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Evaluation of results of cemented hemiarthroplasty and proximal femur nailing in comminuted intertrochanteric fractures of elderly patients

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Abstract

The comminuted intertrochanteric fractures being in cancellous area, fixation of all fragments is difficult. The posteromedial void is generally present which makes the fracture very unstable. The recent popular modality is 4th generation of intramedullary nails like the proximal femoral nails. This may lead to an increased difficulty in placement of femoral neck screws due to osteoporosis. But even with these implants immobilization is required for few days. Management of such cases with primary hemiarthroplasty permits early mobilization, thus avoiding most of the complications of recumbence. The patient is mobilized early giving good rehabilitation and better options for independent free living.

Keywords: PFN, hemiarthroplasty, comminuted fractures, intertrochanteric fractures, cemented

Introduction

- Comminuted intertrochanteric femur fractures of elderly patients are associated with high rates of morbidity and mortality due to the need for prolonged immobilization although results are improved with use of recent modalities of internal fixation.
- Because of prolonged immobilization, complications like deep vein thrombosis, hypostatic pneumonia, pressure sores, dehydration, atelectasis, metabolic disturbances etc are likely.
- The comminuted intertrochanteric fractures being in cancellous area, fixation of all fragments is difficult. The posteromedial void is generally present which makes the fracture very unstable.
- The recent popular modality is 4th generation of intramedullary nails like the proximal femoral nails. This may lead to an increased difficulty in placement of femoral neck screws due to osteoporosis. But even with these implants immobilization is required for few days.
- Management of such cases with primary hemiarthroplasty permits early mobilization, thus avoiding most of the complications of recumbence.
- The patient is mobilized early giving good rehabilitation and better options for independent free living.

Aim of the study

- The purpose of this study was to compare functional recovery with comminuted intertrochanteric fractures of femur treated with PFN and cemented bipolar using Harris hip score.
- To compare intra and postoperative parameters in two groups.

Materials and Methods

- It is a prospective study conducted over a period of Two year from June 2016 - August 2018 in 30 patients.
- All the cases attending either the emergency ward, outpatient department at NRIGH are taken in to study after approval from institutional ethics committee.

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Inclusion criteria

- Patients above 60yrs
- Patients with unstable intertrochanteric fractures
- Patients who gave consent

Exclusion criteria

- Patients having IT fractures with subtrochanteric extension, pathological fractures, and stable undisplaced fractures were not included in the study
- Patients with comorbid conditions and medically not fit.
- After admitting the patient surgical profile, cardiology fitness for surgery and pre-anaesthetic checkup done.
- 30 patients are divided in to two groups based on randomization.
- In group A patients, cemented bipolar hemiarthroplasty is performed and in group B patients, PFN was done.

Treatment modalities

- Patients were operated as their condition stabilized usually with in 48 hrs following presentation.
- Prophylactic antibiotic given at the induction of anesthesia and continued for 3 doses post operatively
- Prophylaxis against DVT using LMWH was started 12 hrs prior to operation and continued post operatively.
- In group A patients cemented bipolar hemiarthroplasty were performed and in group B patients proximal femoral nailing was performed.
- All surgical procedures were performed under either spinal or epidural anaesthesia.
- Postoperatively, patients operated by PFN were made to walk non weight bearing with support from fifth or seventh day and quadriceps exercises are encouraged.
- At first follow up, six weeks from surgery, toe-touch weight bearing was initiated. In the next follow up, after four to six weeks patients showing both clinical and radiological signs of union were allowed to bear full weight.

- Patients operated with cemented bipolar hemiarthroplasty, were made to stand with support of a walker and allowed to walk by fourth or fifth postoperative day not allowed to squat or sit crossed legged.
- They were followed up every month for the first three months, then every three months for the first year and every six months from then onwards.

Results

- Out of the 30 patients, 16 patients (53%) were males and 14 patients (47%) females.
- In our study, the average age was 67 years with 85 years being the maximum and 62 years being the minimum.
- Intertrochanteric fractures due to trivial trauma (77%) was the most common mode of injury, followed by road traffic accidents (23%).
- As the surgical approach, PFN requires a smaller incision to access the entry site into the medullary canal compared to hemiarthroplasty (MOORES APPROACH) which was found to be more than twice the length (17cm).
- Patients operated using the PFN had significantly lower mean blood loss as compared to the other group. The mean days to unaided Full Weight Bearing was significantly higher in patients treated by the PFN as compared to BIPOLAR groups.
- Radiological outcome was assessed at 1month, 3months, 6months and 12th month post-op.
- At 3 months post-op, 11 patients in PFN group showed attempted callus formation.
- At 6 months post-op, we found few variations and complications in both the groups. In the PFN group, all the 15 patients showed good union of fracture.
- Two patients had backing out of the proximal cephalic screw in the PFN group but both of them united without any complications.

