



A Comparative study of treatment of intertrochanteric fractures with bipolar prosthesis and proximal femoral nail in elderly

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Abstract

Aim: Aim of the study is to analyze and compare the functional outcomes and compare the advantages, disadvantages and possible complications associated with fixation of two different surgical modalities, PFN and bipolar prosthesis in the treatment of intertrochanteric fractures in elderly patients.

Background: Elderly patients with intertrochanteric fractures should be mobilized early to reduce the morbidity and mortality. While cemented bipolar prosthesis allows early weight bearing, the prolonged surgical time increase the blood loss and mortality, whereas with PFN once the fracture becomes stable it allows early mobilization thus overcoming the problems of recumbency.

Methodology: A Prospective Comparative Study was conducted in 30 elderly patients who were admitted and operated between July 2017 to April 2018 and had fulfilled the inclusion/exclusion criteria. They were allocated into two groups 15 patients each for PFN and bipolar prosthesis. Harris hip score was used for assessment of the results of surgery. The results thus obtained were analysed and compared.

Results: The demographic and background data of the patients in the two groups were statistically similar. At 9 months follow up PFN group patients had a mean HHS of 85.5 and bipolar prosthesis group had a mean HHS of 79.9. Pain, severity and range of hip movements were better in PFN group than bipolar prosthesis group. Radio logically 2 patients in bipolar prosthesis group had stem loosening and 1 patients had screw cut out in the PFN group with subsequent pain in the final follow up.

Conclusion: PFN is a better option for the treatment of elderly intertrochanteric fractures as the operative time is short, relative surgical ease and has less mortality. PFN also gives a better functional outcome in the late follow up than bipolar prosthesis.

Keywords: Intertrochanteric fracture, Elderly patients, PFN, Biopolar prosthesis, Harris hip score.

Introduction

Intertrochanteric Femur fractures comprise approximately half of all hip fractures caused by low energy mechanism. These hip fractures occur in characteristic population with risk factors including increasing age, female gender,

osteoporosis, a history of fall and gait abnormality.^{1}

Intertrochanteric fractures are a major cause of morbidity and mortality in elderly population. The incidence of all hip fractures is approximately 80 per 100,000 persons. Intertrochanteric fracture

makes up 45% of all hip fractures. Intertrochanteric fractures in elderly patients are associated with high rates of morbidity and mortality although the results have improved with the use of internal fixation.^{2}

The facts that bone quality may not be good in these patients and that there are often accompanying systemic diseases lead to controversy about the choice of appropriate treatment. For this type of fracture, intramedullary fixation equipment, called proximal femoral nail anti-rotation (PFNA), was developed by the Arbeitsgemeinschaft für Osteosynthesefragen/ Association for the Study of Internal Fixation (AO/ASIF) in 2004.^{3}

To achieve this anatomical reduction of comminuted fracture and stable fixation by PFN will restore the neck shaft angle and preserve the natural hip joint. Because of this advantage patients have less pain and could walk better postoperatively and can be rehabilitated better and early.^{4}

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 unstable intertrochanteric fractures in elderly patients with osteoporotic bones. To allow an earlier Post-operative weight-bearing and a rapid rehabilitation and to avoid excessive collapse at the fracture site, some surgeons have recommended prosthetic replacements for the treatment of unstable intertrochanteric fractures.^{5}

Methodology

A prospective study done with 30 patients of age between 60 to 80 years old with intertrochanteric fractures operated PFN or bipolar prosthesis between July 2017 to April 2018. At Government Hospital Aurangabad (MH). Informed written and verbal consent was taken from the patients who met the inclusion criteria. These patients were randomly assigned either to the PFN group or to the bipolar prosthesis groups.



Figure 1- Bipolar and PFN

In first group of 15 patients, 7 were males and 8 females and all of them underwent proximal femoral nailing (PFN). In the other group of 15 patients 8 were males and 7 females and all of them underwent Bipolar Prosthesis.

