International Journal of Research in Orthopaedics
Kanchan S et al. Int J Res Orthop. 2019 Mar;5(2):237-243
http://www.ijoro.org

Original Research Article

DOI: http://dx.doi.org/10.18203/issn.2455-4510.IntJResOrthop20190425

Primary arthroplasty as an option for surgical treatment of unstable intertrochanteric fracture femur in elderly patients: a retrospective study

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Received: 22 December 2018
Revised: 18 January 2019
Accepted: 21 January 2019

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ABSTRACT

Background: An unstable intertrochanteric fracture in osteoporotic elderly patients presents a very challenging problem to the surgeons. This category of patients if kept in bed for long tends to have many complications like deep vein thrombosis, pneumonia, bed sores, etc. Surgeon's worldwide face difficulty in getting a good anatomical reduction and do not allow early mobility to these patients because of risk of loss of reduction and implant cut out. The purpose of our study is to study the usefulness of arthroplasty in these patients in terms of better functional outcomes and no increase in complication rates.
Methods: It was a retrospective study involving 25 patients (17 females, 8 males) with mean age of 76±2.3 years having intertrochanteric femur fractures (AO type A 2.2 and above) with osteoporosis operated upon with bipolar hemiarthroplasty at IQ City Medical College and NM Hospital between January 2015 and January 2017.
Results: All the patients were followed up for a period of 1 year. We had a mean operative time of 75 min (range 55-125 min) with an average blood loss of 450 ml. 4 of our patients required postoperative blood transfusion. All patients walked on 2nd postoperative day. We had a mean Harris hip score of 82 and mean VAS of 1 at the end of 1 year.
Conclusions: Hemiarthroplasty done in cases of unstable intertrochanteric femur fractures in elderly patients with osteoporotic bones allows early weight bearing thus improves the final functional outcomes. Further randomized trials are required before deriving any conclusions.

Keywords: Hemiarthroplasty, Unstable intertrochanteric fractures, Osteoporotic fractures

INTRODUCTION

Fracture of intertrochanteric region is a common occurrence in elderly age group. It accounts for about 20% of all the fractures in patients 50 years and older age.[1] The global burden of the disease was estimated to be about 1.6 million in the year 1990 and it is expected to increase up to 6.26 million by the year 2050.[2,3] The trend of increase in incidence of intertrochanteric fractures can be explained by the fact that the average life expectancy has increased and so has the problems due to osteoporosis and other co morbid conditions.[4] Most of these fractures occur due to low energy trauma or even a trivial fall. It was shown in the study by Bergstterom et al that trivial fall i.e. fall from <1 m accounts for about 53% of all the fractures in patients above 50 years of age and the percentage is about 80% for person more than 75 years of age.[5] The management of these fractures in elderly patients should be definitive and allow early weight bearing in the postoperative period to give them the best

possible functional outcome and avoid the problems occurring due to mal-union, implant failure/cut out and prolonged bed rest.[6,7]

The fracture of pertrochanteric region can be classified in many ways based on different systems.[8] For the purpose of treatment we depend upon:

- Evan's classification which broadly classifies the fractures into stable (2 part) and unstable (3 part & 4 part) types.[9]
- AO classification which again classifies the fractures into stable 31A 1, 31A 2.1 types and unstable 31A 2.2, 31A 2.3 & 31A 3 types.[10]
- Kyle's classification which classifies fractures into stable patterns Type 1 & 2 and unstable patterns type 3 and 4.[11]

The treatment of stable fractures (Evan's type I and II, AO type 31A 1 and 31A 2.1, and Kyle's type 1 and 2) is done by obtaining fracture reduction and fixation using DHS or Intramedullary nails. This allows satisfactory healing and early mobility to the patients without many complications.[12-15]

But the treatment of the unstable fracture patterns (Evans type III and IV, AO type 31A 2.2 and above & Kyle's Type 3 and 4) is still controversial despite the considerable amount of research done in the field of fixation techniques and implants being used.[13] The problem with these fracture patterns is the lack of inherent stability due to the presence of either one or combination of (i) posteromedial wall communition, (ii) lateral wall fracture, (iii) subtrochanteric extension, (iv) reverse oblique pattern, and (v) poor bone quality (osteoporosis), which makes the fracture reduction difficult & the fixation is unstable and prone to failure.[16] The presence of osteoporosis further complicates the situation as there are high chances of screw penetration or cut out leading to implant failure.

