Comparative Study of Treatment of Proximal Femoral Fractures in Elderly Osteoporotic Patients with PFN Vs Cemented Hemiarthroplasty Based on Pre-operative Traction Reduction and Grade of Osteoporosis- 50 Cases

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Comparative Study of Treatment of Proximal Femoral Fractures in Elderly Osteoporotic Patients with PFN Vs Cemented Hemiarthroplasty Based on Pre-operative Traction Reduction and Grade of Osteoporosis- 50 Cases

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Abstract

Context: Most inter-trochanteric fractures occur in elderly people (above 65 yrs) with high mortality rates. Problems with osteoporotic bone fractures includes geometry (grossly comminuted), high instability and difficult to treat. Conservative treatment in such patients demanding prolonged immobilization lands up with complications.

Aim: To study the efficacy of PFN Vs cemented hemi-arthroplasty in proximal femoral fractures in elderly patients with severe osteoporosis.

Methods and Material: We prospectively compared the two modalities viz: PFN & cemented hemi-arthroplasty. Modality used depends upon two criteria: 1) Singh index & 2) reducibility and alignment achieved with skeletal traction. Patients with Singh index >3 and with traction x-ray showing reducible fracture and good alignment were treated with PFN. Patients with Singh index <3 & with traction x-ray showing irreducible and unstable fracture and not showing good alignment were treated with cemented hemi-arthroplasty.

Results: Total 50 cases with mean age of 79.5 yrs. Mean Harris hip score 78.28 for PFN and 76.84 for Hemiarthroplasty. Mean intra-operative blood loss 530 ml in hemi-arthroplasty and 180 ml in PFN cases. 4 cases died of medical complications earliest being 3 months and late being 18 months. 2 hemi-arthroplasty cases had superficial infection treated with oral antibiotics and 1 case of screw back-out due to collapse in PFN case treated with revision surgery with cemented hemi-arthroplasty. Mean time for radiological union for PFN cases was 12.04 weeks.

Conclusions: By following the above mentioned criteria we can treat IT fractures with either PFN or cemented Hemiarthroplasty with equally good results.

Introduction

1. Most inter-trochanteric fractures occur in elderly people (above 65 yrs) with reported mortality rates ranging from 15% to 30%. (1)
2. Problems with osteoporotic bone fractures includes geometry (grossly comminuted), high instability and difficult to treat.
3. Conservative treatment in such patients demanding prolonged immobilization often lands up with complications. (2)

AIM: To study the efficacy of Proximal Femoral Nailing (PFN) Vs cemented Hemiarthroplasty in proximal femoral fractures in elderly patients with severe osteoporosis.

STUDY & DESIGN: Prospective comparative study-50 cases.

STATISTICAL ANALYSIS USED: Two sample T-test was used to compare the outcomes in the two groups.

Outcome was measured with Harris hip score. (3)

RATIONALE FOR STUDY: We retrospectively observed the results in 10 cases of IT fractures treated with PFN.

All 10 cases were graded for osteoporosis by Singh index (4), with traction x-ray was taken; but irrespective of the two, cases were treated with PFN

(i) Of the 10 cases, at follow-up we observed fixation failure in 2 cases.
(ii) Modes of failure observed were-
1. Screw back-out
2. Screw cut-out.
We analyzed the causes for failure in both cases and observed that:

1. Both cases had Singh index < 3.
2. In both cases, with traction x-ray did not show integrity of postero-medial cortex and adequate alignment.

This study was taken by us as a pilot study. Hence we further studied 50 cases of IT fractures comparing the two modalities of treatment viz. PFN and Hemi-arthroplasty.

Methods

Modality used depends upon two criteria:

1. Quality of bone stalk (Singh index ) (4)
2. Integrity and alignment of postero-medial cortex of GT and Calcar achieved with heavy skeletal traction.
3. Patients with Singh index >3 and with traction x-ray showing satisfactory alignment in acceptable position were treated with PFN.
4. Patients with Singh index <3 & with traction x-ray showing loss of integrity of postero-medial cortex and inadequate alignment were treated with cemented bipolar hemi-arthroplasty.
5. Greater Trochanter and Lesser Trochanter were reconstructed where indicated with TBW or Encirclage (GT) and Encirclage/ Fashioned bone graft/ Cement collar (LT). (5)
6. We used Harris hip score for evaluating the functional outcome of the two groups.
7. Permission from the ethical committee was obtained prior.
8. The patients with proximal femoral fractures in elderly people with severe osteoporosis were admitted through OPD or Casualty.

