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Cemented modular bipolar hemiarthroplasty of hip in treatment of unstable intertrochanteric fractures in elderly patients

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Abstract

Aim: The aim of this study is to find out this treatment option can lead to the best clinical and functional outcomes.

Patients and Methods: Twenty patients admitted to Hospital between Jan 2013 and Dec 2015 with a diagnosis of unstable intertrochanteric fractures of femur were selected. Preoperative and operative data was retrieved from inpatient hospital files. Postoperative radio clinical data at follow up visits was collected from outpatient department files. Functional outcomes were assessed with use of Harris hip score. The main clinical measures were early postoperative full weight bearing, postoperative complications and functional outcome.

Results: The time to full weight bearing, the rate of postoperative complications, and the functional outcomes were significantly better in the cemented bipolar modular hemiarthroplasty group.

Conclusion: According to our results, we believe that cemented modular bipolar hemiarthroplasty is of choice in freely mobile elderly patients above seventy years of age with an unstable intertrochanteric femoral fracture.

Keywords: Unstable intertrochanteric fracture of femur, cemented bipolar hemiarthroplasty for treatment of unstable intertrochanteric fracture

Introduction

Intertrochanteric fracture in the elderly patient is a frequent problem and is becoming more common as the proportion of elderly people in the population increases (Fig 1) [1]. Unstable intertrochanteric fracture in the elderly patient is associated with high rate of mortality as much as 20 per cent during the first postoperative year [2-6]. The treatment of such unstable intertrochanteric fracture is still controversial, despite of the publication of reports of randomized trials and comparative studies [7-9]. Excessive collapse, loss of fixation, and cut-out of the lag screw resulting in poor function remain problems associated with internal fixation of unstable intertrochanteric fracture in the elderly patient with osteoporotic bone. To allow early postoperative weight-bearing and to avoid excessive collapse at the fracture site, some surgeons have recommended prosthetic replacement for the treatment of unstable intertrochanteric fractures [10-13]. The purpose of this study is to evaluate the functional and clinical outcomes of cemented modular bipolar hemiarthroplasty as a primary treatment for unstable intertrochanteric fracture in the elderly patient.

Patients and Methods

This study is approved by the ESICMC and GIMS Hospitals in Gulbarga. Between Jan 2013 and Dec 2015, 20 patients admitted with the diagnosis, unstable intertrochanteric femur fracture according to AO-ATO classification of intertrochanteric fractures (Association for Osteosynthesis/Orthopedics Trauma Association) [14] were selected (Fig. 2). These patients were all above sixty years of age and were independently mobile before sustaining the fracture. Exclusion criteria included patients unable to walk before the fracture, patients less than sixty years old, patients with pathological fractures, patients with a previous contra lateral hip fracture, and patients with stable fractures and intact lesser trochanters. Data was collected from in-patient hospital files and out-patient department upon follow up.

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Pre-operative data included: Age, sex, fracture type, and preoperative co-morbid medical problems (Diabetics, hypertension, COPD etc). Peri-operative data included type of anesthesia, operative time, amount of blood loss, number of units of blood transfused, and duration of hospital stay. Postoperative data includes time to full weight bearing, postoperative complications such as pulmonary problems, urinary tract infection, deep vein thrombosis, cardiac problems, infection (superficial and deep), pressure sores. All surgical procedures were performed by the same surgical team as soon as the condition of the patient was stabilized, usually within forty-eight hours after admission.

Preoperative templating of radiographs of the fractured side and contra lateral side was performed to determine the approximate size and position of the stem and the approximate femoral head. The operations were performed using the transgluteal posterolateral approach in a lateral decubitus position. The femoral head and neck were osteotomized at a level determined by preoperative templating of the uninjured side and by the use of trial femoral components to help find the appropriate level. Meticulous care was taken to preserve the integrity of the greater trochanter, abductor muscles, and all the vascularized bone fragments. The femoral medullary canal was then reamed to appropriate stem size and diameter. Trial reductions were performed to determine the exact length that will provide the desired tension of the abductor muscles and equal leg length. Careful restoration of neck length, offset and version to maximize stability of the hip joint was also assessed during trial. The definitive femoral stem was cemented into the femoral canal by use of second-generation cementing techniques (medullary lavage, use of an intramedullary cement plug, hand-mixing of cement, use of a cement gun to deliver the cement in a doughy state in a retrograde fashion and to insert antibiotic-impregnated cement in all patients). Small calcar bone fragments were reduced over the medial aspect of the femoral stem below the stem collar during insertion. As for large calcar bone fragments, they were reduced with the help of cerclage wires. Other cases needed medial calcar bone reconstruction in the form of U- shaped autograft fashioned from the removed head and neck to fit around the medial portion of the femoral stem. Any protrusion of cement between reduced bone fragments was cleaned out (Fig 3). The greater trochanter was reduced and stabilized using tension band wiring technique after hip reduction or just sutured near the prosthesis. The gluteus medius muscle and vastus lateralis muscle were sutured to their anatomical locations using anchor sutures if necessary. Fascia Lata was tightly closed over a suction drain. The use of prophylactic antibiotics was Second generation ceftriaxone (1gram) and amikacin (500 mg) were given at the induction of anesthesia and continued for 6 doses postoperatively. Pain killers were given as needed.