The presence of medical co-morbidities in elderly age group compounds the problem and compromises the outcomes if the patient remains in prolonged bed rest waiting for the fracture to heal post operatively as there are increased chances of bed sores, DVT, embolism, pneumonia, etc.[17,18] It has been shown that elderly patients with unstable intertrochanteric fractures have a high mortality of around 20% in the first postoperative year.[18-20]

While, hemiarthroplasty ensures definitive fracture treatment and allows early mobility to elderly patients with unstable intertrochanteric fracture femur with osteoporosis and thus improve chances of successful outcome.[21,22]

Keeping the above mentioned facts in mind a retrospective study was conducted with the aim of studying the functional and clinical outcomes of cemented bipolar hemiarthroplasty in elderly patients with unstable intertrochanteric femur fractures.

METHODS

Among all the cases with unstable intertrochanteric fracture femur admitted at IQ City Medical college and NM Hospital, Durgapur between January 2015 and January 2017 and undergoing cemented bipolar hemiarthroplasty, 25 patients fulfilling our eligibility criteria were selected and were studied retrospectively. There were 17 females and 8 males in the study. All the patients had confirmed osteoporosis preoperatively as per Singh index.[23]

Elderly patients who were "community ambulator" (i.e. walking outdoors with or without any support prior to the injury) between the age group of 65–84 years (mean age being 76±2.3 yrs) with unstable fracture pattern (AO type 31A 2.2 onwards) were included in our study.

Patients with pathological fractures, polytrauma patients, compound injuries, previous history of any hip pathology, younger patients (with age <65 yrs), previously bed ridden patients and patients not fit from anaesthesia point of view were excluded from our study.

The preoperative data included: age, sex, mode of trauma, side of injury, fracture pattern and associated co morbidities.

The intra operative data included: surgery time, amount of blood loss, need for blood transfusion.

The postoperative data included: time taken for full weight bearing, total duration of hospital stay and any complications.

All the surgeries were performed by the same surgical team using the standard posterior approach (Southern Approach) after due clearance from the anaesthetic team and preoperative templating on the anteroposterior x ray of pelvis with both hips. All the patients received a single dose of antibiotics (3rd generation cephalosporins) preoperatively and two doses postoperatively.

The surgical steps included administration of spinal anaesthesia, positioning of the patient in lateral decubitus, posterior approach to the hip joint and neck cut at subcapital area to facilitate extraction of femoral head. After the femoral head was extracted the fracture had three main parts (i) greater trochanter, (ii) the lesser trochanter with or without the neck part and (iii) the femur shaft (Figure 1A). In our study 15 patients showed continuity between lesser trochanter and the neck. In these cases the restoration of the calcar was done by tying the lesser trochanter to the femur shaft and greater trochanter using steel wires (Figure 1B). The appropriate neck cut was then taken as per the preoperative X-ray templating. The rest of the 10 cases had lesser trochanter

as a separate piece. In these cases a cement mantle was used for calcar reconstruction. The lesser trochanter was tied to the shaft after insertion the femoral stem into the femoral canal. In 21 of our cases where greater trochanter was fracture en masse, it was reattached to the main shaft using steel wires. In rest of the 4 cases greater trochanter was severely comminuted, and here the pieces were sutured with the soft tissues using ethibond sutures to maintain the lateral sleeve. After reconstruction of the proximal femoral anatomy the femoral canal preparation was done using sequential broaching with proper anteversion being maintained (Figure 1B). A trial reduction was done with the trial implant and the leg length was compared with normal limb to look for any shortening. If there was any shortening due to calcar deficit then traction was given to the leg and the distraction between the implant and the femur shaft noted to have the idea of length to which the implant should sink after cementing to avoid limb shortening. 2nd generation cementing technique (i.e. hand mixing of cement, use of cement restrictors and cement gun) was applied, the appropriate size implant was inserted in proper version upto the required length as determined earlier using the trial stem (Figure 2A). If the calcar was deficient then it was recreated using cement mantle (Figure 2B) and the broken trochanters were reattached to the femur shaft and implant with steel wires or ethibond as needed (Figure 2C), reduction of the implant into acetabulum was done, final checking for limb length discrepancy and stability of the hip joints were done, the abductors and the short external rotators were sutured into greater trochanter and shaft femur with sutures using bone tunnels, soft tissue closure was done over a suction drain after achieving proper haemostasis.

