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Primary cemented bipolar hemiarthroplasty by transtrochanteric approach in unstable intertrochanteric fractures

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ABSTRACT

Background: The successful treatment of unstable intertrochanteric fractures of the femur in elderly patients is a challenge. Due to complications associated with internal fixation, primary hemiarthroplasty is increasingly becoming an alternative treatment to achieve early mobilisation. A transtrochanteric approach could potentially decrease the complications associated with primary hemiarthroplasty. Aim of the study is to document the postoperative outcome and complications associated with this treatment.
Methods: In this retrospective study, all elderly patients with unstable trochanteric fractures, treated by primary hemiarthroplasty through a transtrochanteric approach, in a tertiary care centre, from September 2017 to December 2019, were enrolled. Their data from hospital records were analysed and results compared to literature.
Results: 48 patients underwent the procedure. Average age was 85 years. One year mortality was 31.25%. Average duration of surgery is 85 min. 58.3% were ambulant at one year. One case of dislocation secondary to surgical site infection was present.
Conclusions: Primary hemiarthroplasty as a primary treatment in this group of patients enables early mobilization and prevents complications associated with prolonged immobilization. Transtrochanteric approach reduces the duration of surgery. Achieving early ambulation is the key to successful treatment.

Keywords: Hemiarthroplasty, Unstable intertrochanteric fractures, Transtrochanteric, Elderly

INTRODUCTION

Intertrochanteric fractures account for 45% of hip fractures out of which 30-40% are unstable.[1] These fractures are associated with high mortality, 30% at one year, and high morbidity.[2] American academy of orthopaedic surgeons (AAOS) recommends internal fixation as the treatment of choice with only moderate degree of evidence to support.[3] Osteoporosis and comminution are the two key factors that worsens the outcome and hampers early mobilisation in the elderly after fixation.[1] Pneumonia, deep vein thrombosis, pulmonary embolism and pressure sores are the common complications associated with delayed ambulation.[1]

Implants used for fixation has been changing with time. Fixed angle plates, sliding hip screws and cephalomedullary nails have not been able to eradicate the complications like varus collapse, screw cut out and screw back out.[4]

Primary arthroplasty offers a solution to both prevent and treat these problems.[1,5] However, dislocations and sepsis are the dreaded complications of this procedure, especially in elderly patients.[1,6,7]

Bombaci described an approach to the hip that is transtrochanteric and through the fracture, which is easy to do and reduces chances of dislocation.[8]

We plan to study the outcome and post-operative complications of primary hemiarthroplasty using this approach, in the elderly with unstable trochanteric fracture AO (type A2.2, A2.3), in this study.

METHODS

This is a retrospective observational study of all patients with unstable multi fragmentary intertrochanteric fracture that came to a tertiary care hospital in Central Travancore region from September 2017 to December 2019 treated by primary cemented hemiarthroplasty through a transtrochanteric approach. The inpatient and outpatient records were used for collection of data. Surgeries were performed by multiple surgeons following the same approach.

The following inclusion criteria and exclusion criteria were applied.

Inclusion criteria

Inclusion criteria for the study included patients having age more than 75 years, independently ambulant prior to fall and fracture patterns AO-A2.2 and A2.3.

Exclusion criteria

Exclusion criteria for the study excluded patients with other concomitant fractures, fracture more than 3 weeks old and patients with inadequate data in medical records.

Data collected include comorbidities, duration of surgery, blood loss, preoperative and postoperative haemoglobin levels, albumin infusion given, postoperative complications, postoperative mortality, and ambulatory status. Details of deceased were collected telephonically. The data were compared with similar studies in literature.

Operative technique

Prior to starting the procedure, patient was placed on the fracture table and traction applied to the fractured limb to assess the fracture. We proceeded with the procedure only if the fracture fragments are displaced and there was lateral comminution with coronal plane fracture, which indicates an unstable fracture pattern.

The patient was placed in a lateral decubitus position with the fractured side above. The skin incision was made as for lateral approach to hip. The gluteus maximus was split along its fibres and linea aspera split exposing the trochanter. The coronal fracture line was used to guide retraction proximally, distally, and antero-posteriorly. Proximally, the gluteus medius and distally the vastus lateralis are separated. The intact capsule was incised along the axis of the femoral neck. The head of the femur generally carries along part of the neck or calcar. A neck osteotomy was done to separate this fragment from the femoral head. The head of the femur was then removed with the help of a corkscrew. The proximal femoral shaft was then prepared. Anteversion was decided using the long axis of the leg flexed to 90 degrees at the knee as a guide. Length of the implant was decided by trial reduction. The amount of stem to be sunk in was marked both on the trial and final implant. Prosthesis was inserted after cementing. The hip was reduced. A SS wire or fibre wire was passed at the tip of the greater trochanter deep to the abductors and across the fracture to achieve compression at the trochantric fracture site and restore the abductor mechanism. Wound closure was done in layers over a suction drain.

