



FUNCTIONAL AND RADIOLOGICAL OUTCOME OF UNCEMENTED BIPOLAR ARTHROPLASTY IN UNSTABLE INTERTROCHANTERIC FRACTURES OF THE ELDERLY

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ABSTRACT

Background: Bipolar hemiarthroplasty is an effective option for unstable intertrochanteric fractures in the elderly. This study evaluated the functional and radiological outcome following uncemented hemiarthroplasty in elderly unstable intertrochanteric fractures

Methods: 25 hips were followed for a period of 1 year after hemiarthroplasty with a blast coated revision stem (Orthovasive). The mean age was 77 and mean follow up 16 months. The modified Merle D'Aubigne score was assessed for function and radiological results were assessed using a range of indices.

Results: At the last follow up the mean Merle D'Aubigne score was 14.5. Twenty cases (80%) regained their preoperative walking ability postoperatively. Radiologically, there were 15 cases (60%) of bone in growth and 10 cases (40%) with stable fibrous fixation. Endosteal new bone formation was found in 10 (40%) patients. There were no cases with progressive subsidence or significant changes in alignment.

Conclusions: The functional and radiological outcome after 1 year followup in unstable intertrochanteric fractures in elderly patients with uncemented bipolar arthroplasty was satisfactory.

Key Words: Elderly, Unstable intertrochanteric fracture, Uncemented bipolar arthroplasty

INTRODUCTION

Severely displaced and comminuted intertrochanteric fractures are common in elderly patients with osteoporosis. Traditionally, they have been treated by internal fixation which have often had complications of nonunion, implant failure and screw cutout.^{1,2} Bipolar arthroplasty being an alternative to internal fixation, allows for rapid rehabilitation of the elderly patient.³

Controversy regarding use of cement in arthroplasty is there. Cemented fixation has the advantage of giving immediate stability in aged patients.⁴ Cementless fixation has the distinct advantage of avoiding cardiovascular toxicity of cement which may be disastrous in the elderly.⁵

The present study aims to evaluate the functional and radiological outcome of uncemented bipolar hemiarthro-

plasty in patients over the age of 70 years with unstable intertrochanteric fractures. All patients were implanted with cylindrical corundum blasted proximal and isthmic fixing stems

METHODS

Uncemented bipolar arthroplasty using the corundum blasted revision stem (orthovasive, biorad medisys) and 22.2/28 mm femoral head with corresponding femoral cup (INDUS) was performed on 25 patients with unstable intertrochanteric fractures in patients over the age of 70 who were walking with or without a walking aid at our institution between January 2010 and December 2014. All the above patients could be followed up for 1 year and were included in our study. All patients had AO

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type A2 or A3 fractures which are associated with high rates of internal fixation failure.

The mean age of the patients was 77 (range, 70 to 90 years). There were 17 females (68%) and 8 males (32%). The mean follow-up period was 16 months (range, 12 to 20 months). The mean time from fracture to surgery was 2 days. 18 patients (72%) had multiple morbidities. (Table 1)

Operative technique

Surgery was performed by the same team in all cases under spinal anaesthesia in all cases. An uncemented corundum blasted revision femoral stem (Orthovasive, Biorad medisys) was inserted through the posterolateral approach. A bipolar femoral cup (indus) and a corresponding 22.2 or 28 mm femoral head was used. Depending on whether the abductor mechanism was in continuity, trochanteric fragment was fixed by tension band wiring.

Patient was made to sit up with legs dangling on the side and quadriceps muscle strengthening begun on day 1. All patients were started on partial weight bearing with quadrangular walker and full weight bearing within 4 days and 1 month respectively.

Functional outcome assessment

The modified Merle D'áubigne scores⁶⁾ at the last follow-up were classified into four categories; excellent, good, fair and poor. Preoperative and postoperative walking abilities were compared.

Radiological assessment

On the postoperative radiographs, proximal canal fit was deemed good if the stem filled the proximal canal more than 75% and distal fit was good if there was a gap less than 1 mm between the stem and inner cortex.^{7,8)}

The femoral stem stability was classified into fixation by bone ingrowth, stable fibrous fixation, and unstable prosthesis according to the criteria of Engh et al.^{9,10)} The changes in the alignment and subsidence of the femoral components were measured from after surgery to the last follow-up; $\geq 3^\circ$ of valgus or varus and ≥ 5 mm longitudinal change were considered significant.³⁾ The radiolucent line, bone resorption, endosteal new bone formation and osteolysis were examined in the seven zones described by Gruen et al.¹¹⁾ A radiolucent line denoted the radiolucent area around the stem surrounded by radiodense lines, and was considered present if it occupied $\geq 50\%$ of any zone.¹²⁾ Loosening of the femoral stem was defined as the appearance of a radiolucent line progressive or > 1 mm in all zones, or the presence of continuous subsidence or migration of the femoral stem.

The mean Modified Merle D'áubigne score at the last follow up was 14.5. Six (24%) patients had an excellent score, 11 (44%) patients had a good score, 6 (24%) patients had a fair score and 2 (8%) patients had a poor score.