Harris Hip Score

	Hemiarthroplasty Group- 1 (n=15)	PFN Group-2 (n=15)	p-value
Follow-up Period in months(range)	22 (18-26)	21 (19-24)	
Mean Time to full weight bearing (weeks)	1.2	8.2	p<0.001
Harris Hip Score (100)			
3 months	80.55(68 – 86)	68.89 (58 - 75)	(p<0.001)
6 months	83.25 (72 – 89)	72.47(61 - 80)	(p<0.01)
12 months	86.46(76 – 92)	75.91 (66 - 84)	(p<0.01)
Return to Normal daily activities (weeks)	5.4	10.2	P<0.01

Discussion

The treatment of comminuted intertrochanteric fractures in elderly patients is still controversial, despite so many randomized trials and comparative studies. A lot of implants have come up in the recent past, but no single implant,

however, is universally accepted for the operative treatment of these fractures, and new fixation devices keep coming up now and then. Previously, severe osteoporotic patients who were treated with intramedullary osteosynthesis or plate-screw synthesis have shown failure, mostly cut-outs and non-

unions.

Between 1992 and 2005 Geiger *et al.* [54] compared the mortality risk and complication rate after operative treatment of pertrochanteric fractures with primary arthroplasty, dynamic hip screw (DHS), or proximal femoral nail (PFN) in this retrospective study. Of these 283 patients, 132 were treated by primary arthroplasty, 109 with a DHS, and 42 with a PFN. Mortality was significantly influenced by age, gender, and comorbidities, but not by fracture classification. Primary hip arthroplasty did not bear a higher 1-year mortality risk than osteosynthesis in a multiple regression analysis. The main complication with DHS and PFN were cutting out of the hip screw and nonunion, with a revision rate of 12.8%. In a randomized study, Kim *et al.* found a lower mortality and less blood loss with a cephalomedullary nail compared with a cementless calcar replacement arthroplasty with equivalent functional results [55]

Prosthetic replacement in fresh intertrochanteric fracture is not routinely done in common practice. Cemented hemiarthroplasties are considered suitable for unstable four-part intertrochanteric fractures [56] Haentjens *et al.* [57, 58] in 1989 compared the results of primary bipolar replacement blade plate fixation. Chan and Gill. [59] in the year 2000, reported a few complications after cemented hemiarthroplasties. Unstable intertrochanteric fractures, especially badly comminuted ones are common situations wherein fracture goes into nonunion along with a lot of morbidity and at times mortality after internal fixation with DHS or PFN. To overcome such a situation and to prevent morbidity, cemented hemiarthroplasty is a very promising option. This has two advantages: it reduces the chance of nonunion and avoids morbidity and repeated surgeries.

How did we choose which implant for which patient?

We carefully screened the patients clinically and radiologically according to the geometry of fracture. Modality used depended upon two criteria:

- Quality of bone stalk (Singh index) [50]
- Integrity and alignment of postero-medial cortex achieved after skeletal traction.

Patients with Singh index >III and with traction x-ray showing satisfactory alignment in acceptable position were treated with PFN, where as patients with Singh index <III & with traction x-ray showing loss of integrity of postero-medial cortex and inadequate alignment were treated with cemented bipolar hemiarthroplasty.

In our study, we had three patients in group 1 and two patients in group 2 with limb length discrepancy which was less than 1.5 cms, which was compensated by shoe raise. in our study, we have done patient each in both the groups with superficial infection which subsided with iv antibiotics.

We compared our results with other established studies for trochanteric fractures treated with hemiarthroplasty or PFN. Most of our patients were of elderly age group. The mean age of patients undergoing hemiarthroplasty was 75 years, as compared to 82 years in Haentjens [57, 58] The mean age for PFN group was 71.33 years, as compared to 72 years in Tyllianakis *et al.* [60]

The overall female: male ratio in our study was 1.142:1 (16 females and 14 males). In the hemiarthroplasty group, the female to male ratio was 1.142:1 (8 females and 7 males). In the series by Haentjens [57, 58], the ratio was 3.6:1. The female: male ratio in our PFN group was 1.142:1 (8 females and 7 males) and in a study by Tyllianakis *et al.* [60], the ratio was 1.64:1 (28 females and 17 males).

The mean blood loss in our hemiarthroplasty group was 516.66 ml. The mean blood loss in Haentjens [57, 58] group was 680 ml. The mean blood loss in our PFN group was 187.33ml as compared to 320 ml in a study by Pajarinen *et al.* [61] and 0.5 to 1.8 units (175ml to 630 ml) in Tyllianakis *et al.* [60]

The duration of surgery was 80 min for hemiarthroplasty group in our study. In Haentjens. [57, 58] study, the duration of surgery was 82 plus/minus 4 min. The mean operating time for our PFN group was 73.33 min as compared to 68 min in Tyllianakis *et al.* [60]

Out of 30 patients in our study, we had 4 poor results, 18 fair, 7 good and 1 excellent result overall. Further, in our hemiarthroplasty group, we had 9 fair (60%), 4 good (13.33%) and 2 poor (13.33%) as compared to 75-84% as excellent, very good or good and 17-25% as fair poor or bad as compared to Haentjens [57, 58].

