FUNCTIONAL OUTCOME OF PRIMARY CEMENTED BIPOLAR HEMIARTHROPLASTY IN UNSTABLE INTERTROCHANTERIC FRACTURES OF ELDERLY – A PROSPECTIVE STUDY

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Submitted on: 12 May 2016
Accepted on: 17 May 2016

Abstract:
Background: Unstable intertrochanteric fractures in elderly are difficult to treat. Internal fixation of these fractures often results in implant failure owing to poor bone quality and complex fragment geometry, necessitating prolonged bed rest post-operatively and thereby increasing the chances of deep vein thrombosis, pulmonary embolism and decubitus ulcer. The purpose of this prospective study is to evaluate the functional outcome of cemented bipolar hemiarthroplasty as a primary treatment for unstable intertrochanteric fractures in elderly patients.

Materials and methods: 15 cases of unstable intertrochanteric fractures treated by primary cemented bipolar hemiarthroplasty between September 2013 and June 2015 were included in this prospective study. There were 7 males and 8 females with a mean age of 70.8 years (range 65-95 years).

Results: The average follow-up was 11.2 months (range 3-18 months). Two patients were lost to follow-up. 66.7% of the cases admitted were due to trivial trauma and the rest 33.3% due to road traffic accident. Boyd and Griffin Type II fractures accounted for 93.3% of cases. The average blood loss was 300 ml (range 150-550 ml). Mean duration of hospital stay was 14.4 days and mean time to full weight bearing was 4.1 days. There were 2 cases of superficial infection and 1 case of deep infection. 3 patients had shortening of limb post-operatively with an average shortening of 1.6 cm (range 1-2.5 cm). 3 patients were graded as excellent and 10 patients as good at the end of 1 year with a mean Harris Hip Score of 88.9 (range 88-92).

Conclusion: Primary cemented bipolar hemiarthroplasty for unstable intertrochanteric fractures in elderly reduces the complications of prolonged immobilization, prolonged rehabilitation, marked residual deformities and need for revision surgeries. The procedure offers faster mobilization, rapid return to pre-injury level, thereby improving the quality of life.

Key-words: Hemiarthroplasty, unstable intertrochanteric fractures, Harris Hip Score.
Introduction:
Intertrochanteric (IT) fractures with displacement and comminution are common in elderly patients. These fractures constitute one of the major reasons for morbidity and mortality in elderly. The mortality rates among these patients range from 15 to 30% due to associated systemic illness such as diabetes and cardiovascular diseases.

Incidence of these fractures has increased primarily due to increasing life span and more sedentary lifestyle brought by urbanization. The comminuted intertrochanteric fractures begin in cancellous area, and hence fixation of all fragments is difficult. A defect in the posteromedial region is generally present which makes the fracture very unstable.

IT fractures can be managed by conservative or operative methods. As conservative methods resulted in higher mortality rates and complications like decubitus ulcer, urinary tract infections, pneumonia, thromboembolic complications, these methods have been abandoned. Surgical treatment has become the gold standard nowadays. The primary treatment goal is stable fixation, early weight bearing and mobilization and to avoid possible revision surgery. Although stable fractures are treated with internal fixation with excellent results, management of unstable fractures is a challenge because of difficulty in obtaining reduction.

A variety of internal fixation devices were used for treating the unstable fractures. Fixed nail plate devices had high rates of cut-out and fracture displacement. Sliding hip screw was used with much success and became the predominant method of fixation of these fractures. However comminution, osteoporosis and instability prevented early mobilisation resulting in complications like deep vein thrombosis, decubitus ulcers and pulmonary embolism. Primary cemented bipolar hemiarthroplasty for unstable intertrochanteric fractures in elderly reduces the complications of prolonged immobilization, offers faster mobilization, rapid return to pre-injury level thereby improving the quality of life.

The purpose of this prospective study is to evaluate the functional outcome of cemented bipolar hemiarthroplasty as a primary treatment for unstable intertrochanteric fractures in elderly patients.

Materials and methods:
The study was undertaken at the Department of Orthopaedics, Sri Manakula Vinayagar Medical College and Hospital, Pondicherry after obtaining institutional ethical committee approval. It is a prospective study of all patients more than 65 years of age with unstable intertrochanteric fractures who attended our institution between September 2013 and June 2015. Patients with closed unstable intertrochanteric fractures, less than 2 weeks old from the date of injury with ambulatory pre-injury status were included in the study. Patients with compound intertrochanteric fractures, polytrauma, head injury, those who are unfit for surgery and those with pathological fractures and refractures were excluded from the study. The fractures were classified according to Boyd and Griffin classification. Detailed history and clinical assessment were carried out in each case. In all patients, Buck’s skin traction with appropriate weight was applied to the fractured lower limb preoperatively with the aim of relieving pain, preventing shortening and reducing unnecessary movement of injured limb.

