Functional outcome of cemented bipolar prosthesis in unstable trochanteric fractures in elderly

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Received 16 June 2016 Accepted 13 November 2016

Egyptian Rheumatology & Rehabilitation 2017, 44:125–129

Background

Hip arthroplasty in unstable trochanteric fracture warrants quick recovery with little risk of mechanical failure, avoids the risk associated with internal fixation, and enables the patient to maintain a good level of function immediately after surgery. **Aim**

The aim of this study is to evaluate the clinical and functional outcomes of cemented bipolar prosthesis in unstable intertrochanteric fractures in the elderly.

Patients and methods

Twenty-four patients with unstable type of intertrochanteric fracture according to Association Osteosynthesis Classification were treated with hemiarthroplasty (cemented bipolar prosthesis) and reconstruction of trochanter. The average age of the patients was 79 years. We evaluated postoperative complications, mortality rate, functional outcome using the Harris hip score, time to return to preinjury level of activity, and radiological signs of healing and loosening or migration of implant. The range of period of follow-up was 2–5 years (mean: 3.5 years).

Results

Mobilization and full weight-bearing was started immediately within 1 week of surgery. The dislocation rate in our study was zero. Deep infection and loosening of the implant was not observed in any of the cases. The mean Harris hip score improved progressively with time of follow-up. The mean score was 45.30 on the third day. The final average Harris hip score at the last follow-up was 81.90. Limb length discrepancy was observed in seven patients and average shortening was 1.3 cm (range: 0.5–1.8 cm).

Conclusion

Hip arthroplasty in mobile and psychologically stable elderly patients with unstable intertrochanteric fracture is a valuable treatment option.

Keywords:

cemented bipolar prosthesis, elderly, harris hip score, internal fixation, unstable intertrochanteric fracture

Egypt Rheumatol Rehabil 44:125–129 © 2017 Egyptian Society for Rheumatology and Rehabilitation

1110-161X

Introduction

Trochanteric fractures are frequent in the elderly, and the number is increasing with time because of increasing life span and more sedentary lifestyle. A typical patient with trochanteric femoral fracture is characterized by old age, poor bone stock, and significant comorbid conditions. Most of the patients suffer from these injuries because of minor trauma. Unstable intertrochanteric fracture in the elderly patient is associated with a high rate of mortality as much as 20% during the first postoperative year [1]. Excessive collapse at the fracture site, loss of fixation, and migration of the lag screw result in poor functional problems associated with internal fixation of unstable intertrochanteric fracture in the elderly patients with osteoporotic bone.

About 35–40% of these fractures are unstable Association Osteosynthesis (AO)/Orthopaedic Trauma Association (OTA) type 31-A2.2 and 31-A2.3 with displacement and comminution of posteromedial cortex [2]. Stable fractures can be managed successfully with osteosynthesis by internal fixation with satisfactory results, but unstable intertrochanteric fractures are difficult to manage by internal fixation because anatomical reduction is very difficult to achieve. The failure rates of unstable intertrochanteric fractures managed with internal fixation devices has been reported to be about 6–32% [3,4]. Poor bone quality and unstable configuration of fractures are the most important factors contributing to failures. Delayed mobilization in the elderly with unstable intertrochanteric fracture leads to complications such as

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bed sores, respiratory problems, deep vein thrombosis, etc. Therefore, stable fracture fixation, bone quality, and early mobilization collectively contribute to final functional outcome in these patients. Intramedullary devices have decreased incidences of cut-out of screw in osteoporotic bones, but their role in osteoporotic unstable and comminuted intertrochanteric fractures is still to be established. In these types of fractures, literature shows encouraging results with endoprosthetic replacements. Therefore, we conducted a prospective study to evaluate the functional and clinical outcomes of hemiarthroplasty with cemented bipolar prosthesis as a primary treatment for unstable intertrochanteric fracture in the elderly patient.

Patients and methods

We conducted a prospective study in which we included 24 patients who presented to Orthopedic Outpatient Department and Emergency of our institution from January 2010 to June 2015 with trochanteric femoral fractures (unstable, comminuted, osteoporotic, trochanteric nonunion, and failure of fixation). We got ethical committee approval to conducted a prospective study.

Trochanteric femoral fractures were classified according to AO. Only AO/OTA type 31-A2.2 and 31-A2.3 fractures were included in this study. Previously, nonambulatory patients, patients with mental disorders, neuromuscular weakness, compound fractures, and pathological fractures were excluded from this study. Out of 24 patients, 17 patients were walking without support and seven patients were walking with the support before injury. Male-to-female ratio was 3 : 1 (18 male and six female). Left hip was involved in 16 patients and right hip was involved in eight patients. There were 17 patients of type 31-A2.2 and seven were of type 31-A2.3 according to AO classification.

Replacement and stabilization was done with cemented bipolar prosthesis along with trochanteric reconstruction.

