Primary cemented hemiarthroplasty for unstable intertrochanteric fractures in elderly: an intermediate follow-up

Ahmad S. Allam

Department of Orthopedic Surgery, Benha University, Benha, Egypt

Correspondence to Ahmad S. Allam, MD, Department of Orthopedic Surgery, Benha University, Benha, Egypt
Tel: +20 011 166 877 66, +20 010 086 877 33, +20 012 233 315 72;
e-mail: ahmad_allam73@hotmail.com

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Background
Standard methods of internal fixation for comminuted or osteoporotic unstable intertrochanteric fractures in the elderly have a relatively high complication rate. This is because of the poor bone quality and prolonged immobilization periods needed to protect the construct until sound union occurs.

Aim
The aim of the work was to evaluate the results of primary cemented hemiarthroplasty in elderly patients with unstable osteoporotic intertrochanteric fractures.

Patients and methods
A total of 27 patients (all were above the age of 70 years) with unstable intertrochanteric fractures who were prospectively managed with primary cemented hip hemiarthroplasty were followed for an average of 4 years (range: 3.5–5.5). Harris hip score and patients' satisfaction were the evaluation criteria.

Results
According to the Harris hip score, 10 patients (37%) were graded as excellent, 12 patients (44.5%) as good, five patients as fair (18.5%), and no patients were graded as having poor end results. Total complications were 11 in number (0.4 complication/patient) with no major complications or operative mortality.

Conclusion
Primary cemented hemiarthroplasty in elderly's unstable intertrochanteric fractures is a successful procedure regarding early mobilization, functional results, and complication rate.

Keywords:
Hemiarthroplasty, unstable intertrochanteric, intertrochanteric fractures in elderly

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Introduction

The worldwide annual number of hip fractures in 1990 was 1.66 million, with an expected incidence of 6.26 million by the year 2050. Low-energy trauma (fall <1 month) caused 53% of all fractures in persons of 50 years of age and older. In those above 75 years of age, low-energy trauma caused more than 80% of all fractures. This is contributed of course to osteoporosis [1–3].

Many classification systems have been devised. A good one must be easy to use and reproducible. In addition, it should facilitate communication among surgeons.

In present-day surgical practice, it is important to know whether a fracture is stable or unstable. The answer to this question will guide the reduction technique, the type of fixation to be used, and the postoperative management. One of the most accurate, simple, and widely accepted classification systems is that of Evan [4] (Fig. 1).

Stable trochanteric fractures are classically and easily treated with osteosynthesis with the dynamic hip screw with predictable results. However, the management of unstable intertrochanteric fractures is a challenge because of difficulty in obtaining anatomical reduction [4,5]. Irrespective of the classification system used, there is an agreement that two factors must be considered in the assessment of stability: loss of medial support (as a result of separation of the lesser trochanter in association with a fracture of the medial arch) and comminution of the posterior cortex, which is frequently associated with a separation of the greater trochanter. Such fractures must be reduced in internal rotation to close the anterior gap and to replace the posterior cortical fragments. Despite performing that, the dynamic hip screw fixation may result in some complications including cut-out risk for instability, rotational deformities, shortening, and delayed weight bearing [6–8]. Hence, over the last 3 decades, for unstable osteoporotic or comminuted trochanteric fractures in the elderly or in those with a limited life expectancy, different types of arthroplasties were proposed to be used, with accepted end results [9–13].

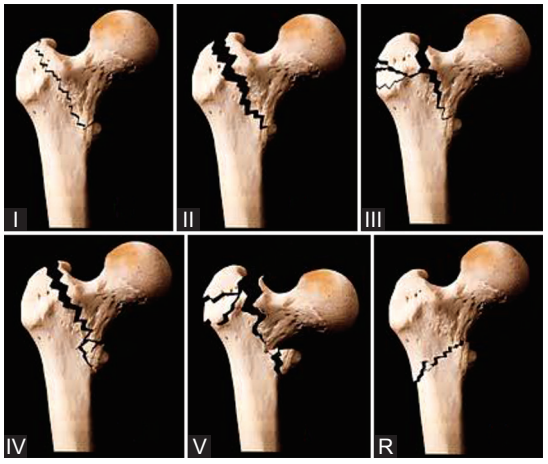
Patients and methods

From 2002 to 2007, 38 elderly patients with unilateral unstable intertrochanteric fractures (Evan's types: IV or V) underwent primary cemented hemiarthroplasty at Benha University Hospitals. Five patients died 9–27 months postoperatively due to unrelated medical causes. Another six patients were lost early during follow-up. A total of 27 patients were the participants of this prospective study.