Pre-Operatively:

1. Skeletal traction with Denham’s pin was given.
2. Patient was graded for osteoporosis by Singh’s index.
3. 4 inj. Decadurabolin fortnightly & calcium with vit.D3 once daily was given.
4. Preoperative anesthetic evaluation for anesthetic fitness was done and patient was posted for surgery.
5. Informed and willful consent was taken prior to the operative procedure.
6. Cemented hemiarthroplasty was performed using the true lateral approach thus directly approaching the fracture site.

Inclusion criteria:

1. Pre-injury status was ambulatory.
2. Co-operative for physiotherapy.
3. Severe osteoporosis.
4. Elderly (age more than 65 yrs.).

Exclusion criteria:

1. Pre-injury status non-ambulatory.
2. Open fractures.
3. Severely moribund patients.
4. Uncontrolled diabetes mellitus.

DO’s and DON’TS

DO’s:
1. Walk with walker.
2. Sit in chair.
3. Use western toilet.
4. Report to a doctor in any suspicion of infection like UTI / URTI/ local discharge.

DON’TS:
1. Do not sit cross legged.
2. Do not squat.
3. Avoid uneven ground and busy roads.
4. Avoid uneven ground and busy roads.

After 1 month, walking with cane in opposite hand was advised for 4 weeks for PFN cases and 2 weeks for Hemiarthroplasty cases.
Results

From 2008 we did 50 cases- 25 cemented bipolar Hemiarthroplasty and 25 PFN. The mean age of the patient was 79.5 years, with the youngest being 68 and the oldest 104 years.

The maximum follow up was 4 years and minimum was of 1 year with mean follow up of 29 months.

Data collected:

Male: Female ratio was 2: 3.

22 patients had associated medical problems like HTN (14), IHD (4), DM (10) and others (4).

Of the 50 cases in 25 cases the Singh index was Grade II and in remaining 25 it was Grade III.

GT reconstruction was required in 16 cases while LT/Calcar reconstruction was required in 4 cases.

Mean blood loss in Hemiarthroplasty cases was 530 ml and in PFN cases was 180 ml.

Mean Harris hip score (5) being 78.2 for PFN and 76.8 for Hemi-arthroplasty cases.

Mean stay in the hospital was 12 days for PFN & 13 days for hemi-arthroplasty patients.

Mean follow up was 29 months.

2 cases of superficial infection in hemi-arthroplasty cases were treated with oral antibiotics.

1 case of screw Back-out due to collapse in PFN case. The failure was due to the collapse of the fragments due to poor bone stock (singh index <3) and reduction of fragments could not be achieved with heavy skeletal traction. Patient was an ideal case for cemented hemi-arthroplasty, but PFN was done as the patient was a known case of old myocardial infarction and had poor cardiac function with ejection fraction of 20%. Hence open reduction and PFN (a short time procedure with less blood loss) was done. Revision surgery with cemented hemi-arthroplasty was performed later when her cardio-pulmonary function improved with rehabilitation and medical treatment after 3 months.

Mean time at which Patients treated with Hemi-arthroplasty started full weight bearing ambulation without support was 6 weeks, while for PFN treated cases it was 8 weeks.

Mean time of radiological union in cases treated with PFN was 12 weeks.

Table II: comparison of outcomes

See Illustration 14

Discussion

In proximal femoral fractures with severe osteoporosis and poor bone stock there is a high risk of failure of fixation of any type.

The treatment of proximal femoral fractures in elderly patients with severe osteoporosis defers with the treatment of proximal femoral fractures in young individuals.

These should be grouped according to fracture geometry as stable and unstable (5) (6) so that correct choice of prosthesis/implant can be used.