Operative technique

Patient positioning: Position the patient with the affected hip upward in lateral position. Prepare the skin over the hip and square off the lateral aspect of the hip from the iliac crest to the proximal thigh with towels and drapes.

All patients were operated by the same surgeon. We used the posterior approach in lateral position.

Subcutaneous tissue is divided along with a skin incision in a single plane down to fascia lata and

fascia covering gluteus maximus superiorly. Fascia is divided in line with the skin wound over the center of the greater trochanter; gluteus maximus is bluntly split proximally in the direction of its fibers. Short external rotators and posterior edge of the gluteus medius were exposed. Fracture fragments were exposed and proper assessment was done without cutting short external rotators. Femoral head is dislocated posteriorly and removed after taking high cut in the neck. When the lesser trochanter is found as a separate fragment with neck, both of them are tied to the shaft using steel wires. In cases of greater trochanter fracture en masse, it is attached to the main shaft using steel wires. In cases in which the greater trochanter is coronally split, a tension band wiring is used. In cases in which the greater trochanter is severely comminuted, Ethibond sutures are used to suture together the trochanteric pieces and the soft tissues to make a stable construct. After proper neck cut, the femoral canal is broached with adequate anteversion. After trial reduction, we inserted a cemented bipolar prosthesis by using first generation cementing technique (Figs. 1 and 2).

Rehabilitation protocol: The patients were allowed to sit up on the bed hanging legs by the side on the second day. Quadriceps strengthening exercises, knee flexion, and extension exercises were started from the second day and patients were allowed full weight-bearing walk with a walking aid after the third day and/or as the pain and discomfort were tolerated. Adduction and abduction exercises of the hip started after 1 week, after which the patient was allowed to roll by the sides. Squatting and sitting cross-legged was totally restricted and patients were encouraged to leave their walking aids as soon as possible. Postoperative hip function was evaluated using the Harris hip-scoring system. Mean follow-up period was 3.5 years (2–5 years).

Observation and results

Mean age of the patients was 76 years (range: 65–85 years). Out of 24 patients, 18 (75%) were female and six (25%), were male with a female : male ratio of 3 : 1. Left-side (66.7%) involvement was more than right-side involvement (33.3%) (Tables 1 and 2). All the fractures belonged to unstable type of fractures. Bone mineral density according to DEXA scan was suggestive of osteoporosis in 75% and osteopenia in 25% cases. In all, 37.5% are hypertensive, 25% are diabetic, 12.5% had cardiac problems, and 25% cases are without any medical comorbidities. Most of the surgeries were performed within 10 (50%) days of admission; mean delay was 5 days because of preanesthetic check-up. In all patients, hemiarthroplasty was done with cemented bipolar

Figure 1



(a) Plain radiograph anteroposterior view of the pelvis of an 82-year-old woman shows unstable intertrochanteric fracture of the left hip (AO 31 A-2.2). (b) Postoperative radiograph shows hemiarthroplasty with cemented bipolar prosthesis with trochanteric reconstruction with Ethibond.

Figure 2



(a) Plain radiograph anteroposterior and lateral (b) view of the pelvis of an 85-year-old man shows unstable intertrochanteric fracture (AO 31-A2.3) of the right hip. (c) Postoperative radiograph shows hemiarthroplasty with cemented bipolar with trochanteric reconstruction with steel wires.

Table 1 Patient variables

	n (%)
Age distribution	
Age group (years)	
65–70	6 (25)
71–75	12 (50)
76–80	2 (8.33)
81–85	4 (16.67)
Sex distribution	
Sex	
Male	6 (25)
Female	18 (75)
Laterality	
Side	
Left	16 (66.6)
Right	8 (33.3)

prosthesis. Before injury, three of the patients were ambulatory indoors and 21 were successfully participating in community activities. Most cases required 1U of postoperative blood transfusion, and four cases required 2U. Mean duration of surgery was 85 min, ranging from 55 to 105 min. The mean blood loss was 270 ml and ranged between 200 and 400 ml. Majority of patients allowed full weight-bearing on third Table 2 Observation and results

	n (%)
Blood transfusion required	
Number of units	
One	20 (83.33)
Two	4 (16.67)
Mean duration of surgery (min)	85 (55–105)
Mean blood loss (ml)	270 (200–400)
Limb length discrepancy	7 (29)
Average shortening (cm)	1.3 (0.5–1.8)
Postoperative dislocation	None
Superficial infection	3 (12.5)
Harris hip scores at follow-up (mean score)	
Time of follow-up	
Third day	45.30
Second week	58.61
3 months	75.10
6 months	78.87
12 months	81.90

to fifth postoperative day. The mean hospital stay was 19 days (2–4 weeks). A total of 12 (50%) patients were discharged from the hospital within a week of operation and nine (37.5%) patients were discharged after stitch removal on the 15th day; three (12.5%) patients were