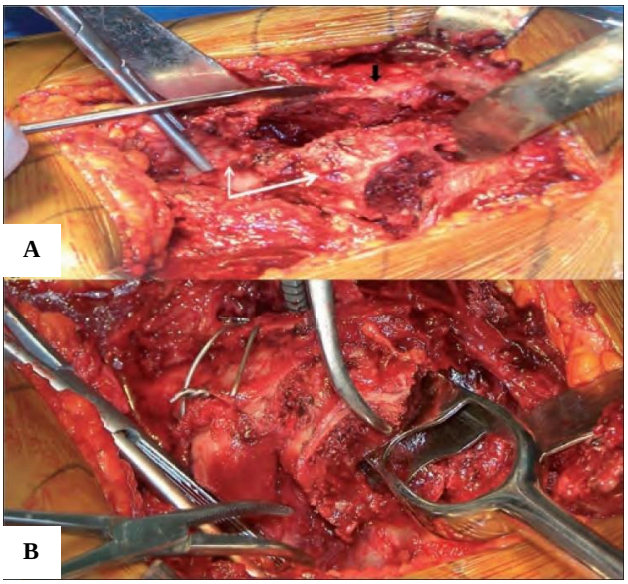

Figure 1: (A) The white arrows show lesser trochanter and the femur neck and black arrow shows femur shaft; (B) proximal femur is reconstructed by use of steel wires to tie the trochanters and the shaft. Femoral broaching is done with proper anteversion.

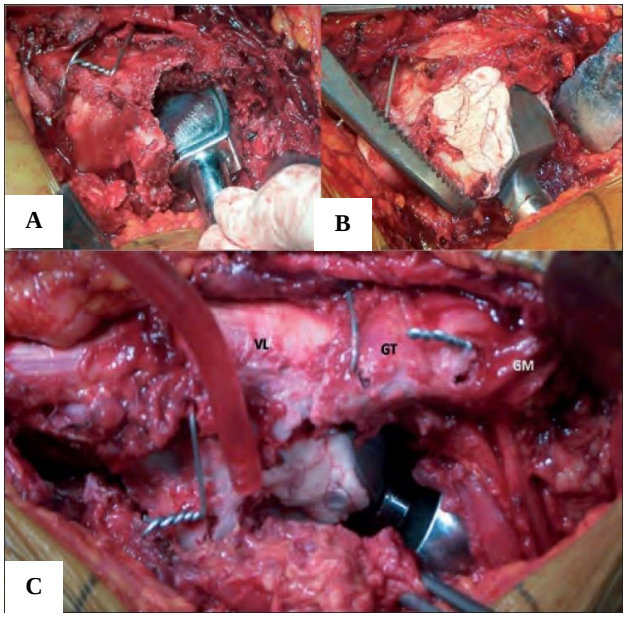

Figure 2: (A) A trial stem put to assess the bone deficiency and level to which the final stem is to be inserted; (B) cementing of final stem done and bone defect reconstructed using cement mantle; (C) lateral tissue sleeve reconstructed using gluteus medius (GM), greater trochanter (GT), vastus medialis (VM) and fixed to shaft using steel wires.