Inclusion criteria are cases of closed IT fractures, Age group 60 to 80 years, all types of fractures under Boyd and Griffith classification are considered, IT fractures were operated with PFN or bipolar prosthesis.

Exclusion criteria are patients not given consent and Intertrochanteric fractures less than 60 years of age, Seriously ill patients and Patients unfit for surgery, fracture due to tumor or any other pathological cause., compound fractures.

PFN was fixed in the following manner:

Entry Point Entry point taken with awl/guide pin over a protector sleeve, It should be on the tip of the greater trochanterin AP and central in lateral position.

Guide wire insertion Guide wire: 2.8mm guide wire is inserted in to the femoral shaft and across the fracture site. Its position is checked in the C-arm and the entry is widened with the awl.

Reaming: Reaming of the proximal femur is done up to the proximal part of the nail to be introduced.

Nail insertion: Nail is fixed on the jig and the alignment is checked. Then the nail is inserted into the femur. The position of the holes for the proximal screws is checked in the C-arm for the depth of the nail.

Placing the guide wire pins: Guide wires for the screws are inserted via the jig and the drill sleeve. The ideal position of the guide wires is parallel and in the lower half of the neck in AP views, in a single line in the center of the neck in the lateral views. The guide pins are inserted up to 5mm from the articular surface of the femoral head and

size of the lag screw determined. Reaming and tapping for lag screw done.

Insertion of the screw: First the 8mm hip screw is inserted after reaming over the distal one and then the 6mm neck screw. The hip screw should be 5mm away from the subchondral bone.

Distal screws: There is one static and another dynamic hole in the distal part of the nail. Either both static and dynamic or only dynamic 4.9mm interlocking bolts are inserted in to the distal part of the nail depending upon the fracture pattern. It should be done after removing the traction along with the tightening of the proximal screws. It is done free hand with the help of Image Intensifying Television.



Figure No.2 IT fracture pre op, intra op and post op pictures(PFN)

The jig is removed. The final position of the nail is checked in the C-arm in both views and the wound closed in layers. Patient was given the IV broad spectrum cephalosporin one dose pre-operatively and followed BID dose till 72 hrs depending on the condition of the wound and patient.

Bipolar prosthesis was fixed in the following manner:

Primary cemented bipolar prosthesis was performed using the Harding lateral approach in alateral decubitus position. The capsule of the hip joint was exposed and capsulotomy of the hip joint was performed. Lesser trochanter reconstruction was performed as required using Ethibond sutures. At times when the lesser trochanter was comminuted, the trochanter pieces

were left attached to the soft tissue and the medial defect was reconstructed using a cement mantle. We used the second-generation cementing technique in all cases. In the final step, insertion of the stem of the prosthesis was sunk up to a point on the stem that was marked previously to equalize the limb length. After finalization and hardening of the cement, the trochanter and calcar were then retightened by stainless-steel wire after the prosthesis was fixed. Reconstruction of the greater trochanter was performed with tension band wiring/K-wires/screws, with the soft tissue sleeve of greater trochanter attached back to the femoral shaft. Finally, hemostasis and wound closure were performed in layers over negative suction drain. Postoperative, moderate flexion of both hips and knees and quadriceps strengthening exercises with a pillow between the legs were

recommended. Weight bearing was permitted as early as tolerated and early gait training with the

help of a walker was initiated.



Figure No.3 IT fracture pre op, intra op and post op pictures(Bipolar prosthesis)

Clinical follow-up was performed after 2 weeks of discharge for removal of sutures, the patients were encouraged to walk using walking frames, followed by visits for every 3 months till 9 months.

Statistical Analysis

The Harris Hip scores were assessed for all the patients at 3 months, 6 months, 9 months year following the surgeries. These scores were compared.

