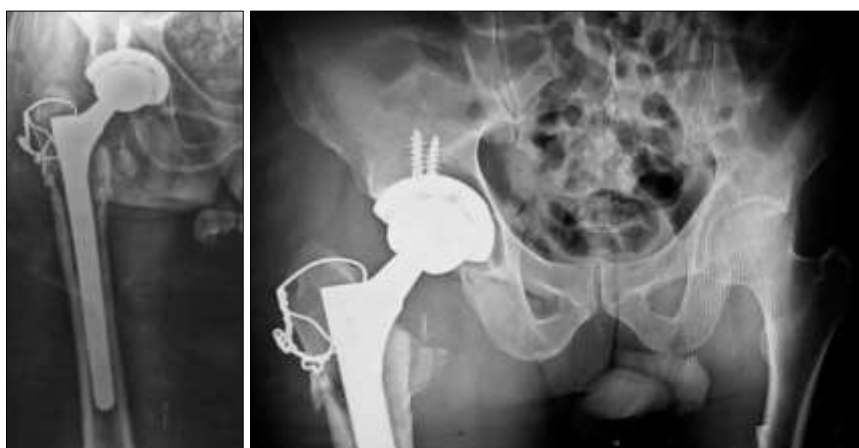


Figure (5): Last follow up imaging of case 1.

Case 2

i. Patient's profile: female patient, 80 years old, fracture of the left intertrochanteric femur, follow up for 16 months.

ii. Operative data: bipolar hemi-arthroplasty cementless done with diaphyseal fitting stem and fixation of bony fragments using circlage wires, through the lateral approach, blood loss: 400 ml,

operation time: 1.5 hours and intraoperative complications: None.

iii. Postoperative data: postoperative complications: None, follow up: 16 months, radiological evaluation,x-ray pelvis anteroposterior and x-ray hip anteroposterior and clinical evaluation (according to Harris Hip Score): good.



Figure (6): Preoperative imaging of case 2.



Figure (7): Postoperative imaging of case 2.



Figure (8): Last follow up imaging of case 2.

DISCUSSION

In treatment of hip fractures in elderly, in order to avoid mortality and morbidities; main purpose is to achieve pre fracture mobilization status and functions as early as possible. postoperative early ambulation and rehabilitation should be taken into account when considering treatment options. ⁽⁷⁾ For this reason, a long stem diaphyseal fitting prosthesis arthroplasty is advised as regarding mobilization with early weight bearing and few implant failures and do not waiting for bony union. ⁽⁸⁾

In the current study, we performed cementless long stem arthroplasty through lateral approach for 20 patients had unstable intertrochanteric femur fractures. Of the 20 patients, there were 10 males (50%) and 10 females (50%) with a mean age at time of surgery of 72.90 years old (range from 62 to 80 years). 8 patients with right side intertrochanteric femur fractures and 12 patients had left sided fractures.

One of our main concerns in this study was early mobilization after operation. All of our patients started assisted weight bearing after operation, sixteen patients started on the day after operation and four patients started two days after operation. HHS for our patients range from 72 to 85 with mean 81.2, eight patients had fair score and twelve had good score.

Biçen et al. (2021) used cementless Long-stem Prosthesis for 48 patients had Intertrochanteric and Femoral Neck Fractures in the Elderly, were followed up minimum 2 years with mean 57 (24-92) months, the last follow-up mean HHS was 77, one patient needed debridement and one patient had dislocation. ⁽⁹⁾

Dung et al. (2019) used primary cementless bipolar Long Stem hemiarthroplasty for 35 patients had unstable osteoporotic Intertrochanteric Fracture in the Elderly, were follow-up at least 6 months showed; Average rehabilitation time was 4.63 ± 1.7 days. The average Harris point at the end was 90.4 ± 4.72 . ⁽¹⁰⁾

Arthroplasty can be performed either cementless or cemented. Some surgeons prefer cemented stems suggesting as being initially more stable when compared with cementless stems. But intraoperative cardiopulmonary complications are still debating issues of cemented prosthesis. bone cement implantation syndrome is still a debating issue. The syndrome is presented just after cementing; with sudden hypotension, arrhythmia, hypoxia, pulmonary hypertension, cardiogenic shock and even with cardiac arrest. ⁽¹¹⁾ The mechanism is still not clear but, thermic, anaphylactic, and inflammatory processes have been accused. recent studies show good outcomes with cementless stems without any complication related with stability. ^(12, 13)

Kim et al. (2018) reported their midterm functional outcomes and survival rates of elderly patients with intertrochanteric fractures, whom they treated with long-stem BHA. They followed their patients for mean of 61.8ms. They did not experience any stem implant failure. ⁽¹⁴⁾

The study of **Gocer et al. (2016)**, compare different arthroplasty methods for treatment of unstable intertrochanteric fracture. 121 patients of intertrochanteric fracture divided in to groups cementless and cemented arthroplasty, there were no significant differences in functional results but mortality is higher in cemented group. ⁽¹⁵⁾

The initial stability is essential for survival of cementless femoral stems and successful osseointegration and reducing the subsidence of the femoral stem. Because the femoral stem has the possibility of poor initial fitting caused by proximal calcar deficiency, distally diaphyseal fixating fluted stem used considering unstable intertrochanteric femoral fracture as one case of femoral revision with preserved femoral diaphysis. The initial stability was achieved at the isthmus allowing rotational and axial control of the implant in the isthmus of the diaphysis and bony in-growth fixation or stable fibrous fixations. ⁽¹⁶⁾

