



FUNCTIONAL OUTCOMES OF BIPOLAR HEMIARTHROPLASTY IN UNSTABLE INTERTROCHANTERIC FRACTURES IN ELDERLY PATIENTS

Orthopaedics

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ABSTRACT

Background: Intertrochanteric fractures account for about 45% to 50% of all hip joint fractures in elderly patients. Conservative treatment carries the disadvantages of non-union and malunion, which in turn will increase the morbidity and mortality. Currently hemiarthroplasty and internal fixation are the two considerable surgical options for fixation for hip fractures. The purpose of this study was primarily to study functional recovery in patients with unstable intertrochanteric fractures treated with bipolar hemiarthroplasty while studying other relevant intraoperative and postoperative parameters of patients in these groups. **Methods:** 16 patients underwent bipolar hemiarthroplasty for unstable intertrochanteric femur fracture. Patients were evaluated in post-operative period for mobilization and full weight bearing. Harris hip score was used for functional evaluation on follow up visit for a period of 12 months. **Results:** In our study the mean age (years) was 73.31 ± 7.79 . Seven (43.8%) of the participants had AO Type: A2.2 fracture, four patients (25.0%) had AO Type: A2.3, two (12.5%) of the participants had AO Type: A3.1. and three of them (18.8%) had AO Type: A3.3 fracture. The mean (SD) of Surgical Time (Minutes) was 111.50. The mean (SD) of Blood Loss (ml) was 491.25. The mean (SD) of Full Weight Bearing Day was 3.81. During the final follow-up Excellent to fair results were obtained in 13 (81.25 %) cases and in 3 (18.75%) cases, results were poor. **Conclusions:** Bipolar hemiarthroplasty is suitable for intertrochanteric fractures in elderly patients who have mechanically weak and porotic bones. Bipolar hemiarthroplasty has fair functional outcomes in unstable intertrochanteric femur fractures.

KEYWORDS

Intertrochanteric fracture, bipolar hemi-arthroplasty, proximal femur fracture, hip, Harris hip score

INTRODUCTION

Intertrochanteric fractures account for about 45% to 50% of all hip joint fractures in elderly patients [1]. Fractures of hip joint are considered as important health problem in elderly population with considerable socioeconomic burden due to longer hospitalization, loss of independence and increased morbidity and mortality [2]. Most of the intertrochanteric fractures result from a low energy fall and trauma to the proximal thigh region. More common in women than men. The fractures are usually caused by fall directly on greater trochanter like fall due to slip, fall from stairs / height or indirect twisting injury. Usually, the patient presents with pain in hip on the affected side and inability to stand. On examination, there will be shortening of affected lower limb and external rotation. [3]. (Figure-1)



Figure-1: Clinical photograph showing deformity [shortened and externally rotated] left lower limb in a patient with inter trochanteric fracture.

Conservative treatment with traction and prolonged immobilization lands up with many complications like bed sores, pulmonary complications, urinary tract infections, DVT and often fatality. Surgical options such as, hemiarthroplasty and internal fixation have allowed early postoperative mobilization while preventing postoperative complications. Patients can return to their pre injury

level of activity much earlier with either of these modalities [4]. Rate of failure with internal fixation, with dynamic hip screws has been found to be high, especially in osteoporotic bones. Revision osteosynthesis is technically demanding and it leads to complication [5]. Bipolar hemiarthroplasty is usually deemed superior to internal fixation in elderly patients with intertrochanteric fracture due to early mobilization and consequently lesser postoperative complications related to prolonged confinement in bed.

METHODS

The study was conducted in Central Institute of Orthopedics, VMMC and Safdarjung Hospital, New Delhi from October 2018 to March 2020. Clearance was taken from the Institutional Ethics Committee prior to start of the study. It was a prospective interventional study. The patients were selected on the basis of inclusion such as- age > 60 years, patients with traumatic unstable intertrochanteric fracture and exclusion criteria like – fractures associated with pathology, poly-trauma and open injury. Finally, the results were analyzed using Statistical Package for Social Sciences (SPSS) version 21.0. The demographics of the group [age, sex, mode of injury, AO type, surgical time, blood loss, post-op mobilization and full weight bearing, Harris hip score] were analyzed individually.