For these 27 patients, average age was 79 years (with a range of 71–88 years). Men constituted the majority (19 patients, 70.3%). The right side was affected in 12 patients (44.4%). Causative trauma was a minor fall in 19 patients (70.4%). A twisting injury to the affected limb during weight bearing was the cause in the remaining eight patients (29.6%). All patients were ambulant before trauma. In all, 17 patients (63%) were walking previously with an aid (a cane or a walking stick). The remaining 10 (37%) were walking independently. None of the patients had any significant pre-existing hip pathology. According to Evan [4], there were 12 (44.4%) and 15 (55.6%) type IV and V fractures, respectively. Radiologic evidence of varying degrees of osteoporosis was present in all patients' plain radiographs. Osteoporosis was documented by DEXA examination previously in seven patients (25.9%); some of them were under antiresorptive treatment for variable durations.

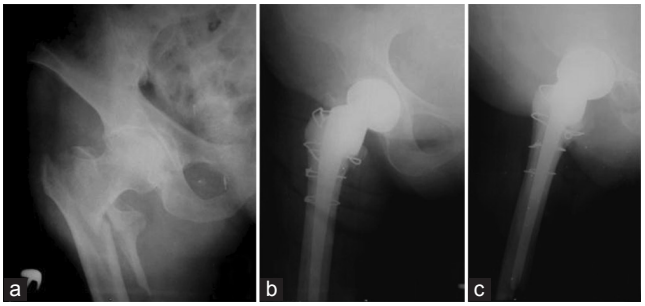
All patients were operated upon within 4 days post-trauma (1–6 days). The operative decision for all patients was a cemented Thompson's type hemiarthroplasty by a direct lateral Hardinge hip approach with the patient in the lateral decubitus position. After dissection, the fracture pathoanatomy was carefully assessed and the head-neck fragment was removed to give a clear view for the fracture's main residual fragments: the greater trochanter, the lesser trochanter, and the shaft. In four patients (14.8%), the separated lesser trochanter had a long diaphyseal extension fragment separated from the medial femoral cortex. In these cases, steel wires loops were used to reconstruct the medial buttress (Fig. 2). The final femoral cut was then performed as clean and as proximal as possible being about 1–2 cm above the lesser trochanter. In the remaining cases, the lesser trochanter was found as a separate fragment with a lot of difficulty to reattach it to the femur to reconstruct the calcar. Hence, it was pulled, with its soft tissue attachments, (five patients, 18.5%) by nonabsorbable sutures to be fixed in place to the femoral shaft. In the remaining 18 patients (66.7%), the small lesser trochanter fragment was ignored, and the left medial defect was reconstructed during cementing (Fig. 3). In nine patients (33.3%), the greater trochanter fragment was big and strong enough to be reattached in place using steel wires (Fig. 4). In six patients (22.2%), the greater trochanter was comminuted, and a tension band or a circlage wire was applied to it to reattach it in place or with mild distal advancement by a cortical hole (Fig. 5). In cases where the lesser trochanter was not in proper place to aid length adjustments, a trial reduction was performed using a trial prosthesis (with 2 mm smaller head size to facilitate redislocation). With the trial prosthesis in place, limb length equality is assessed by applying traction to affected limb, and a mark was made to measure cement mantle height below the prosthesis. Manual technique of cementing was used

Figure 1



The Evan's classification system [4]. Type I: undisplaced two-fragment fracture. Type II: displaced two-fragment fracture. Type III: three-fragment fracture without posterolateral support, owing to displacement of greater trochanter fragment. Type IV: three-fragment fracture without medial support, owing to displaced lesser trochanter or femoral arch fragment. Type V: four-fragment fracture without posterolateral and medial support (combination of type III and type IV). R: reversed obliquity fracture.