All cases were operated by using a standard Moore’s posterior approach in lateral position under spinal/epidural anaesthesia by two senior surgeons. After assessing the fracture geometry, the head of the femur was removed with a cut at the subcapital region. The integrity of the lesser trochanter, greater trochanter and the amount of calcar was then assessed. In 8 cases, the lesser trochanter was continuous with the neck of femur and was reconstructed by cerclage wiring. A neck cut was then made roughly about a finger breadth above the lesser trochanter. In cases where the lesser trochanter was a separate fragment (n=7), the fragment was reconstructed by cerclage wiring. However adequate calcar could not be maintained and the medial void was reconstructed using cement mantle. In 5 cases, the greater trochanter was fractured en masse and was reattached to the shaft using K wires/cancellous screw and cerclage wiring. In cases of coronal split of the greater trochanter (n=10) a tension band wiring was applied beneath the gluteus medius. The femoral canal was broached maintaining appropriate anteversion. A trial prosthesis was then inserted and trial reduction was done. With the trial prosthesis in situ, traction was applied to the leg and compared with the opposite leg for assessing limb length discrepancy. By noting the amount of distraction between the prosthesis and the femoral cut, an estimate of how far the prosthesis should sink in the cement was made. Routine cementing technique was performed and cement restrictor was used in all cases. The final prosthesis was then seated as far as the level noted earlier and any...
defect present was filled with cement mantle. The cerclage wires were retightened and the prosthesis was reduced. After confirming the stability of the prosthesis, the wound was closed in layers in a routine fashion over a suction drain.

Postoperatively intravenous antibiotics were continued for 5 days. Drain tube was removed after 48 hours. Post-operative radiograph was taken after 48 hours. Patients were made to sit up on the second day, standup with support (walker), on the third day and were allowed to bear full weight and walk with the help of a walker on the fourth postoperative day. Sitting cross-legged and squatting were not allowed. Suture removal was done on the twelfth postoperative day. The patients were assessed for any shortening or deformities. Any complications like infections and bed sores were treated before discharging the patients. Patients were followed up at an interval of 6 weeks, 3 months, 6 months and 12 months. During each visit, the patient was evaluated clinically based on Harris Hip Score and radiologically to look for signs of loosening, protrusion, or dislocation.

**Results:**

The mean age of patients was 70.8 years (range 65-95 years). The age distribution of the patients is shown in Table 1. There were 7 males and 8 females. Five fractures were left sided and 10 were right sided. The mode of injury was trivial trauma in 10 cases (66.7%) and road traffic accident in 5 cases (33.3%). Average trauma-surgery interval was 6.56 days (range 2 to 12 days), the delay was due to late presentation of cases or time taken for obtaining anaesthetic fitness. Fourteen patients presented with Boyd and Griffin type II fractures (93.3%) and 1 patient with type III fracture (6.7%). The average blood loss was 300 ml (range 150 to 550 ml). There were 2 cases of postoperative superficial infection (13.3%) and 1 case of deep infection (6.7%). Post-operatively, 3 patients had shortening of the operated limb with an average shortening of 1.6 cm (range 1-2.5 cm). The shortening was managed effectively by shoe raise. The mean duration of full weight bearing post-operatively was 4.1 days (range 3-7 days). The mean duration of hospital stay was 14.4 days (range 12-20 days). Longer stay was required to treat those patients with superficial and deep infection. Two patients were lost to follow-up at the end of 3 months. The average follow-up was 11.2 months (range 3-18 months). At the end of 3 months, 13 patients had good results (86.7), 1 patient had fair result (6.7%) and 1 case had poor result (6.6%) with a mean Harris Hip Score (HHS) of 81.8 (range 63-84). Both the patients with fair and poor results were lost to follow-up. Excluding the patients lost to follow-up, mean HHS at the end of 1 year was 88.9 (range 88-92) with 3 patients graded as excellent and 10 patients as good. One patient was followed up to 18 months who had HHS of 92. At the end of 1 year, 4 patients were walking unaided while 9 patients were walking with cane support.

**Discussion:**

Hip fractures constitute one of the major reasons for significant morbidity and mortality in elderly. With the advent of various internal fixation devices, the mortality associated with intertrochanteric fractures has been reduced drastically. However, the outcome of treatment of intertrochanteric fractures depends on quality of bone, age of patient, general health, trauma surgery interval, adequacy of treatment, co-morbidities, and stability of fixation.

Fixation with Ender nails or other non-sliding implants resulted in complication rates of upto 50%. Currently, internal fixation using dynamic hip screw is the gold standard. However in elderly patients with severe osteoporosis and comminution, this technique prevents early mobilization with failure rates between 5% and 12%. Primary cemented bipolar hemiarthroplasty offers an excellent alternative modality of treatment with faster mobilization and rapid return to pre-injury state thereby avoiding the complications of immobilization. The concept of dual bearing surfaces in the prosthesis offers considerable advantages. It results in sharing of motion at the two surfaces and hence reduces the net wear at either surface, thus reducing erosion at the acetabular joint interface. In addition, the total range of motion at the joint is increased.

