Bipolar hemiarthroplasty for the treatment of unstable trochanteric fracture femur in the elderly

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Background
Hemiarthroplasty using bipolar prostheses for unstable intertrochanteric fractures of the femur in the elderly yields good clinical results in terms of early postoperative ambulation. This will have a direct effect on the general condition and postoperative rehabilitation.
Patients and methods
Thirty patients with unstable proximal extracapsular femoral fractures were treated with bipolar hemiarthroplasty. There were 22 men and eight women, with mean age of 60 years (range: 55–70 years). Primary cemented bipolar hemiarthroplasty was performed using the Hardinge lateral approach in a lateral decubitus position. Harris hip score was used for the clinical evaluation of the patients.
Results
Clinically, the Harris hip score at the last follow-up ranged from 93 to 54, with a mean value of 79.5. Postoperative radiographs showed a good position in all patients. According to the Gruen scoring for cementation, 15 (50%) cases scored A, eight (26.66%) cases scored B, three (10%) cases scored C1, two (6.66%) cases scored C2, and two (6.66%) cases scored D. Four cases developed complications in this study: infection (two patients), loosening (one patient), and acetabular wear (one patient). Revision was performed in one patient because of loosening.
Conclusion
Primary cemented bipolar hemiarthroplasty is a good choice in elderly patients with unstable intertrochanteric fractures of the femur, and it saves time as well as cost, with little significant complications.

Keywords:
bipolar, hemiarthroplasty, trochanteric, unstable

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Introduction

Unstable trochanteric fractures pose a challenge to the trauma surgeon. A good treatment plan therefore starts with proper fracture classification. Several trochanteric fracture classifications exist [1]. The basic classification is to divide trochanteric fractures into stable or unstable fractures. In general, instability is determined by the presence of a zone of comminution of the medial cortex and posterolateral instability [2]. Nowadays, the most commonly used classification is that of the AO/ASIF group (Fig. 1). This classification has a good reproducibility as it basically divides the trochanteric fractures (type 31A) into three groups: A1 fractures (stable pertrochanteric fractures), A2 fractures (unstable pertrochanteric fractures with medial comminution including a fractured lesser trochanter), and A3 fractures (unstable intertrochanteric fractures with or without medial comminution) [3]. Unstable intertrochanteric fractures in the elderly constitute one of the major reasons for morbidity in this age group [4].

Individuals in this age group usually have other systemic complications such as diabetes and cardiovascular diseases. The impact of these diseases leads to a rapid deterioration in the general condition of these patients if they are kept bed ridden. The main goals for the treatment of these fractures in elderly patients are to restore the prefracture activity status, to allow early full weight bearing, and to avoid possible reoperation [5]. As a general rule, preservation of the patient's own bones is the ideal aim of the surgeons. In osteoporotic elderly patients with unstable intertrochanteric fractures, this ideal aim will not bring the patient early back to his daily activities if internal fixation was done. Weak purchase of the internal fixation device because of osteoporosis and comminution of the fracture increases the incidence of failure of internal fixation such as cutting out the screws and displacement of the bone fragments [6]. However, failure of fixation is reported up to 10% of patients [1].

Umarji *et al.* [7] discussed the modes of failure of dynamic hip screw devices and listed the following mechanisms: screw cut-out, plate pull-off from the