Park et al. concluded that the clinical results and mechanical stability obtained with this fluted and tapered modular distal fixation stem design are comparable with or even better than those obtained with other cementless revision stem designs in femoral revision of proximal femoral deficiency. ⁽¹⁷⁾

In our study Circlage wires used in 17 patients for fixation of trochanteric fragments for rigid stability, it depends on fragment size and fracture pattern. **Zha et al. (2018)** used Cementless diaphyseal fixation modular stem without reconstruction of femoral calcar for unstable intertrochanteric fracture in 37 patients aged 75 years or more. 83.8% of patients recovered to preoperative ambulatory status. 4 (10.8%) out of 37 patients had the limb length discrepancy with a range of 3–7 mm, without discomfort. All of the 37-femoral stem achieved press-fit at the isthmus; bony union of the greater trochanter were observed in all patients at a mean follow-up of 4.3 ± 1.7 months; the bony in-growth fixation of stem was achieved in 24 patients (24/37, 64.9%) and stable fibrous fixation were achieved in other patients (13/37, 35.1%). None of these patients had evidence of osteolysis, loosening or subsidence of femoral stem ≥ 5 mm (2 mm subsidence in 11, and 3 mm in 5 patients). There was no subsidence of femoral stem after 6 months postoperatively. ⁽¹⁸⁾

On the other hand, **Lee et al. (2017)** used Cerclage Wiring for Fixation of Trochanteric Fragments in Cementless Bipolar Hemiarthroplasty for Unstable Intertrochanteric Fracture. This study presented that the cerclage fixation of the trochanter restored the abductor mechanism and protect from an

intraoperative fracture, transverse wiring before stem insertion is considered. 62 patients were followed for a minimum of 2 years, the wire was broken in 3 hips (4.8%) and the nonunion of the greater trochanter occurred in 1 hips (1.6%). No patient complained wire-related bursitis as swelling or trochanteric pain. ^(19,20)

Wada et al. (2017) used Cementless calcar-replacement stem with integrated greater trochanter plate for unstable intertrochanteric fracture in very elderly patients 44 patients had hemiarthroplasty using the MOD-Centaur stem for intertrochanteric fractures achieved favorable patient outcomes, bony union of the greater trochanter was observed on postoperative plain X-ray images obtained at least 6 months after surgery. Rigid fixation of the greater trochanter fragment leads to good clinical outcomes in very elderly patients with a high ambulatory rate (50%) and a low mortality rate (9.1%) even in a very elderly population. Postoperative peripheral infection occurred in one patient. Four patients died within 1 year postoperatively (mortality rate: 9.1%). Bony union of the greater trochanter was achieved in all the patients who had a plain X-ray taken at least 6 months postoperatively. At 1-year follow-up, 20 patients could walk independently. ⁽²¹⁾

Chu et al. (2014) reported that in clinical treatment results of unstable intertrochanteric fracture treated by Wagner SL stem, all the trochanteric area fractures healed well regardless of fixation of trochanteric fracture fragment. 47 patients in this study treated by Wagner SL stem, at average follow up of 2.7 years, mean HHS was 89.4 (range: 65 to 100) for total hip arthroplasties and 87.7 (range 57 to 100) for hemi arthroplasties. ⁽²²⁾

In our study, we observed that, in treatment of hip fractures in elderly, long-stem cementless prosthesis provided satisfactory clinical outcomes with low complication rates. None of our patients had post-operative complications except one patient had superficial wound infection treated and did not need debridement.

Kim et al. (2014) used Cementless bipolar hemiarthroplasty for 134 patients had unstable intertrochanteric fractures in octogenarians, With Mean follow-up period was 3.8 (range: 2.2 to 9.0) years, Mean HHS was 82 (range: 78 to 99) at the final followup, 112 patients (80.6%) from 143 regained their pre-injury levels of ambulation, all stems were stable at the final followup and there was no loosening or dislocation, During the follow-up period, two reoperations were performed due to deep infection and periprosthetic fracture. ⁽²³⁾

Choy et al. (2010) presented 40 patients treated with cementless bipolar arthroplasty for intertrochanteric fracture. Mean age of the patients was 78.8. Mean follow-up period of the patients was 40.5 months. HHS at the last controls was 80.6. They did not have any intraoperative death or periprosthetic fracture.

Only in 3 patients superficial infection developed and all be treated without implant removal. None of the patients had implant loosening in follows. ⁽²⁴⁾

According to **Cho (2014)** the average time to partial weight-bearing is 7 days after hemiarthroplasty surgery for patients with fracture intertrochanteric. ⁽²⁵⁾

Parvjeet et al. (2009) compared two groups of hemiarthroplasty bipolar long stem and osteosynthese with DHS plate, which resulted in an average partial stand-up time of the arthroplasty group was 7 days, while osteosynthese group was 10.1 days. ⁽²⁶⁾

One of the limitations in our study is the short term follow-up and the lack of comparison between using the long stem cementless femoral stem and other stem designs or osteosynthesis. Although these restrictions, we has successfully demonstrated that primary cementless long stem arthroplasty is a satisfactory indication for elderly patients with unstable ITF of femur osteoporosis.

CONCLUSION

Unstable intertrochanteric fractures in elderly patients with osteoporosis has severe comminution and displacement, Internal fixation of these fractures had high rate of failures require reoperation. Long-stem prosthesis has an advantage of diaphyseal press fit stability ignoring metaphyseal comminution. We observed clinical outcomes of 20 patients for a mean of 12 months. The mean HHS of the patients was good and all of the patients were able to ambulate early with least complications. We believe that long-stems cementless prosthesis can be chosen as a treatment option for intertrochanteric fractures.

Informed consent

The consent and commitment were signed by the patients in the study and their families.

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