Figure 2



An 82-year-old man with Evan type V unstable intertrochanteric fracture of the right hip. (a) Preoperative radiograph (anteroposterior view): the lesser trochanter has a long diaphyseal extension fragment. (b) Six months after primary hemiarthroplasty: steel wires loops were used to reconstruct the medial buttress (anteroposterior radiograph). (c) One-year follow-up (lateral radiograph). Patient's final outcome was graded as excellent.

Figure 3

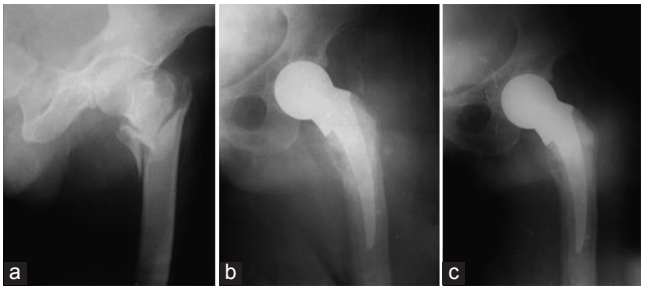
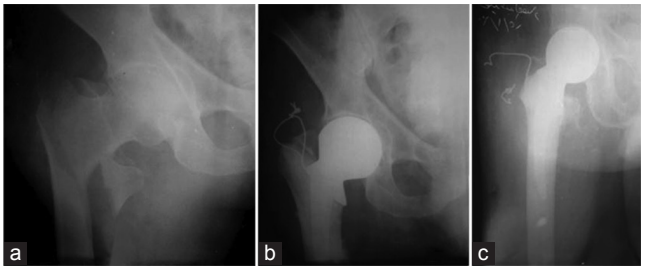


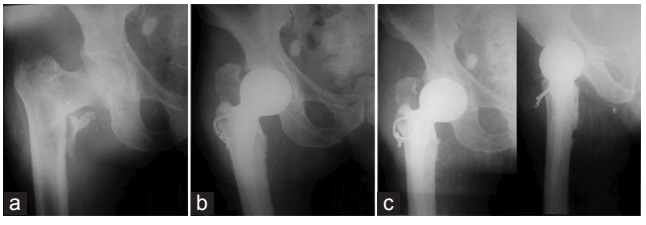
Figure 3A 77-year-old woman with Evan type IV unstable intertrochanteric fracture of the left hip. (a) Preoperative radiograph (anteroposterior view). (b) One month after primary hemiarthroplasty (anteroposterior radiograph). The lesser trochanter fragment could not be reduced, and its defect was reconstructed using cement. (c) Three-year follow-up (lateral radiograph). Patient's final outcome was graded as fair.

Figure 4



A 88-year-old man with Evan type V unstable intertrochanteric fracture of the right hip. (a) Preoperative radiograph (anteroposterior view). (b) One year after primary hemiarthroplasty (anteroposterior radiograph). The greater trochanter main fragment was reattached in place (with repair of the abductor mechanism) using steel wires. The lesser trochanter fragment was pulled, with its soft tissue attachments, by nonabsorbable sutures to be fixed in place to the femoral shaft. (c) 4.5-year follow-up (anteroposterior radiograph). The steel wire was broken 2 years postoperatively, with no effect on patient's final outcome, which was graded as good.

Figure 5



A 74-year-old man with Evan type V unstable intertrochanteric fracture of the right hip. (a) Preoperative radiograph (anteroposterior view). (b) 1.5 years after primary hemiarthroplasty (anteroposterior radiograph). The greater trochanter was comminuted, and a double circlage wire was applied to reattach the main fragment (with repair of the abductor mechanism) with mild distal advancement through cortical holes in the distal fragment. The lesser trochanter fragment was pulled, with its soft tissue attachments, by nonabsorbable sutures to be fixed in place to the femoral shaft. (c) Five-year follow-up (anteroposterior and lateral radiographs). Patient's final score was graded as good.

in all cases. Wound closure over a suction drain was a routine.

Postoperative physiotherapy protocol included early walking with a walker starting from the second postoperative day. This was changed to a supporting cane as tolerated by the patients. Patients were examined clinicoradiologically periodically. Anteroposterior and lateral radiographs of the hip were analyzed for any evidence of loosening or other complication. Patients were finally evaluated using:

(a) A patient's satisfaction questionnaire that included preoperative and postoperative ambulation, which was classified into four grades: I, excellent function; II, intermittent pain, sometimes using a cane; III, decreased walking due to pain; and IV, poor hip function with total dependency and
(b) Harris hip score, which is graded as: 90–100 excellent, 80–89 good, 70–79 fair, and less than 70 poor. Statistical comparisons of the data were made using the χ^2-test and Student's t-test. A P value of less than 0.05 was considered statistically significant.