Patients in the modular bipolar hemiarthroplasty were ambulated full weight bearing on the third postoperative day after check X ray (Fig 4) with the aid of a physiotherapist. After discharge from hospital, patient called back after seven days for suture removal than patients were followed at four weeks; at three, six, and twelve months; thereafter for radiological, clinical and functional evaluation using the Harris Hip score at each visit.

The Harris hip score is a validated fifteen-item patient questionnaire on which scores range from 0 to 100 (<70 poor; 70–79 fair; 80–89 good; 90–100 excellent).

Antero-posterior and lateral radiographs of the affected hip

were made postoperatively and at each follow up visit. Any erosion of the acetabular cartilage with horizontal or vertical migration of the bipolar cup of >2 mm was documented. A stem was considered to be unstable when there was progressive subsidence exceeding 3 mm, any change in position, or a continuous radiolucent line wider than 2 mm at the bone-cement interface.

Results

Twenty patients were enrolled in this study. All had unilateral unstable intertrochanteric fracture of the hip after falling from standing position to ground level. The study group consisted of 20 patients treated with a primary modular bipolar hemiarthroplasty. The average age at operation was 64.6 years (range, 60 to 85 years). There were 8 men and 12 women. 4 patients had the A21 fracture type, 8 patients had A22 fracture type, 4 patients had A23 fracture type, and 4 patients had A33 fracture type (Table 1).

The mean operative time 120 minutes was in the modular bipolar hemiarthroplasty. The mean blood loss intraoperatively 250ml was high in the bipolar hemiarthroplasty. The mean blood transfusions (number of units) required during hospital stay was 2 units in the modular bipolar hemiarthroplasty. Average length of hospital stay 7 days was less in the bipolar hemiarthroplasty (Table 2). Patients with modular bipolar hemiarthroplasty had less postoperative complications; pressure sores 1(5%), pulmonary complications (0%), cardiac complications (0%), superficial wound infection 2 (10%) urinary tract infection 3(15%). In the radio-clinical results of 1 patient were considered unsatisfactory: one patients had restriction in the range of movement of the affected hip, There was no dislocation, no signs of femoral stem instability, or acetabular erosion with cup migration (Table 3).

The Harris Hip Score at 3 months postoperatively was significantly higher in patients with bipolar hemiarthroplasty (76). (range 66 – 86). The Harris Hip Score at 12 months postoperatively was significantly higher in patients who underwent modular bipolar hemiarthroplasty (82) (range 72 – 90). At 24months, Harris Hip Score was significantly higher in patients who underwent bipolar arthroplasty 85 (range 76 – 90) (Table 4).

The time required is 6 weeks to independent full weight bearing and return to the pre-fracture level of daily activity was significantly earlier in patients who underwent modular bipolar hemiarthroplasty (Table 4).

Table 1: Demographic and preoperative data

Number	20
Age (years)	60 – 85
Sex (Female: Male)	3:2
AO/OTA† fracture type (No. of patients)	
A2.1	4
A2.2	8
A2.3	4
A3.1	0
A3.3	4

Table 2: Intra operative data

Type of anesthesia. Block (SA/EA)	20
Operative time (min)	120
Amount of blood loss (ml)	250
Blood transfusions (units)	2
Duration of hospital stay (days)	7

Table 3: Postoperative complications

Mortality rate	0
Duration of hospital stay More than 7 days	0
Pulmonary Complications	0
Urinary Tract Infection	3
Deep Vein Thrombosis	0
Cardiovascular Complications	0
Prosthetic/Fixation Failure	0
Wound Infection Superficial	2
Deep	0
Pressure Sores	1

Table 4: Functional outcome

Follow-up Period (months)	24
Time to full weight bearing (weeks)	3
Harris Hip Score (100)	
3 months postoperative HHS	76
12 months postoperative HHS	85
24 months postoperative Harris HHS	92
Harris Pain Score at 24 months (44)	42
Return to Normal daily activities (days)	35



Fig 1: preoperative x ray of unstable intratrochanteric fracture.

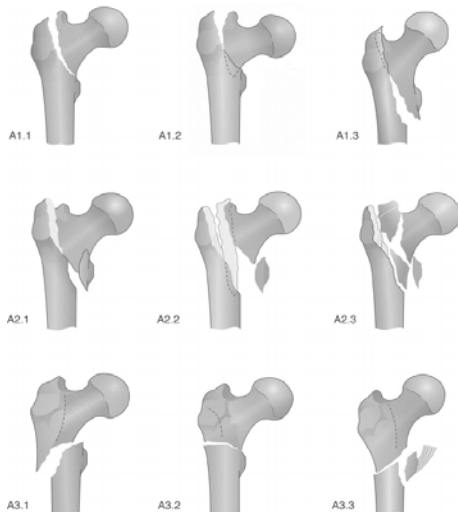


Fig. 2 AO Classification of intertrochanteric fractures of femur

A1. Simple (2-fragment) pertrochanteric area fractures: A1.1 Fractures along the intertrochanteric line; A1.2 Fractures through the greater trochanter; A1.3 Fractures below the lesser trochanter;
A2. Multifragmentary pertrochanteric fractures; A2.1 With one intermediate fragment (lesser trochanter detachment); A2.2 With 2 intermediate fragments; A2.3 With more than 2 intermediate fragments;
A3. Intertrochanteric fractures; A3.1 Simple, oblique; A3.2 Simple, transverse; A3.3 With a medial fragment.

