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Cemented Modular Bipolar Hemiarthroplasty versus Internal Fixation for Unstable Intertrochanteric Femur Fracture in Osteoporotic Elderly Patients

Orthopaedic

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ABSTRACT

Background: Intertrochanteric (IT) fractures are common in elderly & frequently compounded by osteoporosis & comminution at fracture site. Hence hemiarthroplasty may offer prognostic advantages over internal fixation in management.
Objective: to analyze the role of primary hemi-arthroplasty in cases of unstable osteoporotic IT femur fractures in elderly and its comparison with proximal femur nail.
Methodology: 35 elderly cases of unstable IT fracture were enrolled. 17 patients were managed with hemi-arthroplasty and 18 were managed with PFN. 4 participants were lost to follow up. Remaining 31 patients were followed up for average of 8 months and evaluated for intraoperative/postoperative parameters.
Observations: Mean HHS at 6 weeks for prosthesis and fixation group were 84.3 and 74.8; and at 6 months were 84.5 and 74.8 respectively.
Conclusion: cemented modular hemiarthroplasty is a viable option to treat IT fractures & may be considered in elderly patients of osteoporotic unstable inter trochanteric fractures.

KEYWORDS:

Intertrochanteric Fracture, Hemiarthroplasty, Internal Fixation

INTRODUCTION:

Hip fractures are common in elderly. Intertrochanteric fractures account for half of all hip fractures in elderly. These were broadly divided into stable and unstable fractures by Evans *(1)*. Unstable intertrochanteric fracture account for approximately 50 to 60 % of all inter-trochanteric Fractures *(1)*. The goal of management of these fractures is to restore mobility, safely and efficiently while minimizing risk of medical complications and technical failure. They are notoriously tricky from management point of view. Ideal treatment method is still controversial because of the poor quality of bone mass, comorbid disorders, and difficulty in rehabilitation of these patients. Osteoporosis & comminution at the fracture site are particularly worrisome factors while contemplating internal fixation *(2)*. Hence, in search of better alternative, hemi-arthroplasty is being propagated.

The purpose of this study is to analyze the role of primary hemi-arthroplasty in cases of unstable osteoporotic intertrochanteric femur fractures in elderly and its comparison with proximal femur nail.

MATERIALS & METHODS:

Study Design- Prospective comparative study
Study Duration- 2 years (January 2015- December 2016)
Study Setting- Department of Orthopaedics of a tertiary care government hospital

Inclusion criteria-

- Intertrochanteric fractures unstable type
- (AO/OTA (3) types- A 2.2 and A 2.3)
- Singh's Index (4)- Grades I, II, III & IV
- Above 70 years

Exclusion criteria-

- Patients who are non-ambulatory before surgery.
- Comorbid psychiatric disorder.
- Associated fractures which might affect the functional outcome
- History of osteoarthritis in hip joint.
- Pathological fractures

Instruments used-

- Internal Fixation: Standard proximal femur nail
- Hemiarthroplasty: Collared modular bipolar prosthesis

35 cases of unstable IT fracture with osteoporotic bone were included in our study as per admission sequence & mentioned selection criteria and randomised them in to 2 groups using alternative method of randomisation.

Groups created:
Group 1: Patients managed with cemented modular bipolar hemiarthrolasty
Group2: Patients managed with PFN (proximal femoral nail)

17 patients were managed with hemi-arthroplasty and 18 were managed with PFN.

Diagnosis of intertrochanteric fracture was made by clinical and radiological examination. Anteroposterior x-ray of pelvis with both hips with ipsilateral hip in 15 degree internal rotation and lateral view of the hip with thigh taken with 100 % magnification. The X-rays were evaluated by at least two senior surgeons. Skin traction was applied to the injured limb for immobilization and pain Relief in ward. Pre-operative blood investigations (Hb/CBC, Serum Electrolyte, KFT, LFT, RBS, blood grouping) were done. Physician fitness was taken for the surgery and suitable anaesthesia. Plain X-ray was taken post operatively and evaluated. All the routine pre- & post-operative protocols were adhered to in each case.

Informed consent in vernacular language was taken from patient for the surgical procedure, suitable anaesthesia and participation in the study. Ethical clearance was granted by the Institutional Ethics Committee.

RESULTS:

Of the total 35 participants, 2 from each group were lost to follow up. Remaining 31 patients were followed up for an average duration of 8 months (from 6 to 12 months) and evaluated in detail regarding intraoperative and postoperative parameters.

