



## EVALUATION OF CALCAR GRAFTING IN HIP HEMIARTHROPLASTY FOR COMMUNATED INTER-TROCHANTERIC FEMUR FRACTURES IN ELDERLY

<b>Dr. Digamber Peepra</b>	Associate Professor, Dept. Of Orthopaedics, NSCB Medical College, Jabalpur, Madhya Pradesh
<b>Dr. Sparsh Naik</b>	Assistant Professor, Dept. Of Orthopaedics, NSCB Medical College, Jabalpur, Madhya Pradesh.
<b>Dr. H S Varma</b>	Professor And Head, Dept. Of Orthopaedics, NSCB Medical College, Jabalpur, Madhya Pradesh.
<b>Dr. Darwin Kumar Thakur*</b>	PG Resident, Dept. Of Orthopaedics, NSCB Medical College, Jabalpur, Madhya Pradesh. *Corresponding Author
<b>Dr. Devesh Kumar</b>	PG Resident, Dept. Of Orthopaedics, Nscb Medical College, Jabalpur, Madhya Pradesh.
<b>Dr. Rajeev Kumar Singh</b>	PG Resident, Dept. Of Orthopaedics, Nscb Medical College, Jabalpur, Madhya Pradesh.

### ABSTRACT

**Introduction:** Treating intertrochanteric fractures in elderly with osteosynthesis is challenging, and is attributed to multiple factors like poor bone stock, difficult fracture pattern, and non orthopaedic complications arising due to periods of recumbency associated with internal fixation. Hip replacement has come forward as a viable option for treating these cases, but it has its own share of difficulties, such as limb length discrepancy, implant subsidence, long term implant stability and a greater cost. This study aimed at evaluating the utility if calcar strut grafting in dealing with these issues.

**Material And Methods:** A total of 30 patients, with age more than 60 years, with comminuted intertrochanteric fractures, with postero-medial bone deficiency, were treated with hemiarthroplasty, with augmentation with calcar strut grafting. The graft was prepared from the calcar region of the head and neck part of the femur and placed between the deficient medial femoral cortex and medial edge of the implant.

**Result:** In 24 out of the 30 patients, the graft got incorporated at its place without displacement. Shortening was seen in 4 patients, of which 2 reported a shortening of more than 2 centimetres.

**Conclusion:** We can conclude that hemiarthroplasty has come forward as a viable and safe treatment modality for management of comminuted inter-trochanteric fractures in elderly patients. Calcar grafting as described here is useful in minimizing the subsidence of the implant and in maintaining the limb length, it facilitates early rehabilitation and quicker return normal activities

### KEYWORDS : osteoporosis, hip fractures, arthroplasty

#### INTRODUCTION:

Inter-trochanteric femur fractures comprise approximately half of all hip fractures caused by a low-energy trauma mechanism such as a fall from standing height. Various surgical treatment methods and implants have been employed for the treatment of comminuted inter-trochanteric hip fractures such as fixed angle plates, dynamic hip screws, proximal femoral nails, and prosthetic replacement. When fracture fixation is chosen, the primary stability of the fracture and fixation system is crucial for early mobilization. Over the years osteosynthesis has been indicated as the preferable mode of treatment for stable inter-trochanteric fractures and has shown promising results but high rate of mortality, complications due to recumbency in the initial post operative period render this option difficult in comminuted inter-trochanteric fracture cases<sup>1,2,3</sup> in elderly.

Internal fixation in these cases usually involves prolonged bed rest or limited ambulation, to prevent implant failure secondary to osteoporosis. This might result in higher chances of complications like pulmonary embolism, deep vein thrombosis, pneumonia, and bedsore. Also, inter-trochanteric fractures with severe displacement and comminution are common in elderly patients. These patients have a poor bone quality and the fractures are often associated with complications such as non union, peri-implant fractures and femoral head perforation. Excessive collapse, loss of fixation, and cut-out of the lag screw, which result in poor function, remain problems which are associated with the internal fixation of comminuted inter-trochanteric fractures in elderly patients with osteoporotic bones<sup>4</sup>. Studies have shown that early weight-bearing was the major factor responsible for decreasing post-operative complications. To allow an earlier post-operative weight-bearing and a rapid rehabilitation some surgeons have recommended prosthetic replacements for the treatment of comminuted inter-trochanteric fractures in elderly.