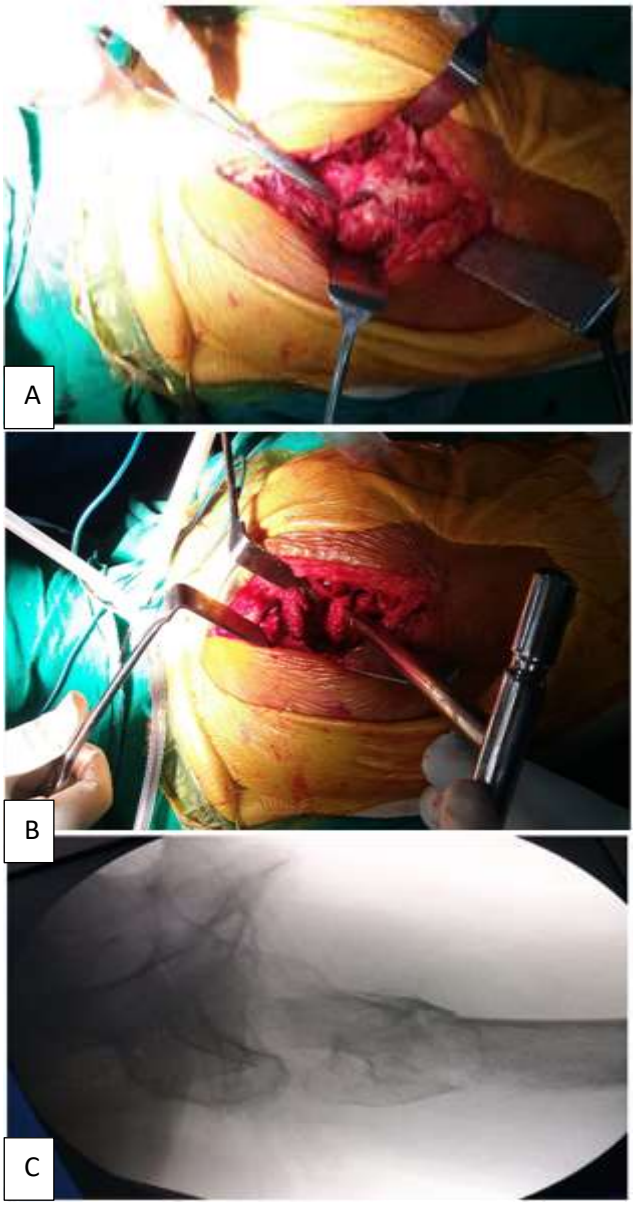

Figure 1 (A, B and C): Intra-operative picture of the transtrochantric approach with the coronal fracture pointed out with artery. The femoral head being extracted with a corkscrew and pre-operative C arm picture showing the coronal plane fracture line.

Post-operative protocol

Postoperative haemoglobin and albumin levels were checked on first day and corrected as required. On the second postoperative day all patients who did not have immediate post-operative complications were started with quadriceps strengthening exercises. From the third postoperative day attempt was made to make the patient walk with a walker. Thereafter rehabilitation progressed as tolerated by the patient. The number of days taken by the patient to achieve bipedal ambulation with a walker was noted. In all patients where the surgical wound healed, suture removal was done 12-14 days postoperatively.

6,00,000 units of injection vitamin D and calcium tablets given to all patients. 2nd generation cephalosporins, were given intravenously as per hospital antibiotic protocol for 3 days and continued as oral tablets especially in those with urinary tract infection. Deep vein thrombosis prophylaxis was given using enoxaparin or heparin (those with renal disease) along with calf pumps during hospital stay and converted to oral aspirin for 1 month at discharge.

All patients were instructed to follow up at 6 weeks, 3 months, 6 months and 1 year.