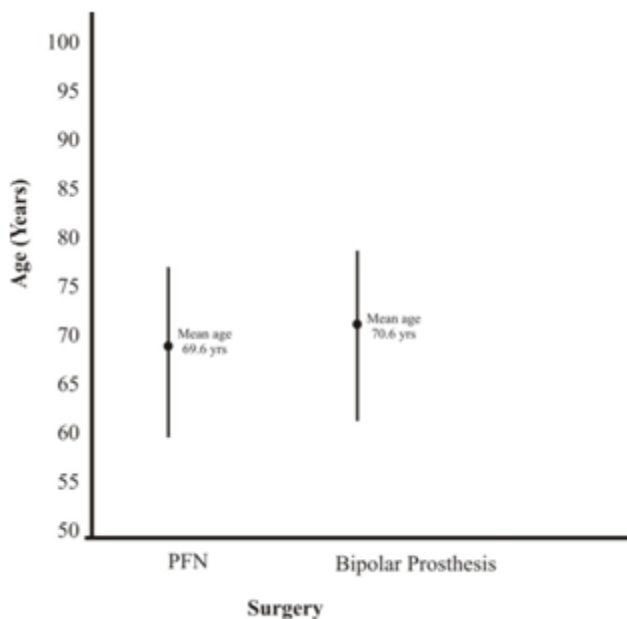


Chart 1

Results

30 elderly patients with intertrochanteric fractures have been included in our study. In PFN group of 15 patients 8 were male and 7 were female. Average mean age was 69.6 (range 60-77 years). In Bipolar prosthesis group of 15 patients 7 were males and 8 were females. Average mean age was 70.6 (range 62-79 years). Mean age depicted in **chart 1**.

Bipolar prosthesis group 1 patient expired after 2 weeks. 1 patient in each group did not turn up for follow up after 2 weeks. Hence the functional assessment at the final follow up of 9 months was derived from 27 patients.

Bipolar prosthesis group patients had higher HHS than the PFN group patients in the initial follow up of 3rd month 73.8 vs 64.6 and 6th month 77.1 vs 73.7 with statistically significant difference ($p < 0.001$). However PFN group patients had better HHS than the Bipolar prosthesis group patients in the later follow up of 9 months 85.9 vs 79.7 significant difference were observed ($p < 0.001$) statistically. PFN Group had poor HHS in the early follow up and good HHS in the 9 months follow up. HA group had fair HHS in the latter follow up period.

HHS is depicted in Table -1 and chart 2.