In many inter trochanteric fractures, there is deficient medial calcar support. Therefore prosthesis with long neck and shaft, or calcar

bearing prosthesis (which may not be readily available off the shelf and are expensive) should be used. One of the options is to fill the void with bone cement around the area of the calcar. But cement has poor tolerance to bending and shear forces. Some problems of prosthetic replacement are achieving limb length equalization and maintaining adequate soft tissue tension in abductors to prevent dislocation. At the time of revision procedure (if required later), there will be loss of bone stock in the proximal femur due to use of metallic prosthesis or bone cement.

Therefore a simple method of using bone from the head and neck portion of the femur as a calcar graft can be performed. This calcar graft fills the commonly occurring postero-medial void; prevents placement of the prosthesis in varus and retroversion and serves as a guide to limb length equalization and will overcome the above discussed problems.

#### MATERIALS AND METHODS

The aim of this study was to analyze the outcome of calcar femoral grafting in hemiarthroplasty of the hip for comminuted inter trochanteric fractures with deficient medial wall. We included patients with age more than 60 years in our study, with comminuted intertrochanteric fractures, with deficient fractured medial wall. A total of 30 patients were included in the study.

#### SURGICAL TECHNIQUE:-

The patient was taken on the operating table in lateral position. All the surgeries were performed with standard Southern Moore's<sup>5</sup> approach. After the skin incision, the underlying fascia was incised in line with the skin incision. The fibres of the gluteus maximus were bluntly separated in the direction of the fibres. The short rotators of the hip joint were visualized, tagged using vicryl sutures and detached from their trochanteric attachments.

Femoral head with remaining part of neck retrieved out. A circular

graft was fashioned from the neck and head of the bone fragment to fit around the broach and replace the calcar. The calcar autograft was compressed between collar of the femoral stem and proximal femur as the stem was fully inserted. Graft with a length of 2-2.5 cm and width of 1.5 cm was harvested from the calcar region of the proximal fragment. The proximal limit of the graft was the junction of calcar portion of the neck with the head. Prosthesis was inserted directly after femoral canal preparation in these cases. An osteopenic femur had a wide medullary canal, making excessive reaming unnecessary. If lesser trochanter was fractured, it was reattached in its anatomical position with steel wire. If greater trochanter was fractured, another stainless steel wire was placed around proximal femur, or tension band wiring of greater trochanter was done<sup>12</sup>. In cases where cementing was done, appropriate canal preparation was done and adequate pre-cementing precautions were taken to minimize the risks associated with it.

Once the prosthesis was placed in situ, the head was reduced. Thorough wash with normal saline was given. The rotators were repaired. The wound was closed in layers over a suction drain. The patients were kept under antibiotic coverage perioperatively.



Fig.1 Graft Harvesting From The Head And Neck Bone Fragment



Fig.2 Pre-op And Post-op Radiograph

## RESULTS:

In a period of 1.5 year, 30 patients were operated in our department of orthopaedics for comminuted intertrochanteric fractures, and were treated with hemiarthroplasty with calcar graft reconstruction. The mean age of our cases at time of surgery which was 76.2 years, with age group between 67-85years. The outcome was evaluated by Harris hip score. Follow up was done according to set proforma. At final follow up, the mean Harris hip score at 6 months post operative was 78.42±6.51. The p-value for the change from first to last follow-up was 0.001, which was statistically significant. In 24 patients, it was seen that the graft consolidated over a period of time, while there was dislodgement of graft in 3 patients. 3 patients were lost during the period of followup.

## DISCUSSION

In the given prospective study, 30 elderly patients of comminuted

inter-trochanteric fracture attending Department of Orthopaedics, Traumatology and Rehabilitation N.S.C.B Medical College and Hospital, Jabalpur, were included. All the patients were managed using calcar femoral grafting used in hemiarthroplasty used in unstable intertrochanteric fractures.