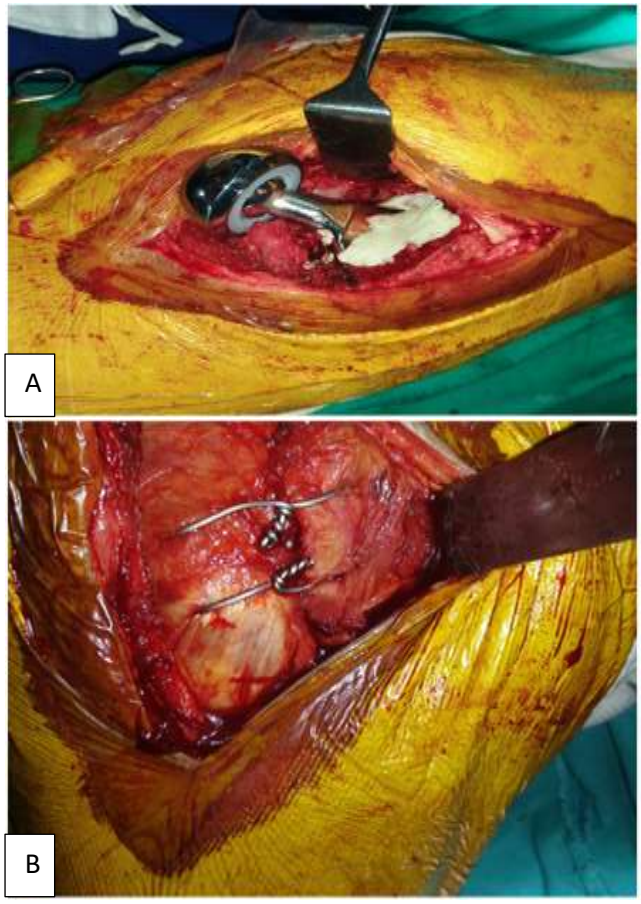

Figure 2 (A and B): Prosthesis cemented in the proximal femur before reduction and the trochanteric fragment fixed with SS wires.

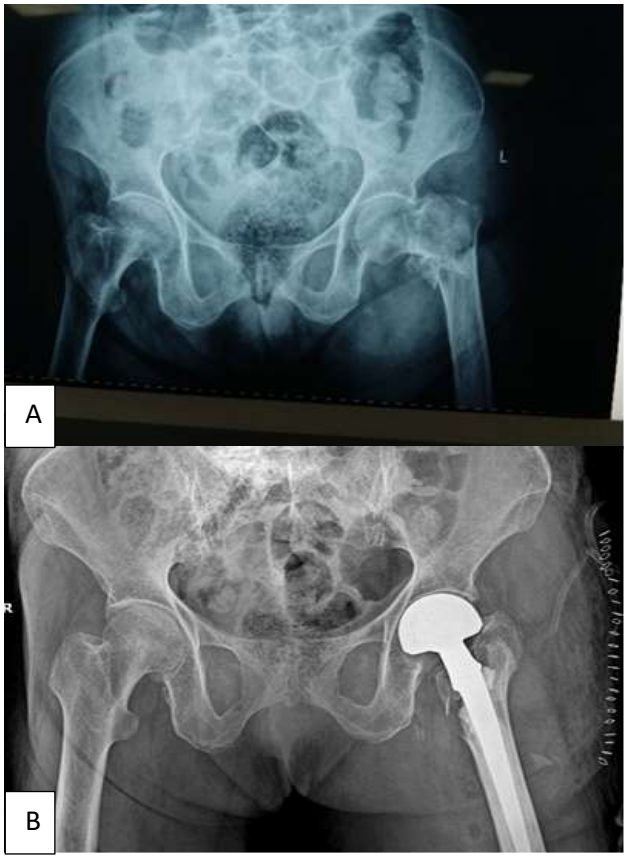

Figure 3 (A and B): Pre-operative and post-operative radiographs of cemented bipolar prosthesis with trochanter fracture fixed with fibre wires.

For statistical analysis, relevant data was entered, and descriptive measures (mean, frequency, percentage) was calculated using MS Excel.

RESULTS

48 patients fulfilled the inclusion criteria, and all relevant data were available for all patients. The average age was 85 years. 35 were females, 27 patients sustained right hip fractures. Mode of injury was slip and fall in 38 cases and road accidents in 10 cases.

There was an average delay of 1.5 days from injury to admission and an average in hospital delay of 3 days prior to surgery. Withholding clopidogrel was the most common reason for the delay in surgery.