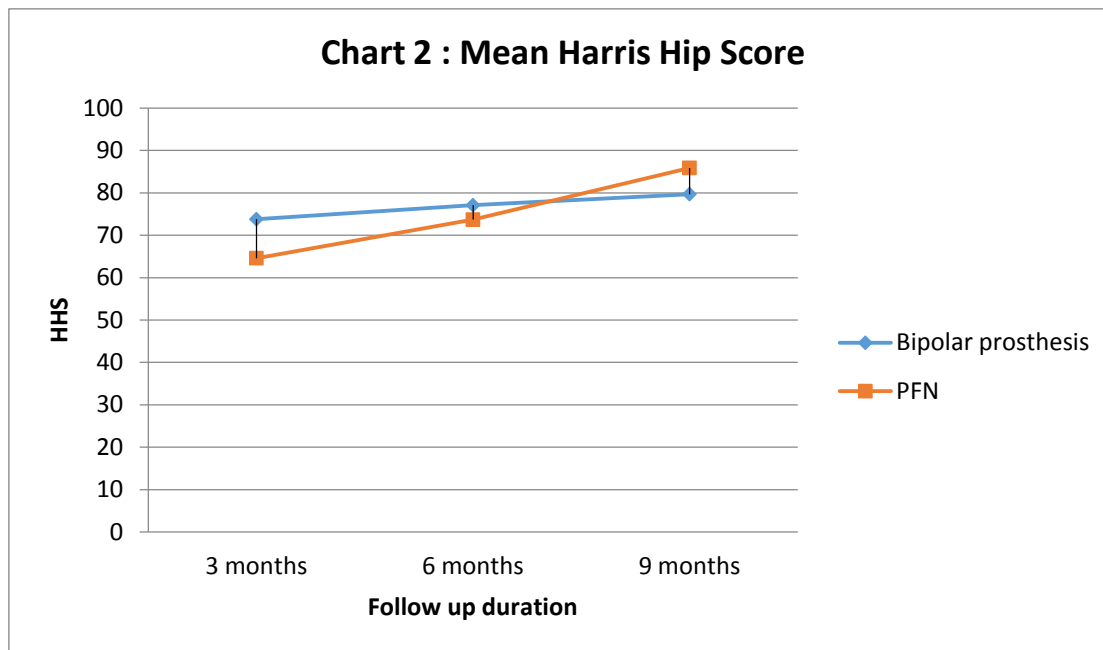


Table No.1: The Mean Harris Hip Scores at the various time periods following the surgery

Treatment	Time of HHS Measurement	Mean HHS
PFN	3 months	64.6
	6 months	73.7
	9 months	85.9
Bipolar prosthesis	3 months	73.8
	6 months	77.1
	9 months	79.7

The duration of surgery in the bipolar group ranged from 120 minutes to 145 minutes with a mean of 129.2 minutes. The duration of surgery in the PFN group ranged from 65 minutes to 100 minutes with a mean of 80.6 minutes. The difference in the operative times in both groups was found to be highly significant. The surgery duration depicted in **chart 3**.

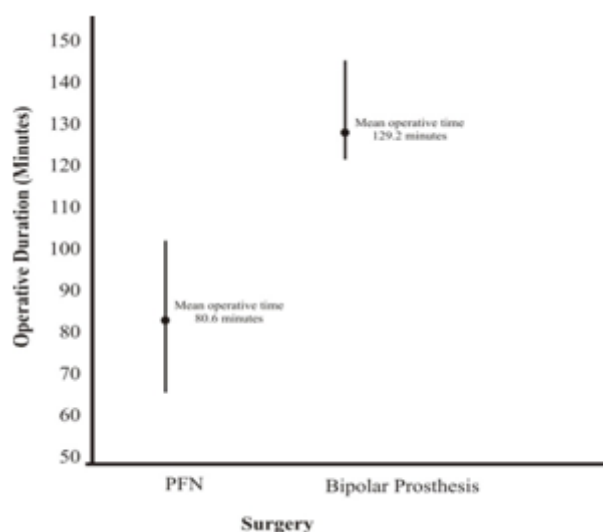


Chart 3

The Bipolar patients had more blood loss intra-operatively owing to larger incision and more soft tissue handling as compared to PFN group (average 250ml). Blood loss was calculated by number of mops used and post op drain. 2 patients in bipolar prosthesis group developed infection. 1 of infected patients died after 1 month. 1 patient in PFN group developed infection. Stem loosening and implant subsidence occurred in 2 patients in bipolar prosthesis group. Screw cut out was observed in 1 patient in PFN group. 1 patient of each group did not turn up for follow up after 2nd week post operatively. Pressure sores developed in 1 patient of Bipolar prosthesis group.



Figure No.3: Post operative complications (infection) in operated bipolar prosthesis at 1 month

Table No.2: Post operative Complications

	PFN	Bipolar prosthesis
Infection	1 (6.6%)	2 (13.33%)
Pressure sores	0 (0%)	1 (6.6%)
Implant failure	1 (6.6%)	2 (13.33%)
Limb lengthening	0 (0%)	1 (6.6%)
Limb shortening	2 (13.33%)	2 (13.33%)
Death	0 (0%)	1 (6.6%)

Bipolar prosthesis group patients were allowed full weight bearing on 2nd post-operative day. PFN group patients were mobilized bed side non-weight bearing at 3rd-4th post operative day. Limb length discrepancy was significant in bipolar prosthesis group with 1 patient having limb lengthening >2 cm and 2 patients having shortening >2 cm. In PFN group 2 patients had >2 cm shortening because of varus collapse. Post operative complications are depicted in Table 2.