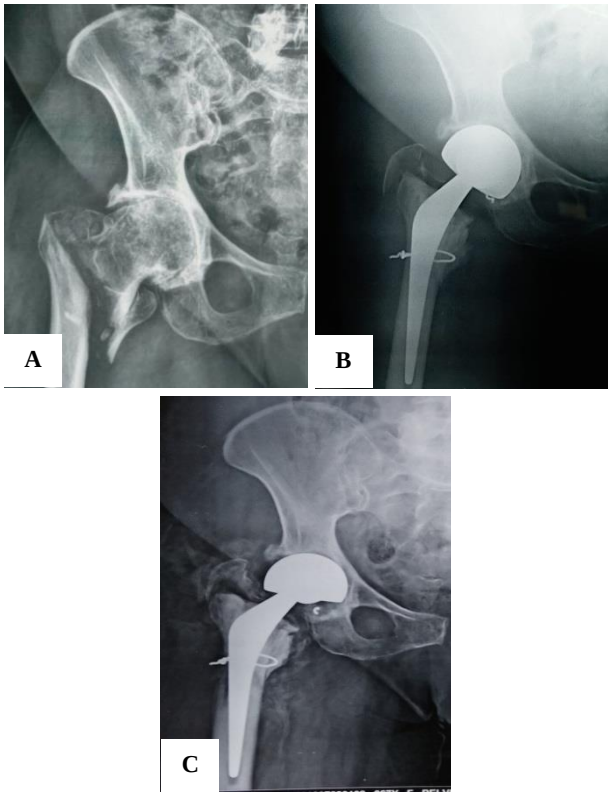

Figure 3: (A) Preoperative X ray (B) postoperative X ray (C) follow up X ray.

All the patients were given an abduction pillow post operatively and were made to follow a physiotherapy

protocol which included sitting with leg hanging from day 1 and gait training and mobilisation with walker support on day 2 or 3 based on pain tolerance by the patient. A pelvis with both hips anteroposterior X-ray was taken post operatively on day 1. The drain was removed on day 2. The patients were discharged on day 5 and subsequently followed up in OPD at 6 weeks, 3 months, 6 months, 9 months and 12 months using Harris hip score and VAS. X-ray pelvis with both hips anteroposterior view was done on each visit to look for signs of any subsidence, loosening, dislocation, infection or acetabular erosion.

RESULTS

A total of 25 patients were enrolled in the study after obtaining proper consent. The mean age of the patients was 76±2.3 years (65–84 yrs) among which 8 were males and while 17 were females. All the study subjects had medical co-morbidities (5 had cardio vascular diseases, 13 had DM and 7 had COPD), were walking outdoors with or without support in the pre trauma period and all had a history of fall at ground level (Table 1). The mean operative time was 75 min (55 min to 125 min) with an average blood loss of 450 ml. 4 patients required a single unit of blood transfusion post operatively. Drains were used in all the cases and were removed 48 hrs after surgery. All patients were allowed to do partial weight bearing with crutches on 2nd postoperative day and full weight bearing was encouraged from 3rd postoperative day. None of our study subjects had a postoperative hip dislocation. One patient had developed deep vein thrombosis, 1 patient had bed sores while 2 patients had superficial wound infection. We did not have any incidence of deep wound infections (Table 2).

Table 1: Characteristics of study subjects.

Variable	Frequency (%)
Age group (in years)	
65-70	8 (32)
71-75	7 (28)
76-80	5 (20)
81 and above	5 (20)
Sex	
Male	7 (28)
Female	18 (72)
Medical co-morbidities	
Cardio vascular diseases	5 (20)
Type 2 diabetes mellitus	13 (52)
COPD	7 (28)

Postoperative evaluation was done using VAS, Harris hip scores and X-ray pelvis with both hips anteroposterior view at 6 weeks, 3 months, 6 months, 9 months and 12 months postoperatively.

The mean Harris hip score for the study group was 82 (52–86) after one year which increased to 92 at the end of two years. The VAS score was 1 at the end of one year. 92% of our patients were walking without support at the end of one year. We had no deaths in the follow up period. One patient had breakage of the circlage wire. One patient had aseptic loosening of the implant and subsidence of implant with consequent shortening of more than 1 cms during follow up (Table 3).

Table 2: Operative findings.

Variable	Observations
Operative time	Mean- 75 min (55-125 min)
Average blood loss	450 ml
No. of patients requiring blood transfusion	4 (16%)
Immediate complications	
Dislocations	0 (0%)
Deep vein thrombosis	1 (4%)
Bed sores	1 (4%)
Superficial infections	2 (8%)
Deep infections	0 (0%)

Table 3: Final outcomes after a follow up of one year.