Duration of surgery was on average 85 minutes. Average blood loss was 250 mL. Pre-operative haemoglobin was 9.8. Average of 1.4 pints of blood was transfused perioperatively to achieve an average postoperative haemoglobin level of 10.3. Seven patients were given albumin transfusion.

There was an average shortening of 0.5 cm in operated site.

Two patients died in immediate postoperative period due to cardiac disease. The six-month mortality was 20.83% (10/48) and one year mortality was 31.25% (15/48).

Average number of comorbidities was 1 in the study population. However, in those who died in 1-year, average number of comorbidities was 1.8.

34 were ambulated as per protocol on 3rd day. Out of the 14 non ambulant at discharge, 12 (85.7%) died before 1 year. 4 patients who were ambulant at discharge became non ambulant at 1 year. 28 out of 48 were ambulant at 1 year (58.30%). There was 1 case of postoperative early surgical site infection that caused dislocation of the hip. The patient died within 1 month. He had multiple comorbidities including uncontrolled diabetes, chronic renal disease, and urinary tract infection. Moreover, he was discharged early at request.

Of the 5 patients with chronic renal disease, 4 were ambulant at 1 year follow up.

Table 1: Summarised data of the study.

Data	Results	Range
Age (Years)	85	75-96
Side	Right-27, Left-21	
Avg. Hb pre-op (g/dL)	9.8	6.5-13.7
Avg. Hb at discharge (g/dL)	10.3	8-13.7
Avg. units of blood transfused per patient	1.4	
Delay from injury to admission (days)	1.54	0-6
Delay from admission to surgery (days)	3	0-13
Duration of surgery (minutes)	85	45-130
Avg. no. of comorbidities per patient	1	
Avg. no. of comorbidities in deceased	1.8	
No. ambulant at discharge	34	
No. ambulant at 1 year	28	58%
Immediate postoperative mortality	2	9.60%
6 months mortality	10	20.83%
1 year mortality	15	31.25%

DISCUSSION

AAOS have found only moderate evidence in favour of cephalomedullary devices.[3] Fixation devises are being constantly renovated to tackle the complications when dealing with severe osteoporosis and instability.[9] Primary hemiarthroplasty became a reasonable option in the late twentieth century, when arthroplasty techniques were rapidly improving. This favoured early ambulation and mitigated complications associated with prolonged rest following fixation. Tronzo was the first to use a prosthesis for unstable intertrochanteric fracture in 1971. Stern and Goldstein used the Leinbach prosthesis for 22 patients and found good results.[9] Haentjen, in 1989, compared hemiarthroplasty with internal fixation namely, blade plate and found similar mortality but early ambulation and lesser complications with 75% satisfactory rate in the hemiarthroplasty group.[5] With the advent of cephalomedullary devices namely proximal femoral nails and PFNA2, there was increased interest in fixation. However, implant related complications like screw cut out, screw back out, varus collapse, non-union and proximal migration of helical blade started to be reported. In the last decade there is a resurgent interest in hemiarthroplasty, especially after Pui et al found more complications following secondary arthroplasty for a failed cephalomedullary fixation at a rate of 41.9% than sliding hip screw (11.7%).[4]

One of the reasons for failure of fixation was lateral wall comminution, which can also occur during the fixation if the lateral wall is less than 20 mm.[10] Palm et al reported that patients with a fracture of lateral wall had seven times greater risk of reoperation following sliding hip screw fixation compared to those with intact lateral wall.[11] Gao et al reported failure rate of 10% using cephalomedullary nailing in this group of patients.[12] Pre-operatively, we ascertained the degree of comminution especially lateral wall comminution prior to choosing replacement surgery. Our complication rate is 2% (1/48), far less than these studies.

Considering these factors, primary hemiarthroplasty in the elderly, those more than 75 years, with severe osteoporosis, fracture comminution, multiple comorbidities and reduced activities is a reasonable option to gain early ambulation and prevent complications.[1,13] Prospective studies comparing the two treatment options are few in literature. Ozkayin et al and Jolly et al found increased mobility and better outcome in hemiarthroplasty group in the first 3 months, but better functional outcome at 1 year in the fixation group.[14,15] Destelli studied in a lower age group and found better quality of life for fixation group at 2 years.[16] Other comparative studies like Park et al, Tang et al and Kim et al found equal functional results at 1 year.[2,17,18] A meta-analysis concludes that bipolar hemiarthroplasty has the advantage of immediate mobilisation with full weight bearing and are especially useful in frail patients with lower life expectancies. These patients have poor mental and physical strength and could be les compliant to specific instructions of non-weight bearing.[13]

Dislocation and sepsis are the most dreaded complications following hemiarthroplasty.[1,6,7] Other complications include sciatic nerve palsy, heterotrophic ossification, loosening and acetabular arthritis.