The mean age of our cases at time of surgery this was 76.2 years, with age group between 67-85 years. This was comparative to studies by Geiger et al<sup>10</sup>, where it was 80.5 years, Sinno k et al<sup>7</sup> where it was 78 years, Kiran Kumar et al<sup>5</sup> where it was 74.2 years. In our study, of the entire sample of 30 patients, 57% of the participants, i.e 17, were male. The rest of the 13 participants, 43%, were females. Our results were comparable with other similar studies. In a similar study by Wonsik Choy et al<sup>3</sup>, had 20% males and 80% females. Sinno K et al<sup>7</sup>, in their study had 29% males and 71% females. 12 patients (40%) suffered injuries to their left hip, while 18 of the participants (60%) presented with involvement of the right hip 56.7% (n=17) of the patients had associated hypertension. Diabetes mellitus was found to be present in 20% (n=6), 10%(n=3) had bronchial asthma and 3.3%(n=1) had a history of cerebro-vascular accident. 8 patients (26.7%) had no associated comorbidity. 60%(n=18) sustained their injury due to fall on ground, 33.3%(n=10) due to road traffic accidents, and 3.3% (n=1) each due to assault and bull horn injury. Ebrahim Ghayem Hassankhani et al<sup>11</sup> 2014, noted in their study that the average duration of surgery was 121.8±25.3 minutes. Sanjay K Gupta et al<sup>9</sup>, in their study observed that the mean duration of surgery was 100 minutes. Sinno K et al<sup>7</sup>, in their study observed that the mean operative time was 112±29 minutes. Similar findings were found in our study. The mean duration of surgery in our cases was 118 minutes.

Sanjay K Gupta et al<sup>9</sup> 2014, average blood loss in the surgery was found to be 450ml. Atul Patil et al<sup>10</sup> 2013, stated that their mean blood loss during hemiarthroplasty was 321ml. Sancheti et al<sup>10</sup> 2010, average intraoperative blood loss of 350ml. Comparable observations were made in our study. In our study, the average blood loss was 330.3ml. 10% (n=3) of the cases had intra-operative blood loss less than 250ml, while 90% (n=27) had an intra-operative blood loss of more than 250ml.

The advantages of building posteromedial defect with calcar femoral graft include – less discrepancy in limb length; prevents varus tilt/collapse of stem; normal host bone preservation, which may be useful in revision surgery. Since it permits the use of standard endoprosthesis, it is less expensive than calcar replacement long stem prosthesis and entails less bone resection from the proximal femur. We used standard endoprosthesis in all our patients and implant subsidence was not a major problem in our series due to the presence of the intramedullary calcar graft.

Use of cemented implants has the benefit of achieving initial implant stability and rapid rehabilitation in patients with unstable fracture and poor bone quality. Uncemented implants can be used in less osteoporotic bones and also avoid complications related to cementing. In our study cemented implants were used in 70% (n=21) of the cases, where as uncemented implant was used 30% of the cases (n=9). These were similar to Ebrahim Ghayem Hassan khani et al<sup>11</sup>, who treated 40 patients with hemiarthroplasty, out of which in 36 cases cemented implants were used and in 4 cementless implant were used. Complications included limp in most cases, single case of hip dislocation, two case of superficial wound infection. Shortening was seen in a total of 4 subjects. 2 of these showed a shortening of less than 2cm, whereas 2 subjects showed a shortening of more than 2cm.

The mean harris hip score in the first post-op week was 33.23±3.3, this gradually increased to 51.63±3.97 at 6 weeks, and 72.22±5.68 at 3 months. At the final followup at 6 months the mean harris hip score was 78.42±6.51. The p-value for the change from first to last follow-up was 0.001, which was significant. Out of 30 patients, the outcome of 1 patients was graded as excellent, 18 as good, 5 as fair and 3 as poor as per Harris hip score. Twenty one patients were walking independently, and the remaining 6 had to use a cane. There were no heterotopic ossifications, peri-prosthetic fractures or protrusion acetabuli.

In our study the mean duration for starting full weight bearing in the patients was 10.4 days. This was because we used both cemented and cementless implants in the study. Individually, in the cemented group, the average duration to full weight bearing as tolerated was 6.2 days, and for the uncemented group was 31.6 days. This was comparable to the results in the other studies. Praful Rawate et al<sup>5</sup>, 2017, in their

study noted that average time for gaining full weight bearing was 5.1 days. **Sancheti et al<sup>4</sup>, 2010** in their study on primary hemiarthroplasty in unstable osteoporotic intertrochanteric fractures, noted that the mean time for full weight bearing was 4.2 days.