Fifteen patients from bipolar group & 14 patient from fixation group were from 70-80 age group and 4 from fixation and 2 from bipolar were from 80-90 age group. There were 24 males (68.5%) and 11 females (31.4%) in our study with 6 females and 11 males in hemiarthroplasty group and 5 females and 13 males in fixation group. There were 29 patients with fall as mode of injury and 6 patients with Road Traffic Accident (RTA) as mode of injury. In both groups fall was by far the major cause.

Out of 31 patients, 29 belonged to Singh's Index grade 3, 5 belonged to grade 2 and 1 belonged to grade 4. Patient distribution as per AO/OTA classification of IT fracture revealed (21, 60%) of total patients were of type A2.2 and (14, 40%) were of type A2.3. Majority of A2.2 fracture types were from fixation group (16, 76%) and majority of A2.3 fracture types were from bipolar group (12, 86%).

As far as the intra-operative parameters go, the mean time to surgery was 15.3 days in fixation and 9.2 days in bipolar group. Average Surgery time was more in bipolar group (109.1 minutes) than in fixation group (87.5 minutes) and was statistically significant (p-0.01). Intra op blood loss was more (323.5 ml) in bipolar group, than in fixation group (86.1 ml) and the difference was statistically significant using unpaired t test (p<0.001). More patients in bipolar group required blood transfusion than in fixation group. In bipolar group calcar was repaired with bone graft in 2 patients and with cement mantle in 15 patients. Out of total study population, only 2 patients had intraoperative hypotension (SBP fall greater than 30%). Both were from bipolar group.

As for post-operative parameters, out of all study population only two developed early complications like external rotation (5.8%) and superficial infection (5.8%) and both were from bipolar group. only 3 patients developed late complications at 6 weeks. 2 developed bed sore and 1 developed lung infection and all were from fixation group.

Table 1 details postoperative true limb length discrepancy (LLD). We measured the limb length & divided patients into 3 groups as follows:

1. With discrepancy 0- 1cm
2. 1-2cm
3. >2 cm.

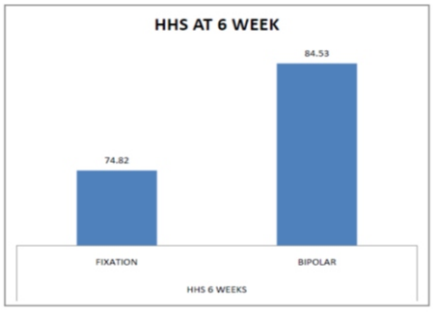
TABLE 1: COMPARISON OF POSTOPERATIVE LIMB LENGTH DISCREPENCY

LLD	Bipolar Group	Fixation Group	Total
0 TO 1	10	17	23
1 TO 2	6	1	11
More than 2	1	0	1
Total	17	8	35

Limb length discrepancy was significantly higher in bipolar group than in fixation group (P<0.001). Mean time to weight bearing was more in fixation group (5.11 weeks) as compared to bipolar group (2.8 days) (p<0.001).

The mean Harris Hip Score (HHS) was significantly higher in bipolar group (84.5) than in fixation group (74.8) at 6 weeks **(Fig. 1).** This was due to delayed mobilisation in fixation as compared to bipolar group.

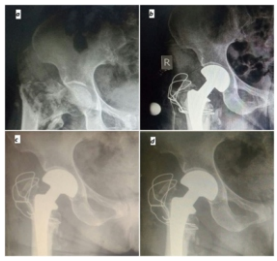
FIGURE 1: MEAN HARRIS HIP SCORES (HHS) AT 6 WEEKS



At 6 months, the mean HHS still held on to be significantly higher in bipolar group (84.5) than fixation group (74.8) (p value <0.001).

Figure 2 illustrates the results obtained in one prototype case, fitting all the selection criteria, managed with cemented bipolar hemiar throplasty; with X-rays taken pre-op, immediate post-op and after 6 weeks & 6 months.