discharged after 15 days because of superficial wound infection, which was managed by daily dressing. None of the patients required debridement. The dislocation rate in our study was zero. Although surgical technique might decrease the risk of dislocation if proper soft tissue balancing around the hip joint, proper restoration of equal leg length, and proper selection of the neck length, offset and version were performed. The mean Harris hip score improved progressively with time of follow-up. The mean score was 45.30 on the third day, which increased to 58.61 at 2 weeks, whereas at 3 and 6 months the scores were 75.1 and 78.87, respectively. The final average Harris hip score at last follow-up was 81.90. At last follow-up, 15 patients were walking without any aid and nine patients were walking with support. After 2 weeks of surgery, the score was poor. By 6 weeks, the majority had a fair score. At 3 months, Harris hip score was good in all the patients. At last follow-up, the score was good in 19 patients and excellent in five patients. Thus, it was observed that the score increased progressively and the difference in score between two consecutive follow-ups was highly significant especially between 2 and 6 weeks. One patient died after 9 months of operation because of some other medical problem not related to surgery. This patient was included in Harris hip score for 6 months. Limb length discrepancy was observed in seven patients and average shortening was 1.3 cm (range: 0.5–1.8 cm). At the final follow-up, four patients had abductor muscle weakness on Trendelenberg's test.

Discussion

Unstable intertrochanteric fractures in elderly patients are characterized by osteoporosis, severe comminution, and displacement. In patients with osteoporotic and/or comminuted fractures, maintenance of reduction can be a major problem during the healing period. To reduce the healing time, dynamic devices are replaced with the static ones. Biomechanical studies show that dynamic implants have more weight-bearing capacity than static implants [5-7]. It has been recommended that position of the screw in the femoral head should be in the center [8], which yields a cut-out rate of about 13%. Accurate anatomic reduction of these fractures is difficult to achieve and rather more difficult to maintain, which usually leads to malunion or failure of reduction. Postoperative early full weight-bearing therefore is not easy, and postoperative complication rates and mortality rates are high. Intertrochanteric fractures make up 45% of all hip fractures [2]. Stable two-part fractures can be fixed satisfactorily by sliding hip screws or intramedullary implant. However, 35-40% are unstable (AO/OTA

type 31-A2.2 and 31-A2.3) fractures that are associated with high rates of morbidity and mortality [2]. Overall failure rates in internal fixation of intertrochanteric fracture range from 3 to 16.5%, which is on the higher side in the elderly with unstable fractures [9]. Because of high failure rates, complications associated with internal fixation, use of hemiarthroplasty, and total hip arthroplasty as primary treatment of these fractures have emerged. Tronzo [10] pioneered the use of prostheses for the primary treatment of comminuted intertrochanteric fractures. Stern and Goldstein [11] used the Leinbach prosthesis for the primary management of 22 intertrochanteric fractures and concluded that early mobilization and early recovery to preinjury status are definite advantages. Rodop et al. [12] in a study of primary bipolar arthroplasty for unstable intertrochanteric fractures in 37 elderly patients obtained 17 (45%) excellent and 14 (37%) good results after 12 months according to the Harris hip-scoring system. Haentjens et al. [13] compared the outcomes of internal fixation and hemiarthroplasty and reported a significantly reduced incidence of pneumonia and pressure sores in the hemiarthroplasty group. Sancheti et al. [14]concluded that primary hemiarthroplasty provides a stable, pain-free, and mobile joint with acceptable complication rate. Elderly patients, who are often unable to cooperate with partial weight-bearing, which is required after an internal fixation, respond wonderfully to full weight-bearing with arthroplasty. This reduces the period of recumbency and related complications. We concluded that arthroplasty allows early and rapid recovery toward preinjury status with immediate weight-bearing, and maintenance of a good level of function with minimal risk of mechanical failure. Tendency of dislocation was limited to negligible by the use of bipolar prosthesis having a large-diameter head and a self-centered cup [15]. We performed cemented bipolar in all of our elderly patients with osteoporotic/unstable/ comminuted intertrochanteric fractures. They could ambulate early, thereby avoiding the various potential complications of prolonged immobilization. The uncertainty of union of the fracture therefore is not there. This provided substantial stability to the hip and allowed assisted full weight-bearing in the immediate postoperative period. Limitations of our study are the small number of patients and relatively shorter follow-up. In the future, a comprehensive prospective study with longer follow-up would be necessary.

Conclusion

In our study, 23 out of 24 patients had fair to excellent Harris hip score with primary replacement with cemented bipolar prosthesis. Trochanteric reconstruction with Ethibond or steel wires and formation of calcar with cement plays an important role in stable and correct placement of bipolar prosthesis. Early postoperative full weight-bearing, less hospital stay, excellent functional stability, and absence of postoperative complications related to non-weight-bearing after internal fixation in arthroplasty with cemented bipolar prosthesis makes this a valid and promising modality of management of unstable intertrochanteric fractures in the elderly.

Financial support and sponsorship

Nil.

Conflicts of interest

There are no conflicts of interest.

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