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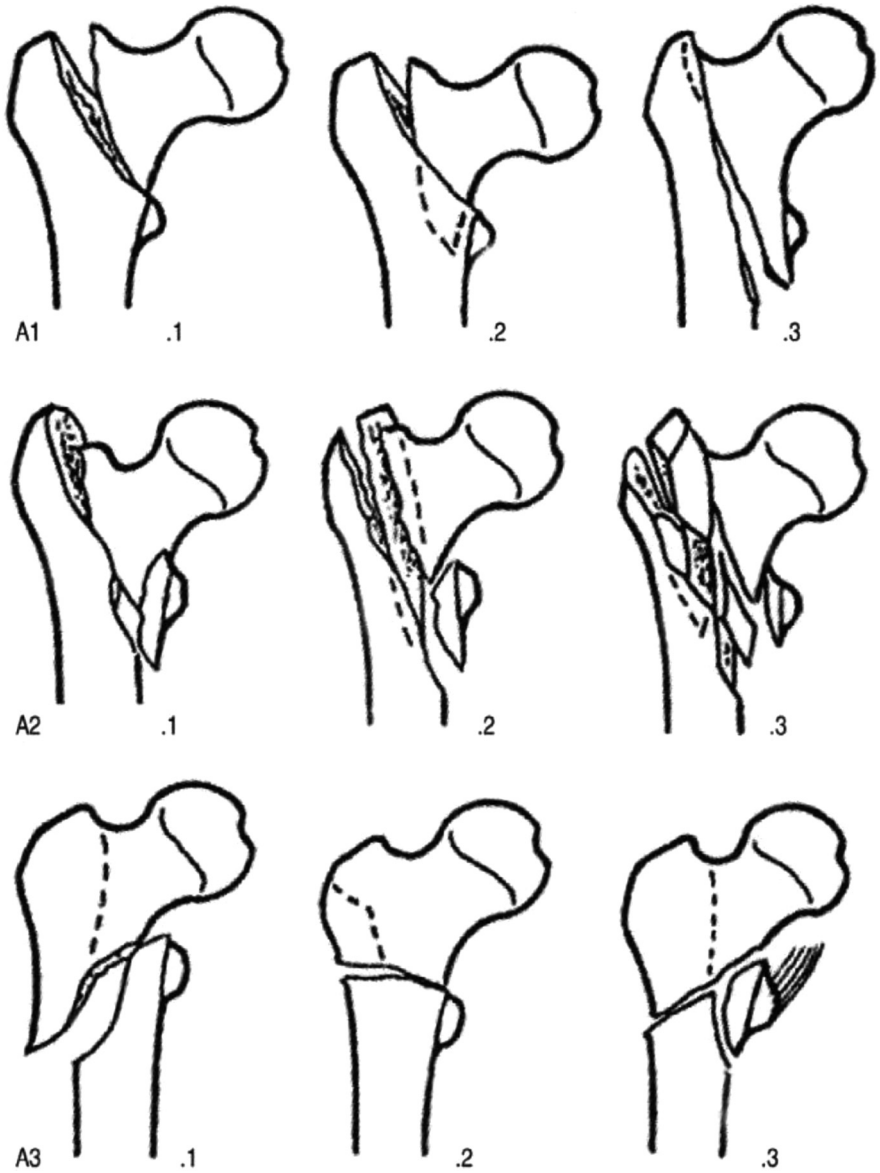
shaft, implant disassembly, and fatigue failure in cases of delayed union. As we cannot rely on internal fixation devices to allow early full weight bearing of patients in the presence of severe osteoporosis and marked comminution at the fracture site, partial weight bearing is very difficult to be followed by these patients; thus, they shift to full weight bearing on the operated limb, causing mechanical failure [1]. Hemiarthroplasty using bipolar prostheses for the unstable intertrochanteric fractures of the femur in elderly yields good clinical results in terms of early postoperative ambulation. This will have a direct effect on the general condition and postoperative rehabilitation [8].

The aim of this prospective study was to report the results of bipolar arthroplasty for unstable intertrochanteric fractures of the femur in 30 elderly patients.