Of the 25 patients, 8 (32%) and 17 (68%) patients could walk with and without aid before surgery respectively. Of the 17 patients, 14 could still walk without support after surgery, but of these 3 needed a walking aid. Of the 8 patients who needed a walking aid before surgery, 6 patients used the same aid after surgery and 2 patients needed to use a quadrangular walker. None of the patients were unable to walk. Overall, 20 out of 25 patients regained their preoperative walking ability. (Table 2)

All patients achieved either a proximal or isthmic fit or both. The proximal fit, the isthmic level press fit and both were seen in 7 (28%), 11 (44%) and 7 (28%) respectively. The stability of the femoral stem at the final follow up were classified according to the criteria of Engh et al. There was fixation by bone ingrowth in 15 patients (60%) and stable fibrous fixation in 10 patients (40%). There were no unstable prostheses. A radiolucent line was observed in 3 patients and mainly in Gruen zones 2 and 7; in zone 2 in 1 patient and in zone 7 in 2 patients. Endosteal new bone formation was observed in 10 patients, mainly in Gruen zones 4, 5 and 6. Bone resorption was noted in 12 patients (48%) and mostly in Gruen zones 1 and 7. None of the cases showed a change in alignment of the implant more than 3 degrees, valgus or varus. The amount of femoral stem subsidence was 1 and 2 mm in 5 and 7 patients respectively. Deep infection occurred as a postoperative complication in one patient which healed uneventfully by debridement and lavage. No heterotopic ossification was seen in any case. No intraoperative femoral fracture or death occurred during surgery. There were no dislocations or embolic episodes. There was one death due to myocardial infarction at 8 months followup in a patient with previous cardiac illness.

DISCUSSION

Elderly patients with unstable intertrochanteric fractures have severe comminution and displacement. These fractures are less amenable to open reduction and fixation often leading to fixation failure or nonunion.²⁾ The inability to mobilize early in the postoperative period often leads to postoperative complications and high mortality. Hemiarthroplasty is invariably the most effective primary treatment method for unstable intertrochanteric fractures with respect to early postoperative mobilization.^{3,4,13,14)}

In patients with poor bone quality, cemented implants have the distinct advantage of offering initial implant

stability.^{13,15,16} The high death rate in arthroplasty patients undergoing cemented fixation⁵) can be prevented by use of cementless implants. But implant migration due to lack of osteointegration, thigh pain and bone resorption as a result of increased stiffness can be a problem^{17,18}). But recent reports are encouraging in that, by promoting osteointegration of cementless implants, there has been no increase of implant failure rates, even in elderly patients with osteoporosis.¹⁷ In our study, initial press fit fixation was achieved in all patients either at the proximal canal or isthmus, and fixation by osteointegration or fibrous fixation after a 1 year follow up was observed, even though minimal subsidence was observed in few patients. This indicates the high Osteointegration rates in the diaphysis of osteoporotic elderly patients with blast coated implants. There were no incidents of stem loosening, progression of subsidence or alignment changes. Bone resorption was mainly noted in Gruen zones 1, 2 and 7, which did not produce any fracture or loosening. In elderly patients with multiple co morbidities, early ambulation within one week is essential for preventing complications. Early mobilisation is feasible only with initial press fit fixation. In a study comparing hemiarthroplasty and internal fixation, better results were seen in the hemiarthroplasty group with respect to limping and use of walking aids in patients with limited walking ability before surgery.¹⁴ The use of a cylindrical implant as in our study for isthmic or diaphyseal fixation is necessary in elderly patients with intertrochanteric fractures where proximal femoral fit is difficult to achieve. The orthovasive stem, owing to the cylindrical shape makes isthmic or diaphyseal fixation regardless of the Dorr type.¹⁹ In our study, initial press fit at the isthmus was achieved in 60% of patients in whom proximal fixation was not possible. The prevention of complications associated with bed rest such as Deep vein thrombosis and subsequent embolism, bed sores were achieved by the initial press fit fixation, the subsequent mobilisation and intensive quadriceps femoris muscle rehabilitation.

The overall functional recovery was deemed satisfactory in view of all patients walking with or without aid at final followup excepting one patient who was bedridden with a cerebrovascular accident.

Cemented fixation is associated with the highest mortality rate in arthroplasty patients²⁰), which is a concern in elderly patients. In our study, uncemented fixation in unstable intertrochanteric fractures using a cylindrical implant resulted in satisfactory results due to avoidance of cement related complications and early mobilisation due to achievement of initial on table press fit stability.

CONCLUSION

The short term results of uncemented bipolar hemiarthroplasty with a cylindrical stem in elderly patients with

unstable intertrochanteric fractures yielded satisfactory results. Further studies with long term follow up should be done to determine long term functional outcome.

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CONFLICTS OF INTEREST

The authors declare that there are no conflicts of interest

ETHICAL CLEARANCE

Ethical clearance for this study has been obtained from the Highland Hospital Institutional and Ethics committee

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Table 1: Patients demographics

	Characteristics	Values
No. of hips		25
Gender	Male	8
	Female	17
Age	70-79 yrs	14
	80-89 yrs	9
	90-95 yrs	2
Concomitant disease	Diabetes mellitus	8
	Hypertension	14
	Lung disease	2
	Cerebrovascular disease	2
	None	3

Table 2: Comparison of preoperative and postoperative walking ability

	Preoperative	Postoperative
Without support	17	14
With support	8	11
Unable to walk	0	0
Total	25	25

Table 3: Radiologic findings around the femoral stem

	Gruen zone						
	1	2	3	4	5	6	7
Radiolucent line	0	1	0	0	0	0	2
Bone resorption	6	0	0	0	0	0	6
Endosteal new bone formation	0	0	0	3	4	3	0

Values are presented as number