FIGURE 2: A PROTOTYPE PATIENT MANAGED WITH MODULAR BIPOLAR HEMIARTHROLASTY.



a- Pre-Operative X-ray (Singh's index- grade2, Posteromedial-comminution, Dorr type c canal);
b- Immediate Post-Op X-ray (Showing cerclage of trochanters with medial bone graft over Calcar);
c- 6 weeks post-operative X-ray; *d-* 6 months post-operative X-ray

DISCUSSION:

Outcomes of treatment of inter-trochanteric fractures depends on quality of bone, age of patient, general health, trauma surgery interval; which are surgeon independent; and choice of implant, stability of fixation; which are surgeon dependent *(5),(6)*. Ideal treatment in unstable IT fractures in elderly is still controversial because of the poor quality of bone mass, comorbid disorders, and difficulty in rehabilitation of these patients.

In our study we included 17 patients who underwent cemented modular bipolar hemiarthroplasty and 18 patients who underwent fixation.2 patient from replacement group and 2 patient from fixation group died in post-operative follow up period .hence we studied 31 patients in terms of their functional and radiological outcome.

Intertrochanteric fractures are known to be common in elderly, as was reiterated in our study. The commonest mode of injury reported was trivial domestic fall. Patil et al (7) also found trivial fall (57.9%) was more contributing to fracture than RTA (42.1%).

In the present study, the intertrochanteric fractures were classified according to AO/OTA classification, which is a widely accepted classification. There were 21 A2.3 fractures and 14 A2.2 fractures. Both of these type constitute unstable variety of fractures. We did not do CT for evaluation of lateral wall thickness, lateral wall comminution, and posteromedial wall comminution. This is since till now there is no standard CT based classification for such type of fractures. In future if any standard CT based classification comes into existence, then there might be uniform consensus regarding instability criteria.

According to kokoeoghiannis *(8)*, the inter-observer reliability is moderate for AO/OTA classification but it's better than modified Evans classification. We considered AO/OTA Types A2.2 and A2.3 having postero-medial comminution with osteoporosis as unstable variety in our study. Thakkar et al *(9)* & Sancheti et al *(10)* in their respective studies had also included AO/OTA Types A2.2 and A2.3 only in their study.

Ideally all patients should be operated within 48 hours. But in our study the average time to surgery was 12.3 days. This increase in time from admission to surgery in our set up which is a tertiary care government hospital was due to multiple factors like; difficulty in getting fitness in such age group, battery of investigation in old patients, interdepartmental dependency for fitness, long time for RGJY approval & long waiting list of patients.

In hemiarthroplasty group, the average operating time was 109 mins, which is higher than in fixation group. In true sense the surgical time in fixation group is not actual equivalent for comparison because in none of the fixation group we did augmentation with bone grafting, trochanter reconstruction by TBW, trochanteric buttress or plating, which would have increased surgery time and that would have been true comparison. The average operating time was 87 min from reduction under c-arm to closure in fixation group. The surgical time in our study is in agreement with other recent similar studies *(8,9,10)*.

In present study, the average post-op day (POD) mobilization was significantly much less in prosthesis group (mean POD mobilization-2.8 days) than in fixation group (mean POD mobilization-5.1 weeks). We evaluated patients functionally based on Harris Hip Score (HHS) at 6 weeks and 6 months and strength of fixation and prosthesis alignment, at six weeks. Mean HHS for prosthesis and fixation group were 84.3 and 74.8 respectively. The average HHS at 6 month were 84.5 and 74.8 respectively. For bipolar hemiarthroplasty Puttakemparaju et al *(11)* reported the HHS at 78.2, which is lower than our finding. But Thakkar et al (9) (84.96) & Sancheti et al (10) (84.8) had observations very close to ours.

In all of our cases we did cemented bipolar prosthesis and not un-cemented prosthesis because the study patients had Dorr type C proximal femur. Thakkar et al *(9)* & A K Sancheti et al *(10)* in their

study used cemented prosthesis as well and got good functional results. Larsson et al *(12)* & Bannistor et al *(13)* also reported similar good outcomes with cemented bipolar hemiarthroplasty. Abdelkhalek et al *(14)* used cemented bipolar prosthesis with cerclage cable technique & reported improved functional outcome. The sample studied too was very similar to our study population.

So, the present study concludes that cemented modular hemiart hroplasty is a viable option to treat unstable intertrochanteric fracture neck femur in elderly with excellent early-midterm survivorship. In our study we got better results with bipolar hemiarthroplasty in functional score at mid-term follow up. Apart from this, early mobilisation in prosthesis patients significantly increases the quality of independent life. Hence, cemented modular hemi- arthroplasty may be considered as a primary option in strictly selected elderly patients of osteoporotic unstable inter trochanteric fractures.

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