Patients and methods

From January 2009 to December 2014, 30 patients were treated for unstable proximal extracapsular femoral fractures with bipolar hemiarthroplasty. The mean age of the patients was 60 years (range: 55–70 years) and the sex distribution was 22 men and eight women. According to the AO/ASIF classification, there were 20 cases with type A2 and 10 cases with type A3. All operations were performed under spinal anesthesia. The fracture mechanism of injury was a fall on a level surface (25 cases) and because of a road traffic accident (five cases). The time interval between injury

Figure 1



A. O. Classification of trochanteric fracture femur.

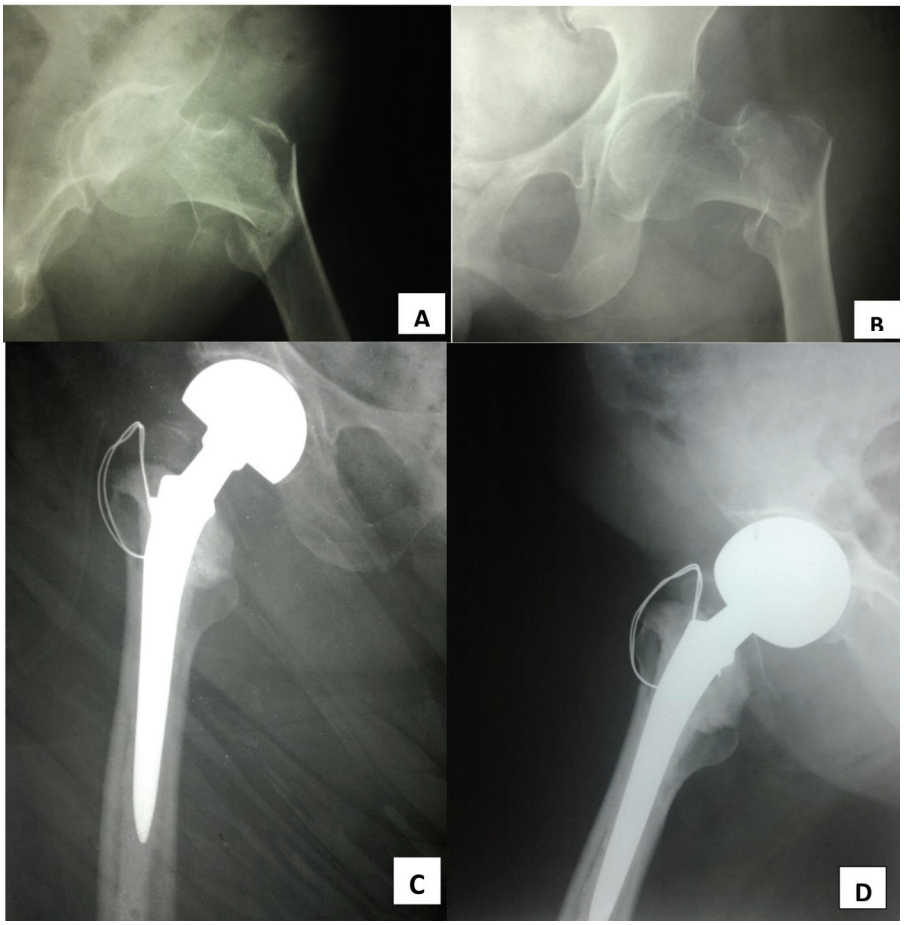
and surgery was 4–18 days (average: 7 days). Imaging studies such as computed tomography scan or MRI were not required in any case.

In this work, primary cemented bipolar hemiarthroplasty was performed using the Hardinge lateral approach in a lateral decubitus position. The capsule of the hip joint was exposed and capsulotomy of the hip joint was performed. Lesser trochanter reconstruction was performed as required using stainless-steel wires and Ethibond sutures. At times when the lesser trochanter was comminuted, the trochanter pieces were left attached to the soft tissue and the medial defect was reconstructed using a cement mantle. We used the second-generation cementing technique and a cement restrictor in all cases. In the final step, insertion of the stem of the prosthesis was sunk up to a point on the stem that was marked previously to equalize the limb length. After finalization and hardening of the cement, the trochanter and calcar were then retightened by stainless-steel wire after the prosthesis was fixed. Reconstruction of the greater trochanter was performed with tension band wiring/K-wires/screws, with the soft tissue sleeve of greater trochanter attached back to the femoral shaft (Figs 2 and 3). Finally, hemostasis and wound closure were performed in layers over negative suction drain.