Results

The average operative time was 70 min (range, 50–90 min) with an average intraoperative blood loss of 300 ml (range: 200–1000 ml). The average hospital stay was 8 days (range: 5–12 days). The average follow-up period was 4 years (range: 3.5–5.5 years). The average limb shortening was 1 cm (range: 0.5–1.5 cm) in only seven patients (26%). Nothing was performed for this, as it was well tolerated. A total of 10 patients (37%) had an abductor lurch at early follow-up visits. However, only four patients (14.8%) had abductor muscle insufficiency with a positive Trendelenberg test at their final follow-up visit. At the latest follow-up, 16 patients (59.2%) achieved their preoperative ambulation grade. The remaining 11 (40.8%) lost only one grade (none was finally grade IV).

Patients' satisfaction was graded as 81% (22 patients) satisfactory with excellent and good results. Fair results were 19% (the remaining five patients), with no cases graded as poor end results. According to the Harris hip score, 10 patients (37%) were graded as excellent, 12 patients (44.5%) as good, five patients as fair (18.5%), and no patients were graded as having poor end results. Total complications were 11 in number (0.4 complication/patient) with no major complications or operative mortality. This included two (7.4%) superficial wound infection and one (3.7%) urinary tract infection. These three cases with

infection were resolved with antibiotic therapy. Four patients (14.8%) had abductor muscle insufficiency, with a positive Trendelenberg test; all were graded as having fair final end results. Two (7.4%) patients showed radiologic signs of early aseptic loosening (Fig. 3). Two patients (7.4%) had intermittent mild unexplained pain, but it did not prevent them from ambulation using a cane. There were no cases of dislocation and deep or late infections. None of the two patients with radiologic signs of early aseptic loosening were symptomatic or radiologically progressing, warranting a revision.

Discussion

Management of unstable trochanteric fractures is a real challenge, even for the most experienced orthopedic surgeon. Despite modern methods of osteosynthesis, early mobilization is still avoided in cases with comminution, diminished bone stock, or poor screw fixation. Hence, primary hemiarthroplasty has been used as an alternative for unstable intertrochanteric fractures since 1971, allowing early mobilization in these patients and preventing postoperative complications [10]. Tronzo [14] claimed to be the first to use long, straight-stemmed prosthesis for the primary treatment of intertrochanteric fractures. Rosenfeld *et al*. [15] reported good results with the use of the Leinbach prosthesis. Since then, there were multiple studies showing good results using this technique [16–19]. The earliest comparison of internal fixation and hemiarthroplasty was performed by Haentjens *et al*. [11] showing a significant reduction in the incidence of pneumonia and pressure sores in those undergoing prosthetic replacement. In a comparative study on cone hemiarthroplasty versus internal fixation, Kayali *et al*. [13] reached the conclusion that clinical results of both groups were similar. Hemiarthroplasty patients were allowed full weight bearing significantly earlier than the internal fixation patients. Broos *et al*. [20] concluded that the operative time, blood loss, and mortality rates were comparable between the two groups, with a slightly higher percentage (73 versus 63%) in those receiving prosthesis. The functional outcome was comparable between both groups. The results of the present study are comparable with and supporting the above results, despite using different types of prostheses and different surgical approaches. Thompson's prostheses were used in this study because of its low price. The lateral approach was preferred because of its shorter operative time, less blood loss, and lower incidence of postoperative dislocation. About the postoperative mortality, several studies have shown no differences in mortality between the internal fixation and arthroplasty groups [11,20,21]. In the present series, five patients (of the initial 38 patients) died 9–27 months postoperatively due to unrelated medical causes. They were excluded because of their short follow-up.

Conclusion

In the elderly, unstable intertrochanteric fractures with osteoporosis or comminution could be effectively managed by primary hemiarthroplasty, which provides early mobilization with a stable, pain-free, and mobile joint with acceptable complication rate.

Acknowledgements

Conflicts of interest

There are no conflicts of interest.

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