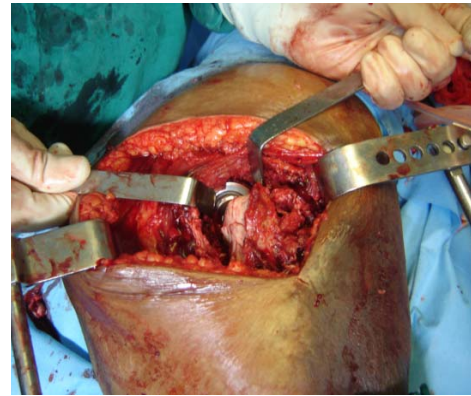


Fig 3: Intraoperative cemented bipolar fixation



Fig 4 Postoperative radiograph of unstable intertrochanteric fracture treated by cemented hemiarthroplasty.

Discussion

Although the use of internal fixation has decreased the mortality rate somewhat [2, 3] the rate of complications still ranges from 4 to 50 percent [20] and walking with full weight-bearing before the fracture has healed is often impossible [7, 15, 16, 17, 19, 21]. Therefore treatment with primary modular bipolar hemiarthroplasty rather than internal fixation could return these patients to their pre injury level of activity more quickly, thus obviating the postoperative complications caused by immobilization or failure of the implant [7, 17, 18, 19, 22, 23]. Harwin *et al.* [24] reported on fifty-eight elderly patients with osteoporosis in whom a comminuted intertrochanteric femoral fracture had been treated with a bipolar Bateman-Leinbach prosthesis and who were followed for an average of twenty-eight months. The average patient age was seventy-eight years, and 91% walked prior to discharge. Two patients had a nonunion of the greater trochanter. There were no deep infections, dislocations, acetabular erosions, or cases of stem loosening. Broos *et al.* [25] reported on ninety-four elderly patients treated with a bipolar Vandeputte prosthesis. They found that the average operating time was shorter, the mortality rate was lower, and the functional results were better in the group treated with the bipolar hemiarthroplasty. Recently, Rodop *et al.* [26] reported on fifty-four elderly patients who had been treated with a bipolar Leinbach hemiprosthesis (Protek; Sulzer Orthopedics, Baar, Switzerland). A good to excellent result, as assessed with the Harris hip-scoring system, was reported in 80% of the patients. There were no dislocations or cases of stem loosening.

In our study, the results of the hemiarthroplasty group were significantly better regarding operative time, blood loss, perioperative blood transfusion, and hospital stay. Early postoperative full weight bearing in the hemiarthroplasty group compared with early partial or non-weight-bearing in the internal fixation group was the main reason for significant reduction in postoperative complications^[23, 27, 28].

The serious complication in patients who have had a prosthetic operation on the hip is deep infection; the rate of infection after such an operation has been reported to range from 0 to 3 percent. The large wound surfaces and the extensive dissection that is needed are factors that facilitate bacterial contamination^[29, 30]. Nevertheless, the rate of deep infection in our study was zero. The rate of dislocation, as reported in the literature, has varied widely aggravated by many factors^[31]. In the study of Woo and Morrey^[32], there was an increased rate of dislocation of the hip due to abductor weakness and/or trochanteric non-union. The dislocation rate in our hemiarthroplasty group was zero. The large diameter of the head and self-centering cup that was used in the bipolar hemiarthroplasty might explain the decreased tendency to dislocate^[33]. Also the 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 presence of unattached lesser trochanter may preclude accurate adjustment of the proper limb length. This added to the technical difficulty of the operation. To establish a proper limb length, the center of the prosthetic head was adjusted to be in line with the tip of the anatomically repositioned greater trochanter^[34].

Our present study also showed that the cemented mantle used to fix the prosthesis in the femoral shaft was possibly able to transmit the stresses of weight bearing directly to the femoral diaphysis bypassing the posteromedial area of the proximal femur. In addition, calcar reconstruction had the potential advantage of improved trochanteric healing, restoration of bone stock, re-establishment of proper limb length and reduced implant cost. This mechanism was properly efficient for elderly patients with low functional demands^[35].

Conclusion

Accordingly, we believe that cemented modular bipolar hemiarthroplasty is of choice in freely mobile elderly patients above sixty years of age with an unstable intertrochanteric femoral fracture. Postoperative full weight bearing after hemiarthroplasty spares the postoperative complications of non weight bearing after internal fixation. Yet hemiarthroplasty in these cases is a surgically demanding technique. Bad surgical technique may lead to prolonged operative time, high incidence of deep infection, dislocation, and a poor radiological and functional outcome.

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