Green et al, in a series of 20 cases, performed bipolar hemiarthroplasty for elderly patients with unstable trochanteric fractures with a mean time to ambulation of 5.5 days. They concluded that with technical considerations in mind, head neck replacement hip arthroplasty for unstable intertrochanteric fractures in forgetful, elderly patients was a suitable alternative to internal fixation because the prosthesis provided for early full weight bearing and rapid rehabilitation.

Haentjens et al reported on a series of 37 patients with unstable intertrochanteric fractures treated with immediate bipolar hemiarthroplasty, 7 patients had excellent results, 11 patients had good results, 7 patients had fair results, 5 patients had poor
results and reported death of 3 cases. They concluded that immediate bipolar hemiarthroplasty for independently mobile patients older than 70 years having an unstable intertrochanteric fractures, allowed early walking with full weight bearing and helped the patients to return to prefracture level of activity rapidly, preventing complications such as pressure sores, pneumonia, atelectasis and pseudoarthrosis. They observed bone callus radiologically 4 weeks post operatively on the medial aspect of the femur and sometimes completely surrounding the prosthesis.

Rosenfeld et al\textsuperscript{29}, studied a series of 72 elderly patients with unstable trochanteric fractures treated using head neck replacement prosthesis. Their series showed excellent results in 33 patients, good results in 21 patients, fair results in 11 patients, poor results in 2 patients and reported death of 5 patients. They concluded that in elderly, frail and confused patients who had intertrochanteric fractures, hemiarthroplasty helped in faster ambulation and reduced the complications.

Rodop et al\textsuperscript{30}, in a study of primary bipolar hemiprosthesis for unstable intertrochanteric fractures on 54 elderly showed excellent results in 17 cases, good results in 14 cases, fair results in 3 cases, poor results in 13 cases and reported death of 7 cases. They concluded that in elderly, frail and confused patients who had intertrochanteric fractures, hemiarthroplasty helped in faster ambulation and reduced the complications.

Grimsrud et al\textsuperscript{31} studied a series of 39 patients with unstable three and four part intertrochanteric hip fractures, treated with cemented bipolar hemiarthroplasty with a novel technique of cerclage fixation of the trochanteric bone fragments allowing retention of the femoral calcar. At one year minimum follow up, there was no loosening or subsidence of the femoral components. All troCHANTERS healed well. One case of dislocation and one deep infection occurred. They concluded that, this technique allows safe early weight bearing on the injured hip and had a relatively lower rate of complications. In our series, there were two cases of superficial infection and one case of deep infection.

Broos PL et al\textsuperscript{18} reported on a series of 565 patients, who sustained acute per-trochanteric fractures and treated with compression hip screw, angled blade plate, Enders nail or bipolar hemiarthroplasty. They concluded that fixation with angled blade plate and Enders nail should be forsaken, patients treated with compression hip screw had good results but this treatment had a risk of serious fracture collapse and pain in 80\% of the cases, he suggested that complex multifragmentary intertrochanteric fractures can be treated with endoprosthesis as it is no longer considered a severe intervention with less than 1\% danger of mechanical complications.

A total of 13 out of 15 patients in our study showed good to excellent results (86.67\%) using Harris Hip Score. There were no cases of loosening or dislocation at the end of 1 year. Thus this modality of treatment shows promising results as compared to osteosynthesis in terms of complications, early rehabilitation and returning to daily living activities.

Table 1: Age distribution

<table>
<thead>
<tr>
<th>Age group (years)</th>
<th>No. of cases</th>
<th>Percentage</th>
</tr>
</thead>
<tbody>
<tr>
<td>65-75</td>
<td>12</td>
<td>80</td>
</tr>
<tr>
<td>76-85</td>
<td>2</td>
<td>13.3</td>
</tr>
<tr>
<td>86-95</td>
<td>1</td>
<td>6.7</td>
</tr>
</tbody>
</table>
Immediate post-op X-ray

1 year follow-up X-ray

Case: 3

Pre-op X-ray

Immediate post-op X-ray

Conclusion:

Bipolar hemiarthroplasty offers excellent pain free mobile hip, with easy rehabilitation and rapid return to functional level, when standard techniques are used. The potential of the bipolar prosthesis in varied indications shows its versatility. This speaks for the superiority of the procedure. Bipolar hemiarthroplasty reduces the complications of prolonged immobilization, prolonged rehabilitation, marked residual deformities and need for revision surgeries. The procedure offers faster mobilization, rapid return to pre injury level, improves the quality of life and provides a long term solution in elderly patients with intertrochanteric fractures of the femur. However a long term follow-up with larger sample size is needed to conclusively establish the superiority of bipolar hemiarthroplasty over other fixation techniques for treatment of unstable intertrochanteric fractures in elderly.

Source of support: Nil
Conflict of interest: Nil

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