Postoperative, moderate flexion of both hips and knees and quadriceps strengthening exercises with a pillow between the legs were recommended. Weight bearing was permitted as early as tolerated and early gait training with the help of a walker was initiated. Clinical follow-up was performed after 2 weeks of discharge for removal of sutures, the patients were encouraged to walk using walking frames, followed by visits for every 3 months for the first year, and then every 6 months for the following period. The patients were evaluated clinically using the Harris hip score [9]. Results were rated as excellent (91–100 points), good (81–90 points), fair (71–80 points), and poor (≤70 points).

SPSS version 15.0 (SPSS Inc., Chicago, Illinois, USA), a statistical analysis software, was used to analyze the results with the aim of studying the functional outcome of the intervention.

Figure 2



Male patient 62 years with trochanteric fracture femur (A & B): preoperative X-Ray; (C & D): X-Ray one year postoperative.

Results

The mean follow-up period was 3 years (range: 18–4.5 years). The mean admission period was 8 days (range: 6–17 days). The mean time latency before operation was 4 days (range: 2–9 days). We encountered no intra-operative complications, but some technical points were kept in mind such as gentle manipulations, correct entry from the first trial, straight reaming before rasping, good intraoperative radiology, and good equipment. Postoperatively, 22 cases were able to ambulate independently using a walker, whereas eight cases were able to ambulate, but with assistance. Clinically, the Harris hip score at the last follow-up ranged from 93 to 54, with a mean value of 79.5. Four (13.33%) cases rated the results as excellent (91–100), 12 (40%) as good (81–90), 10 (33.33%) as fair (71–80), and four (13.33%) as poor (≤70).

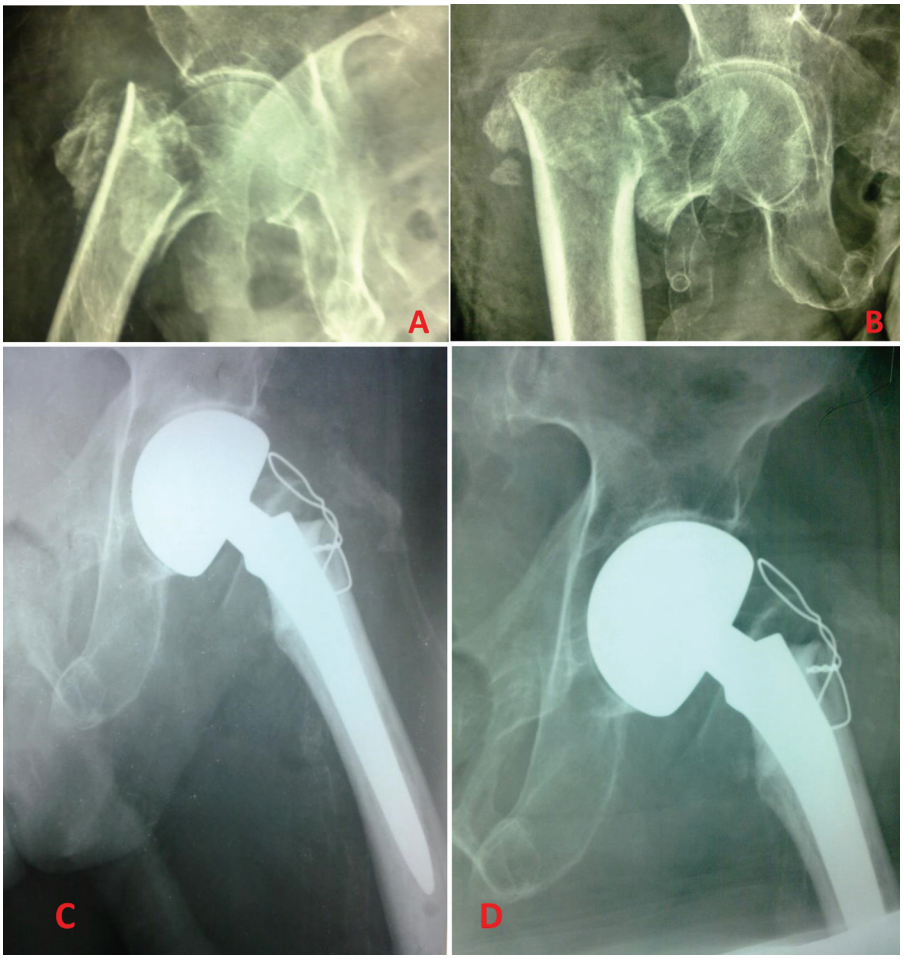
Postoperative radiographs showed a good position in all patients. According to Gruen scoring for cementation, 15 (50%) cases scored A, eight (26.66%) cases scored B, three (10%) cases scored C1, two (6.66%) cases scored C2, and two (6.66%) cases scored D.