Approaches to hip are usually posterolateral and lateral hardinge with lesser rate of dislocation associated with Hardinge approach.[6] All previous studies on primary hemiarthroplasty in unstable intertrochantric fracture have approached in either of the two approaches mostly the posterior approach cutting the short external rotator and the posterior capsule. This increases the chance of dislocation. Parker MJ Cochrane study had 2 dislocations out of 72 patients (2.8%).[19] Haentjen did a flip osteotomy of trochanter in his approach and had 2 complications.[5] Faldini et al used a Hardinge approach and had no dislocations.[20] Bombaci approach to the hip is through the coronal fracture site allowing maintenance of the posterior short external rotators and capsule. The capsule must be cut super anteriorly. This reduces chances of dislocation and prevents sciatic nerve injury.[8] However, we had 1 case of posterior dislocation. This was secondary to postoperative infection in a debilitated patient. Another possible cause of dislocation is the mismatch in version.[6] The version while inserting implant relies on the position of the leg since the fractured lesser trochanter is not reliable.

The infection rate post hemiarthroplasty varies from 2 to 17%.[7] Optimising the patient with haemoglobin level above 10 g/dL and serum albumin level above 3.5g/dL is a prophylactic measure in preventing infection.[21,22] Increased allogenic transfusion is associated with increased infection due to immunological variability in one study.[21,23] Though we gave average of 1.4 units of blood, our infection rate is only 2%. Symptomatic DVT occurs at rate of 2-4%.[24] We did not have any deep vein thrombosis.

Ideally, surgery is to be done within 48 hours in hip fracture to reduce mortality. We had a delay of 72 hours on average mostly in view of clopidogrel intake. Delaying surgery to optimise the patient resulted in decreased mortality in 1 study.[25]

Grimsrud et al described a technique of strengthening calcar using a part of the osteotomised neck and a particular wiring technique to prevent later varus collapse. He also used collared long stem.[26] We did not use this technique though we have used wires to hold the trochanteric fragment. We used the regular stem length but a modular prosthesis to maintain the offset.

This is the first study on Bombaci's approach to the hip. The duration of surgery is lesser than most other studies. Lesser soft tissues are to be dissected maintaining vascularity to fragments and better union. This also helps in reducing infection rate.[21]

Ambulation status at 1 year is taken as the functional outcome considering the multiple comorbidities and sociocultural factors in the study population. Of the 12 patients who could not be ambulated at time of discharge due to various reasons, 10 passed away within 1 year asserting the justification in using this parameter. 29/48 (60.41%) were ambulant at 1 year follow up.

Mortality rate at 1 year is 31.25% which is near to other studies and considering the average age is 85 years with multiple comorbidities. Number of comorbidities affect the mortality in hip fractures. Though we had an average of 1 in the study group, the average in those who died in 1 year is 1.8. Renal disease is associated with higher mortality of up to 70% in those with dialysis. They are also associated with higher chances of wound complications, infection and non-union. Renal osteodystrophy can lead to biological and mechanical failure in hip surgeries.[27,28] In our study, 5 patients had chronic renal disease (CKD) but none were on dialysis. 1 developed infection and later dislocation. Proper postoperative care could not be administered in this patient as he was discharged early at request. The other 4 CKD patients were ambulant at 1 year post operation.

Total hip replacement was preferred over hemiarthroplasty in a few studies.[29] This was in a younger age group. Moreover, THR is costlier surgery and not affordable to the study population.

In this study, though the above surgical and postoperative protocols were adhered to, multiple surgeons had operated which can affect the results. Another limitation is that functional outcome was not measured with a scoring system. This is a retrospective study. A prospective and comparative study with fixation, involving more patients would have been ideal and can be considered in the future.

CONCLUSION

Primary hemiarthroplasty as a primary treatment in elderly patients with unstable trochanteric fractures enables early mobilization and thus prevents complications associated with prolonged immobilization Transtrochanteric approach reduces the duration of surgery with less dissection and blood loss. Managing the comorbidities and achieving early mobilisation is the key to successful treatment.

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Conflict of interest: None declared
Ethical approval: The study was approved by the institutional ethics committee

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