Sample size was calculated to be sixteen as per the study by Kiran Kumar et al. [6]. Lateral and AP radiographs of the affected part taken with bilateral hip joint and knee joint of fracture side. [Figure – 2]



Figure – 2: X-ray showing intertrochanteric fracture left femur [AO Type A2.3]

The study participants were operated under spinal anesthesia. Patient were placed in lateral decubitus position on OT table, painting and draping was done. Greater trochanter (GT), anterior and posterior borders of femur, anterior bow of femur were marked out. Incision was taken posterior to midline of GT, down shaft of femur, curved posterior to the edge of GT aimed towards PSIS, about 10-15 cm (1/3rd proximal to GT and 2/3rd distal to GT). Fascia lata was exposed using two self-retainers and incised. Gluteus Maximus and short external rotators were dissected. Short external rotators tied with Ethibond 5, capsule released, hip dislocated by flexion, adduction and internal rotation. Preliminary neck cut made 0.5 -1 cm proximal to GT, head removed using corkscrew. Implant size chosen using native femoral head. Implant trial taken by reduction and external rotation. Stability, range of motion and leg lengths checked out. Hip dislocated, trial head removed, cement restrictor placed about 15cm down from neck cut (varies with length of stem used). Canal clean dried with Epinephrine-soaked sponge, cement inserted with pressurized gun. Stem placed in proper ante-version and hold till cement gets hard. head and neck size trial taken. Implant position confirmed, checked for final ante version of stem, impingement, leg lengths and rotation [Fig- 3].

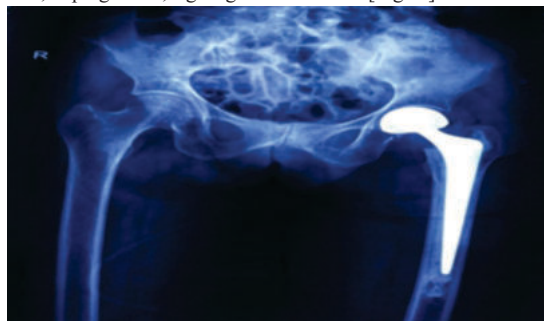


Figure – 3: Immediate post – op x- ray showing cemented bipolar hemi- arthroplasty implant in situ.

Irrigated, hemostasis achieved and drain placed. Deep and superficial closures are done and dressing done.

During post-operative period, operated limbs were kept abducted using pillow. Patient's vitals were monitored for the first 24 hours. Blood transfusion was given in demanding situations. Drain was kept insitu up to 48 hours. Patients were made to sit up on the second day. Partial weight bearing was allowed from the third post-operative day onwards and the patient was mobilized with the assistance of a walker. Full weight bearing was allowed on forth post – op day. Suture removal was done on the 12 to 15 postoperative days. The patients were assessed for any shortening or deformities. Patients were followed up at an interval of 6 weeks, 3 months, 6months and 12 months. Functional scores were recorded using Harris Hip Score at each visit. Radiological follow up done for signs of loosening, protrusion, dislocation of implant.

RESULTS

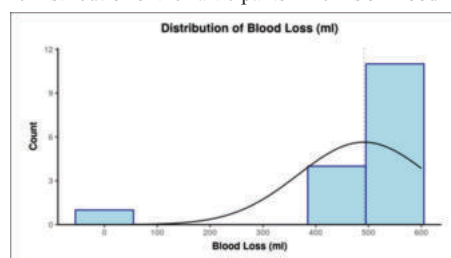
Our study included sixteen patients, 7 (43.8%) of them had AO Type: A2.2. injury, 4 (25%) had AO Type: A2.3, 2 (12.5%) had AO Type: A3.1 and 3 (18.8%) had AO Type: A3.3. injury. Most participants were females (9/16) with preponderance towards the right side (10/16). The mode of injury was fall due to slip in 43.8% of the patients, fall from stairs in 43.8% and fall from height in 12.5% [Table-I].

Table I: Distribution of the Participants in Terms of Mode of Injury (n = 16)

Mode Of Injury	Frequency	Percentage
Fall Due to Slip	9	56.25%
Fall From Height	5	31.25%
Road traffic accident	2	12.5%
Total	16	100.0%

The mean (SD) of Surgical Time (Minutes) was 111.50 (8.98). The surgical time ranged from 98 - 128. There was no significant difference between different fracture patterns (AO type) in terms of surgical time. With the increased surgical time there was delay in the post op full weight bearing. The mean (SD) of Full Weight Bearing Day was 3.81. There was no significant difference between the groups in terms of Post-Op Mobilization Day. The mean (SD) of Blood Loss (ml) was 491.25 (124.41). The blood loss ranged from 50 – 600 [Table-II].

Table II: Distribution of the Participants in Terms of Blood Loss (ml)



During the final follow-up, excellent to fair results were obtained in 13 (81.25 %) cases and in 3 (18.75%) cases, the results were poor. The average Harris hip score was 77. The Change in Harris Hip Score ranged from 61 - 82. Post-operatively, 2 patients (12.5%) had a shortening of less than 2 cm but had satisfactory subjective outcome and one patient had a lengthening of 1.5cm (6.25%).