Four cases developed complications in this study: infection, which was a superficial infection in two patients and was controlled by intravenous antibiotics and repeated dressing, loosening (one patient), and acetabular wear (one patient). Revision was performed in one patient because of loosening (Fig. 4).

Discussion

Several surgical options exist for the treatment of unstable intertrochanteric fractures. Traditionally, the consensus was to preserve the normal bone by open reduction and internal fixation. The technique is familiar to orthopedic surgeons and it is relatively rapid. Arthroplasty is a less frequently used alternative, although it allows immediate full weight bearing. Many of the complications of internal fixation (e.g. nonunion) are avoided by performing arthroplasty [10]. Several studies have been published reporting the results of treatment using different techniques.

Figure 3



Female patient 66 years with trochanteric femur (A & B): preoperative plain X-Ray; C: One month postoperative; D: 2 years postoperative X-Ray.

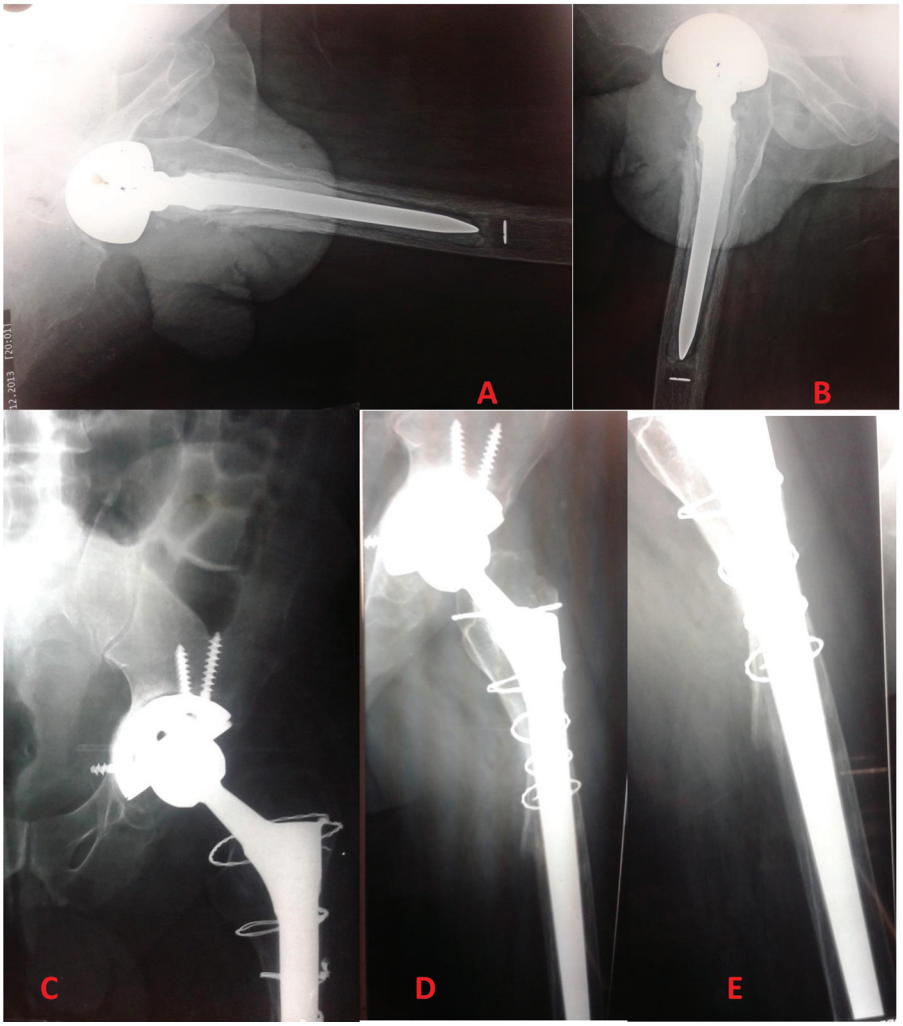
Studies of internal fixation of both stable and unstable intertrochanteric hip fractures reported a failure rate between 6 and 32% [10–12].