Peculiarities of these fractures include:

1. Instability.
2. Osteoporosis.
3. Associated medical co-morbidities.
4. Post-operative complications with delayed ambulation.

Requirements for the treatment are:

1. Maintenance of neck- shaft angle.
2. Good bone stock.
3. Near anatomical alignment.
4. Right choice of prosthesis/implant.
5. Early Ambulation.

Failure to fulfil these requirements leads to high chances of failure of implant (Excessive collapse, loss of fixation and cut-out of the screws) resulting in poor function.

In 1997 PFN was introduced for the treatment of per-trochanteric fractures of femur and was designed to reduce implant related complications. Prospective clinical studies of PFN shows cut-out rates ranging from 0.6 – 1.4 % and a low tendency for varus displacement as compared to other implants. (7) (8) (9)

Studies also show that intra- medullary devices are several times stronger than the DHS, with less or no deformity at maximum loads. (10) PFN has an advantage of shorter operative time, less blood loss, lower hospital stay and low hospital cost with no difference in functional outcome, time to weight bearing and general complications as compared to hemi-arthroplasty.

Also in contrast to hemi-arthroplasty, patients treated with PFN, after fracture union can squat and sit cross legged.

Conclusion(s)
By following the above mentioned criteria we can treat IT fractures with either PFN or cemented Hemiarthroplasty with equally good results.

Abbreviation

IT: Intertrochanteric
PFN: Proximal Femoral Nail
PWB: partial weight bearing
FWB: full weight bearing
GT: greater trochanter
LT: lesser trochanter

References

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Illustrations

Illustration 1

Pre op xray

Illustration 2

xray with skeletal traction
Illustration 3

day-1 post op xray with pfn in situ

Illustration 4

follow up xary at 12 weeks
Illustration 5

without traction xray showing IT fracture with severe osteoporosis

Illustration 6

with traction xray showing no anatomical allignment
Illustration 7

bipolar hemi arthroplasty done.

Illustration 8

without traction xray
Illustration 9

with traction xray

Illustration 10

day- 1 post operative xray
Illustration 11

xray at 3 months follow up showing screw back-out.

Illustration 12

revision surgery with bipolar hemi arthroplasty
Illustration 13

Type of bipolar prosthesis used

<table>
<thead>
<tr>
<th>Type of Prosthesis</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>I</td>
<td>Calcar and lesser trochanter intact, no comminution. Bipolar prosthesis AMP type.</td>
</tr>
<tr>
<td>II</td>
<td>Calcar is fractured or less Bipolar-thompson’s type</td>
</tr>
<tr>
<td>III</td>
<td>Instability of postero-medial wall with lesser trochanter and calcar fractured Modular type of bipolar prosthesis with reconstruction of greater trochanter and calcar reconstruction.</td>
</tr>
</tbody>
</table>

Illustration 14

Comparison of Outcomes

<table>
<thead>
<tr>
<th>Sr.No</th>
<th>Outcomes</th>
<th>Hemiarthroplasty group: Mean (S.D)</th>
<th>PFN group: Mean (S.D)</th>
<th>P Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>1.</td>
<td>Age (years)</td>
<td>79.28 (10.83)</td>
<td>79.72 (10.12)</td>
<td>0.883</td>
</tr>
<tr>
<td>2.</td>
<td>Harris hip score</td>
<td>76.84 (3.82)</td>
<td>78.28 (2.71)</td>
<td>0.131</td>
</tr>
<tr>
<td>3.</td>
<td>Stay in the hospital (days)</td>
<td>13 (1)</td>
<td>12 (0.86)</td>
<td>&lt; 0.001</td>
</tr>
<tr>
<td>4.</td>
<td>Intra-operative blood loss (ml)</td>
<td>530 (80.78)</td>
<td>180 (44.88)</td>
<td>&lt; 0.001</td>
</tr>
<tr>
<td>5.</td>
<td>Time for radiological union (weeks)</td>
<td>-</td>
<td>12.04</td>
<td>-</td>
</tr>
</tbody>
</table>
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