Fixed external rotation of less than 20 degrees were seen among two patients (12.5%), three patients (18.75%) had flexion deformities of less than 15 degrees. Complication like peri- prosthetic fracture, implant loosening was not reported. A majority of the study population had a pain free mobile hip with a full range of flexion, abduction and adequate amount of rotations.

DISCUSSION

Hemi-arthroplasty has been used for unstable intertrochanteric fractures since 1971 however less frequently as compared to femoral neck fractures [7]. During those days, this was used as a salvage procedure for failed pinning or other complications. Tronzo claimed to be the first to use long, straight-stemmed prosthesis for the primary treatment of intertrochanteric fractures [8]. Rosenfeld, Schwartz, and Alter reported good results with the use of the Leinbach prosthesis [9]. Since then there are multiple studies showing good results using this technique. Bipolar hemi-arthroplasty has a number of added advantages owing to its dual articulation, which was proposed to reduce the risk of wear and acetabula protrusion.

The importance of early ambulation after surgery has been well documented. Prolonged bed rest is associated with numerous incidences of complications including decubitus ulcers, pulmonary infections, deep vein thrombosis and pulmonary embolism.

Although, many operative techniques are available for the treatment of unstable intertrochanteric femur fracture. The techniques are not very easy [10-15]. The poor mechanical property of weak and osteoporotic bone in elderly does not allow for unrestricted weight bearing with internal fixation devices like dynamic hip screw and failure rates between 5% and 12% have been reported [16-17]. There will be collapse with migration of femoral neck into varus leading to shortening and limping. Implant failure causing pain and disability is also another complication of internal fixation in elderly patients.

Although union rates are good with well reduced, stable fractures that are treated with ideal implant placement higher failure rates have been observed in unstable fractures, comminuted fractures, sub-optimal fracture fixation or poor bone quality as seen in elderly patients [18-19].

In our study, the most common associated medical problem was hypertension among nine cases (56.25%), followed by anaemia in 5 cases (31.25%) and diabetes in 3 cases (18.75%). Pre-operatively 3 patients (18.75%) had blood transfusion and 4 patients (25%) had blood transfusion in recovery time, which were uneventful. Greater trochanter Cerclage wiring was done in 5 cases [Figure – 4].



Figure – 4: Post-op x- ray showing greater trochanter fragment fixation using wire encirclement.

There was serous discharge from surgical site in 2 patients. They responded well to antibiotics medication. In our study, 4 patients had excellent results, 7 patients had good results, 2 patients had fair results, and 3 patients had poor result; other authors have reported variable success after fixation of intertrochanteric fracture with bipolar hemiarthroplasty [Table III].

Table III: Comparison of studies of Intertrochanteric fracture fixation using bipolar hemiarthroplasty

	No of cases	Operative time [min]	Full weight bearing day	Mean blood loss [ml]	Average HHS
Kumar Gn K et al.	20	116±14 minutes	5.4th day	-	75
Sancheti Kh et al.	37	71 min	3.2 days	350 ml	84.8±9.72
Singh S et al.	25	-	5 days	-	78.86±8.13
Gadre N et al. [20]	50	101.86 mins	4 days	-	67-93
Tajima K et al. [21]	60	66.1±25.9 minutes	-	207±145 mL	-
Rawate P et al. [22]	32	82.53 min	5.1 days	409.37 ml	-
Our study	16	111.50	3.81	491.25 ml	77

CONCLUSION

Our study suggests that bipolar hemiarthroplasty is suitable for unstable intertrochanteric fractures in elderly patients, as it has fair functional outcomes, shorter duration of surgery and decreased blood loss helps in better outcome with bipolar hemi arthroplasty. Early post-op mobilization and full weight bearing are possible as there is no need for union as required in other modes of fixation. Early post op mobilization of the patient has added advantages of reducing complications of prolonged immobilization and hospitalization in elderly patients.

Limitations of the study are small sample size, selection of suitable patients, surgical expertisation. Hence we recommend confirmation of results by future prospective studies with large cohort.