#### CONCLUSION:

We can conclude that hemiarthroplasty has come forward as a viable and safe treatment modality for management of unstable intertrochanteric fractures in elderly patients. Calcar grafting as described here is useful in minimizing the subsidence of the implant and in maintaining the limb length. Also, the use of this grafting technique, there is lesser need for use of any special implants, and simple bipolar prosthesis can suffice. Hence the procedure becomes cost effective as well. It facilitates early rehabilitation and quicker return to normal activities, all the while protecting the patient from complications which have been known to occur in patients treated with other modalities for such fractures. A longer follow up with greater number of cases is recommended to evaluate the long term efficacy of the cases.

#### REFERENCES :

1. Adams CI, Robinson CM, Court-Brown CM, McQueenMM. Prospective randomized controlled trial of an intramedullary nail versus dynamic screw and plate for intertrochanteric fractures of the femur. *J Orthop Trauma*.2001;15(6):394-400.
2. Haentjens P, Casteleyn PP, De Boeck H, Handelberg F, OpdecamP. Treatment of unstable intertrochanteric and subtrochanteric fractures in elderly patients: primary bipolar arthroplasty compared with internal fixation. *J Bone Joint Surg Am*. 1989;71(8):1214-25
3. Choy WS, Ahn JH, Ko JH, Kam BS, Lee DH. Cementless bipolar hemiarthroplasty for unstable intertrochanteric fractures in elderly patients. *ClinOrthop Surg*. 2010;2(4):221-6.
4. KH Sancheti, PK Sancheti, AK Shyam, S Patil, Q Dhariwal, and R Joshi, Primary hemiarthroplasty for unstable osteoporotic intertrochantericfractures in the elderly: A retrospective case series
5. Praful Rawate, Amit R Kale, Chandrashekhar S Sonawane, Functional Outcome of Cemented Bipolar Hemiarthroplasty for Unstable Intertrochanteric Fractures of Femur in Elderly: An Indian Perspective, *International Journal of Scientific Study | August 2017 | Vol 5 | Issue 5*, DOI: 10.17354/ijss/2017/391
6. Kumar GN K, Meena S, Kumar N V, S M, Raj MK V.Bipolar Hemiarthroplasty in Unstable Intertrochanteric Fractures in Elderly: A Prospective Study [Internet].2013 August [Cited November6, 2020];7(8):1669-1671. Available from:[http://www.jcdr.net/back\\_issues.asp?issn=0973-709x&year=2013&month= August&volume=7 &issue=8&page=1669&id=3228](http://www.jcdr.net/back_issues.asp?issn=0973-709x&year=2013&month=August&volume=7&issue=8&page=1669&id=3228)
7. Sinno K, Sakr M, Girard J, Khatib H. The effectiveness of primary bipolar arthroplasty in treatment of unstable intertrochanteric fractures in elderly patients. *North Am J Med Sci* 2010; 2: 561-568.
8. Sidhu, Amarjit & Singh, Ajay Pal & Singh, Arun & Singh, Sukhraj. (2009). Total hip replacement as primary treatment of unstable intertrochanteric fractures in elderly patients. *International orthopaedics*. 34. 789-92. 10.1007/s00264-009-0826-x
9. Sanjay K. Gupta, V. P. Pathania, Maneesh Sharma. "Primary Modular Bipolar Hemiarthroplasty for Unstable Osteoporotic Intertrochanteric Fractures in Elderly". *Journal of Evolution of Medical and Dental Sciences* 2014; Vol. 3, Issue 12, March 24; Page: 3148-3153, DOI: 10.14260/jemds/2014/2258.
10. Atul Patil, Dr Muqtadeer Ansari, Dr Aditya Pathak, Dr A B Goregaonkar, Dr C J Thakker. *OSR Journal of Dental and Medical Sciences (IOSRJDMS)* e-ISSN: 2279-0853, p-ISSN: 2279-0861. Volume 9, Issue 4 (Sep.- Oct. 2013), PP 40-47.
11. Hassankhani EG, Omid-Kashani F, Hajitaghi H, Hassankhani GG. How to Treat the Complex Unstable Intertrochanteric Fractures in Elderly Patients DHS or Arthroplasty. *The Archives of Bone and Joint Surgery* 2014 Sep;2(3):174-179