Theoretically, bipolar hemiarthroplasties were introduced to address the complications of unipolar implants such as acetabular wear, protrusion, loosening, and dislocation. Stems were reconfigured, more in line with total hip replacement designs, to decrease component loosening. Inner bearing motion was introduced to reduce acetabular wear and dislocation rates.

Modularity allowed for sizing to improve stability [13]. In the management of unstable intertrochanteric fractures, the choice of bipolar hemiarthroplasty prosthesis raised a new question: which stem design should be used? The deficient proximal medial femur is one of the challenges encountered during surgery. It is either to be augmented with calcar replacement prosthesis or the calcar has to be reconstructed. Several investigations have reported good to excellent functional results with the use of calcar replacement femoral prosthesis [10].

By comparing the results of this study with the results obtained by other studies, the mean Harris hip score in this study at the last follow-up was 79.5 in comparison with Elmorsy *et al.* [14], Kumar *et al.* [15], and Choy *et al.* [16], who reported 78.19, 75, and 80.6, respectively. Walia *et al.* [17], in a study comparing total hip replacement arthroplasty and cemented bipolar hemiarthroplasty, reported advantages of total hip replacement in terms of control of pain; however, they also highlighted certain drawbacks of total hip replacement arthroplasty in elderly patients such as instability, impaired reflexes, cognitive impairment, and higher dislocation rates. Fan *et al.* [18], in their study, reported that bipolar hemiarthroplasty provided results that were

Figure 4



Case No. 14 a male patient with loosening of bipolar 1 year after operation (A & B): X-ray after 1 year of operation of bipolar hemiarthroplasty after trochanteric femur; (C & D): postoperative X-Ray. With long stem total hip replacement.

comparable with total hip arthroplasty in terms of the hospitalization period, general complications, joint function, pain, rate of revision, and mortality.

The present study provided good results, with achievement of remarkable functional ability and pain control. In the literature, bipolar hemiarthroplasty has been shown to be similar to total hip replacement arthroplasty in terms of the hospitalization period, pain severity, and functional restoration [15,19,20].

In the present study, complications were reported in four cases, two of them being a superficial infection, which was controlled by intravenous antibiotics and repeated dressing, loosening in one patient, and acetabular wear in one patient. Revision was performed in one patient because of loosening. These results are similar to those obtained by Laffosse *et al.* [21], who reported revision surgery in only one patient. However, in a study by Elmorsy *et al.* [14], both complication rates as well as revision rates were much higher. They reported the need for revision surgery in four (9.8%) patients and complications such as stem loosening and subsidence, infection, dislocation, bleeding peptic ulcer, and intraoperative fracture of the femur.

Conclusion

According to this study, primary cemented bipolar hemiarthroplasty is a good choice for unstable intertrochanteric fractures in the elderly and saves time as well as cost, with few significant complications. Therefore, bipolar hemiarthroplasty should be considered one of the modalities of treatment of unstable intertrochanteric fractures in the elderly.

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Nil.

Conflicts of interest

There are no conflicts of interest.

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