REFERENCES

- Mansukhani SA, Tuteja SV, Kasodekar VB, Mukhi SR. A Comparative study of the Dynamic Hip Screw, the Cemented Bipolar Hemiarthroplasty and the Proximal Femoral Nail for the Treatment of Unstable Intertrochanteric Fractures. *J Clin Diag Res*. 2017;11:14-9.
- Yoo J, Ha Y, Lim J, Kang H, Yoon B, Kim H. Early Rehabilitation in Elderly after Arthroplasty versus Internal Fixation for Unstable Intertrochanteric Fractures of Femur: Systematic Review and Meta-Analysis. *Journal of Korean Medical Science*. 2017;32:858-67.
- Blom A, Warwick D, Whitehouse M. APLEY & SOLOMON'S System of Orthopaedics and Trauma. 10th ed. Boca Raton: CRC Press Taylor & Francis group; 2018: 880-920.
- Shen J, Wang DL, Chen GX, Li L, Wei MX, Cai XQ, et al. Bipolar hemiarthroplasty compared with internal fixation for unstable intertrochanteric fractures in elderly patients. *J Orthop Sci*. 2012;17:722-9.
- Bucholz R, MacQueen M, Rockwood C, Green D. Rockwood and Green's fractures in adults. 8th ed. Philadelphia, Pa., [etc.]: Wolters Kluwer/Lippincott Williams & Wilkins; 2010.
- Kiran Kumar GN, Meena S, Kumar V, Manjunath S, MK VR. Bipolar hemiarthroplasty in unstable intertrochanteric fractures in elderly: a prospective study. *Journal of clinical and diagnostic research: JCDR*. 2013;7:1669.
- Stern MB, Angerman A. Comminuted intertrochanteric fractures treated with a Leinbach prosthesis. *Clin Orthop Relat Res*. 1987;218:75-80.
- Harwin SF, Stern RE, Kulick RG. Primary BatemanLeinbach Bipolar prosthetic replacement of the hip in the treatment of unstable intertrochanteric fractures in the elderly. *Orthopedics*. 1990;13:1131-6.
- Rosenfeld RT, Schwartz DR, Alter AH. Prosthetic replacements for trochanteric fractures of the femur. *J Bone Joint Surg Am*. 1973;55:420.
- Meganath P, Ibrahim M, Nazneen K. Cemented modular bipolar hemiarthroplasty of hip in treatment of unstable intertrochanteric fractures in elderly patients. *Int. j. orthop. Sci*. 2017;3:660-4.
- Sancheti KH, Sancheti PK, Shyam AK, Patil S, Dhariwal Q, Joshi R. Primary hemiarthroplasty for unstable osteoporotic intertrochanteric fractures in the elderly: A retrospective case series. *Indian J Orthop*. 2010;44:428-34.
- Singh S, Shrivastava C, Kumar S. Hemi replacement arthroplasty for unstable intertrochanteric fractures of femur. *J. clin. diagn. res*. 2014;8:LC01.
- Tornetta III P, Ricci W, F. Ostrum R, M. McQueen M, D. McKee M, M. Court- Brown C. Rockwood and Green's Fractures in Adults. 9th ed. Philadelphia: Wolters Kluwer; 2020.
- Elmorsy A, Saied M, Zaied M, Hafez M. Primary Bipolar Arthroplasty in Unstable Intertrochanteric Fractures in Elderly. *Open Orthop J*. 2012;02:13-7.
- Karthik K, Natarajan M. Unstable trochanteric fractures in elderly osteoporotic patients: role of primary hemiarthroplasty. *Orthopaedic Surgery*. 2012;4:89-93.
- Sahoo PK, Dash SK, Panigrahi R et. al. Cemented bipolar hemiarthroplasty versus proximal femoral nails: a prospective comparative outcome analysis in unstable elderly intertrochanteric fractures. *Int J Health Sci Res*. 2015;5:99-106.
- Haentjens P, Casteleyn PP, De HB, Handelberg F, Opdecam P. Treatment of unstable intertrochanteric and subtrochanteric fractures in elderly patients. Primary bipolar

- arthroplasty compared with internal fixation. *J Bone Joint Surg Am*. 1989;71:1214-25.
- Cankaya D, Ozkurt B, Tabak AY. Cemented calcar replacement versus cementless hemiarthroplasty for unstable intertrochanteric femur fractures in elderly. *Turkish Journal of Trauma and Emergency Surgery*. 2013;19:548-53.
- Kanchan S, Raj V, Agarwal D, R. Primary arthroplasty as an option for surgical treatment of unstable intertrochanteric fracture femur in elderly patients: a retrospective study. *Int J Res Orthop*. 2019;5:237.
- Gadre N, Kalambe HV, Das S. Cemented bipolar hemiarthroplasty in the management of comminuted intertrochanteric fracture of femur in elderly. *National Journal of Clinical Orthopaedics*. 2018;2(1):
- Tajima K, Yoshida M, Murakami D, Nishimura T, Hirakawa A, Uenishi N, Iwata M. Primary bipolar hemiarthroplasty as a treatment option for unstable intertrochanteric fractures. *Fujita medical journal*. 2020:2019-022.
- Rawate P, Kale AR, Sonawane CS. Functional outcome of cemented bipolar hemiarthroplasty for unstable intertrochanteric fractures of femur in elderly: an Indian perspective. *Int. J. Sci. Res*. 2017;5(5):48-53.