Variable	Observations
Harris Hip score	Mean - 82
Pain	
Anterior thigh pain	VAS 1-5
Fracture site pain	VAS 1-3.5
Ambulation without aid	23 (92%)
Complications	
Breakage of wires	1 (4%)
Implant loosening	1 (4%)
Heterotrophic ossification	0 (0%)
Shortening of limb by more than 1 cm	1 (4%)
Subsidence of implant	0 (0%)
Death	0 (0%)

DISCUSSION

Fracture intertrochanteric femur in elderly population is a very common occurrence with incidence of around 20% of all fractures in population above 50 years and older.[1] As the age of patients advances bone quality decreases due to osteoporosis while the associated co morbidities increase. Internal fixation of the intertrochanteric fractures has shown to significantly reduce the morbidity and mortality in the elderly age group.[18-20]

The choice of implants for stable intertrochanteric fractures is proven beyond doubt to be dynamic hip screw or proximal femur nails both of which give invariably good results in terms of fracture union (nearing 100%) and functional outcome.[17,18] However there are high chances of complications such as loss of reduction, implant failure and malunion (nearing 56%)in elderly

patients with unstable intertrochanteric fractures.[25] These patients cannot be mobilised postoperatively until one is sure of fracture union. This increases their morbidity and mortality.[18,19] A delay in surgery and prolonged bed rest are important predictors of morbidity and mortality in patients with intertrochanteric femur fractures.[20]

Bipolar hemiarthroplasty has been proposed to be a viable option for treatment of unstable intertrochanteric femur in elderly population to allow a definitive stable fixation and immediate mobility in the postoperative period.[27,28] It was initially used as a salvage procedure for failed osteosynthesis or other complications. Later studies by Torenzo et al, Rosenfeld et al and Stern et al reported good outcomes with the use of Leinbach bipolar prosthesis as a primary treatment modality for unstable intertrochanteric femur in elderly.[21,29,30] Liang et al concluded that bipolar hemirtharthroplasty is an effective method to treat unstable intertrochanteric femur in elderly and it decreases the complication rates & mortality thus improving patient's living quality and financial burden on the family.[31] Grimsrud et al also concluded that cemented bipolar prosthesis with circlage of trochanter can be considered as a standard treatment for unstable intertrochanteric femur as it allows safe and early weight bearing with low complication rates.[32] Rodop et al in a similar study showed good to excellent functional outcomes according to the Harris hip scoring system.[33] In a comparative study of internal fixation versus bipolar hemiarthroplasty Haentjens et al showed significant reduction in incidence of pneumonia and bed sores in the arthroplasty group.[34] Kayali et al concluded similar clinical outcomes in both the groups but the latter group could weight bear earlier.[35] Broos et al inferred that the operative time, blood loss, and mortality rates were comparable between the two groups.[36]

Kesmezacare et al reported a postoperative mortality of 34.2% after a mean follow up of 13 months in internal fixation group and a mortality of 48.8% after a mean follow up of 6 months in endoprosthesis group.[37] This finding could not be repeated in several other studies, which showed no difference in postoperative mortality in the two groups. There were no postoperative mortalities in our study group.

Hardy et al had reported the possibility of early weight bearing post operatively without the fear of excessive collapse in cases operated with intramedullary nails for comminuted intertrochanteric femur fractures.[38] Kim et al in their prospective study involving 29 patients undergoing either calcar replacement endoprosthesis or intramedullary nailing could not find any difference in functional outcomes, however they reported a 7% incidence of screw cut out in the intramedullary nailing group.[39] In a meta-analysis Yoo et al inferred that arthroplasty provides better functional outcomes in terms of earlier mobilization with respect to the internal fixation group while there is no difference in the two groups with regards to overall outcomes in terms of mortality, re-operation rates and complications.[40]

CONCLUSION

Osteosynthesis using dynamic hip screws or intramedullary nails are preferred treatment modalities in fracture intertrochanteric femur. But if there is osteoporosis and unstable fracture pattern in the elderly patients then bipolar hemiarthroplasty can be considered as a better option. Endoprosthesis provides instant stability and allows early mobility to the patients without adding to the complications and improves functional outcomes in these patients.

Limitations

Our study had its limitations in the form of small sample size, inhomogeneous population with respect to existing co morbidities and a retrospective study design. Further prospective studies in a large population involving multiple centres is require to establish the benefits of the proposed treatment modality.

Funding: No funding sources
Conflict of interest: None declared
Ethical approval: The study was approved by the institutional ethics committee of IQ City Medical College, Durgapur, West Bengal, India

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Cite this article as: Kanchan S, Raj V, Agarwal D, Richa. Primary arthroplasty as an option for surgical treatment of unstable intertrochanteric fracture femur in elderly patients: a retrospective study. Int J Res Orthop 2019;5:237-43.