Discussion

The discussion about the ideal implant for treatment of proximal femoral fractures continues. From the mechanical point of view, a combined intramedullary device inserted by means of a minimally invasive procedure seems to be better in elderly patients (Rosenblume et al.1992, Prinz et al.1996). Closed reduction of the fracture preserves the fracture hematoma, an essential

element in the consolidation process (McKibbin 1978).

Intramedullary fixation allows the surgeon to minimize soft tissue dissection thereby reduction surgical trauma, blood loss, infection, and wound complications (Leung et al.1992, Radford et al. 1993).^{6} Due to its position close to the weight-bearing axis the stress generated on the intramedullary implants is negligible. The PFN implant also acts as a buttress in preventing the medialisation of the shaft. The entry portal of the PFN through the trochanter limits the surgical insult to the tendinous hip abductor musculature, only unlike those nails which require entry through the piriformis fossa. ^{7} ^{8}

The stabilising and the compression screws of the PFN adequately compress the fracture, leaving between them a bone block for further revision should the need arise.^{9} A medial buttress provides adequate reduction in implant stress and fatigue. PFN also acts as a buttress in preventing the medialisation of the shaft. Moreover, thus, the fracture heals without the primary restoration of the medial support. The implant compensates for the function of the medial column. The nail's position near the weight bearing axis reduces the stress generated on the implant significantly.^{10}

Several studies in literature have shown that results with Cemented bipolar hemiarthroplasty are good. It helps in early mobilization of patient with good and fast improvement in Harris Hip score. Complications like pressure sores, aspiration, Pneumonitis are very rare with this surgery. Cemented bipolar hemiarthroplasty has given constant good results in terms of early ambulation and good mid-term survival rates in comminuted unstable inter-trochanteric fractures and results are constant as compared to variable results given by osteosynthesis. Even our results were synchronous to the above studies in terms of early mobilization, less implant related complications and faster over-all rehabilitation^{11} The literature supports that all three approaches have comparable dislocation rates when using the posterior approach augmented with soft tissue

repair and it is apparent an adequate soft tissue repair when performing the posterior approach greatly reduces the relative risk of dislocation. But certain studies have also shown that there are higher rates of dislocation with posterior approach when compared with transtrochanteric and antero-lateral approach. Studies have also shown that former has less rate of ectopic ossification as compared to the latter two. Also there is higher rate of non-union with trans-trochanteric approach thus affecting the abductor lever arm and can lead to Lurching gait.^{12}

In a comparative study of cone hemiarthroplasty versus internal fixation, Kayali *et al.*^{13} reached the conclusion that clinical results of both groups were similar. Hemiarthroplasty patients were allowed full weight-bearing significantly earlier than the internal fixation patients. Cone hemiarthroplasty can be an alternative treatment for unstable intertrochanteric fractures in elderly patients so as to achieve earlier mobilization.

The Indian perspective of using primary hemiarthroplasty as treatment option for unstable intertrochanteric fractures is explored by few authors. Sancheti *et al.*^{14} concluded that hemiarthroplasty for unstable osteoporotic intertrochanteric fractures in elderly results in early ambulation and good functional results.

Primary cemented bipolar prosthesis is a good choice for unstable intertrochanteric fractures in the elderly and saves time as well as cost, with few significant complications. Therefore, bipolar prosthesis should be considered one of the modalities of treatment of unstable intertrochanteric fractures in the elderly.^{15}

Conclusion

PFN is a better option for the treatment of elderly intertrochanteric fractures because of its short operative, relative ease of surgical technique, less morbidity and mortality. PFN also gives a better functional outcome in the late follow up period than the bipolar prosthesis.

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