Our results of the PFN group were better than Tyllianakis *et al.* [60] We had no case of non union and one case of hip pin backing out four months after surgery. On the other hand in Minos Tyllianakis' study, he had no case of non union, 2 cases of broken nails, 2 cases of cutting out of proximal screws and 4 cases of protrusion of hip pins in a study group of 45 patients.

Now the big question; Hemi-arthroplasty or PFN?

Rodop *et al.* [62] in a study of primary bipolar hemiprosthesis for unstable intertrochanteric fractures in 37 elderly patients obtained 17 excellent (45%) and 14 good (37%) results after 12 months according to the Harris hip-scoring system. The opponents of the technique stated increased blood loss, mechanical complications like dislocation, and infection as possible complications as compared to PFN.

The earliest comparison of internal fixation and hemiarthroplasty was done by Haentjens *et al.* [57, 58] showing a significant reduction in the incidence of pneumonia and pressure sores in those undergoing prosthetic replacement. In a comparative study of hemiarthroplasty versus internal fixation, Kayali *et al.* [63] 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. Broos *et al.* [64] concluded that the operative time, blood loss, and mortality rates were comparable between the two groups, with a slightly higher percentage (73% versus 63%) of those receiving a prosthesis considered to be pain free. The functional outcome was comparable between both groups.

Stappaerts *et al.* [65] found no difference between two groups except a higher transfusion need in the replacement group. In our series the average blood loss in hemiarthroplasty group was 516.66 ml with 2 patients requiring postoperative blood transfusion and there was no incidence of dislocation.

Conflicting reports about postoperative mortality in cases with primary hemiarthroplasty are cited in the literature. Kesmezacare *et al.* [66] reported postoperative mortality in 34.2% after a mean of 13 months and in 48.8% after a mean of 6 months in patients treated with internal fixation and endoprosthesis, respectively. Other studies have shown no differences in postoperative mortality in two groups. [58, 64, 65]

In present series, no patient died in a follow up of one year.

Hardy *et al.* [67] reported early weight bearing without excessive collapse in cases with comminuted intertrochanteric fractures fixed with intramedullary nailing. However, there is only one study by Kim *et al.* [68] which compares the calcar replacement prosthesis with intramedullary nailing in a prospective study involving two groups of 29 patients. They

could not find any significant difference concerning the functional outcomes, but the cut-out rate of the hip screw was 7% in their patients. The Cochrane database analysis of relevant studies concluded that there is insufficient evidence to prove that primary arthroplasty has any advantage over internal fixation.^[69] However, they also mentioned that there were only two randomized trials studied and both had methodological limitations, including an inadequate assessment of the longer term outcome.

Internal fixation has drastically reduced the mortality associated with intertrochanteric fractures; however, early weight bearing is still avoided in cases with comminution, osteoporosis, or poor screw fixation and non-weight bearing walking is recommended. Early post-operative ambulation is necessary to prevent complications like pressure sores, pneumonia, osteoporosis, contractures and muscle wasting. Surgical treatment facilitates early rehabilitation with improved quality of life and function^[72].

Delay in surgery is an important predictor for mortality in patients with proximal femur fracture and also of the postoperative morbidity^[70, 71]. We in our study, however, could not comment on these points because of small sample size and this is one of the limitations of our study.

To sum up the discussion, the treatment of Comminuted intertrochanteric fractures in elderly patients with severe osteoporosis differs from the treatment of comminuted intertrochanteric fractures in relatively healthier patients with better bone quality. They should be grouped according to fracture geometry as stable and unstable so that correct choice of implant can be made. PFN has an advantage of shorter operative time, less blood loss, lower hospital stay with no difference in functional outcome or general complications as compared to hemiarthroplasty. On the other hand, patients treated with PFN can squat and sit cross legged after fracture union. Primary hemiarthroplasty does provide a stable, pain-free, and mobile joint with acceptable complication rate as seen in our study; however a larger prospective randomized study with longer follow up comparing the use of PFN against primary hemiarthroplasty for unstable osteoporotic fractures needs to be done.

Conclusion

The management of unstable osteoporotic trochanteric fractures in elderly is challenging because of difficult anatomical reduction, poor bone quality, and sometimes a need to protect the fracture from stresses of weight bearing.

The key to successful management of trochanteric fractures in elderly patients lies in planning the surgery beforehand on the basis of quality of bone and pre operative reduction X- ray. Patients with good bone stock and satisfactory alignment in acceptable position can be treated with PFN. Patients with poor bone stock and traction X-ray showing loss of integrity of postero-medial cortex and inadequate alignment should be treated with cemented bipolar hemi-arthroplasty.

The outcomes of both the modalities are almost equal. PFN has an advantage of shorter operative time, less blood loss, lower hospital stay with no difference in functional outcome or general complications as compared to hemiarthroplasty. Major advantage of PFN is patients treated with PFN can squat and sit cross legged after fracture union.

Hemiarthroplasty does provide a stable, pain-free, and mobile joint with a very low complication rate as seen in our study; however a larger prospective randomized study with longer follow up comparing the use of PFN against primary hemiarthroplasty for proximal femur fractures needs to be done.

Clinical Pictures

Case 1

Preop xray

postop xray

Post op 3 months

6 months

Range of movements

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