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Comparative Study between Proximal Femoral Nail and Proximal Nail Antirotation Unstable Trochanteric Fractures in Andhra Population

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Abstract

Background: Intertrochanteric fractures are quite common in elderly patients. Although many devices are present to stabilize the fractures for early healing hence early healing, Ideal techniques are required because in old age bones are osteoporotic.

Method: 70 (seventy) patients aged between 50 to 70 years admitted due to intertrochanteric fracture were studied. 35 patients were inserted with proximal Femoral Nail (PFN) and 35 were inserted with proximal Nail anti rotation (PENA). The helical blade PFN has two screws, one large which stabilizes the fractured part of femur and another is anti-rotation while PFNA has helical blade which provides stability and anti-rotation mobility. Both surgeries were similar but instrumentations and techniques were different.

Results: The mean duration time for PFN was 40.30 (±6.11) and 35.19 (±5.03) in PFNA, t test was 3.82 and $p<0.004$. Blood loss was 75.76 (±14.33) in PFN 59.39 (±11.98) in PFNA, t test 5.18 and $p<0.001$ Fluoroscopy images mean value 27.48 (±3.44) in PFN, 16.28 (±3.11) in PFNA, t test 14.2 and $p<0.001$. Reoperation was 3 (8.57) in PFN and 1 (2.85%) in PFNA. Cut out z-effect was 4 (11.4%) in PFN and 1 (2.85%) in PFNA, loss of reduction had shortening >1 cm were 6 (17.1%) in PFN and 3 (8.57%) in PFNA. Varus malalignment was 4)11.4%) in PFN and 1 (2.85%) in PFNA. Postoperative final outcomes were very less in PFNA as compared to PFN surgery.

Conclusion: PFNA technique significantly reduced duration of time for surgery, loss of blood, fluoroscopy imaging usage mortality rate hence PFNA is a better option is Osteoporotic (elderly) patients.

Keywords: PFN, PFNA, Helical blade, troncheteric, Fluoroscopy

Introduction

Intertrochanteric fractures are common in the elderly population with significant mortality and morbidity(1). The workhorse for fixation of the intertrochanteric fracture has shifted from

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Dynamic hip screw (DNS) to proximal femur Nail anti rotation (PFNA) especially for unstable type fractures and proximal Femoral Nail fractures [2].

The proximal femoral Nail anti-rotation (PFNA) system is an intra medullary nail implant design of PFNA and improved sliding properties of the Femoral Neck result in fewer perforations of the head, neck fragment and a better hold in osteoporotic bone [3]. Hence intramedullary (IM) devices include proximal Femoral Nail (PFN) and proximal femoral Nail antirotation, PFN includes IM Nail through which two screws are inserted in the Neck of femur. One is a large screw that stabilizes the fractures allowing collapse and the other one is an anti-rotation screw used to provide rotatory stability to the fracture PFNA in which helical blade instead of two screws [4][5]. The helical blade is believed to provide stability compression and rotational control of the fracture. Hence an attempt was made to compare the both devices and the pros and cons of both techniques were evaluated.

Material and Method

70 (seventy) patients aged between 50 to 70 years admitted at Nimra Institute of Medical Sciences, Ibrahimpatnam, Jupudi, Vijayawada-521456 Andhra Pradesh were studied.

Inclusive Criteria: Acute unilateral trochanteric fractures belonged to AO/ASIF. 31-A1-A2, 31-S3 were independent ambulates, prior to injury were selected for study.

Exclusive Criteria: Patients having pathological fractures, open fractures, poly-trauma, neuro-muscular disorders were excluded from study.

Method

Out of 70 patients, 35 were selected for PFN and 35 for PFNA written consent were obtained from every patient. The surgical procedure was similar in both groups except for the techniques and instrumentation used in either system. Types of fractures assessed as per AO/ASIF classification system using orthogonal radiographs. All patients were administered spinal or epidural anaesthesia and positioned supine on the fracture table prior to closed reduction of fracture. The duration of surgery and loss of blood was noted.

Every patient received prophylactic antibiotics as pre-operative dosage. Post operatively every patient of both groups with low molecular weight heparin, first ten days postoperatively or during stay at hospital whichever is shorter duration followed aspirin for 4 weeks. All patients were allowed to touch down weight bearing ambulation using a walking frame starting from the first postoperative day till six weeks, clinical and radiological assessment of fracture union or complication for every patient was carried out pre-operatively or post-operatively at 6 weeks, 3 months, 6 months and 1 year. Functional evaluation was done at year post-operatively by using Harris Hip score.

The duration of study was June-2017 to February-2022

Statistical analysis: Comparison of operation details postoperative complications, loss of reduction details, final outcomes were carried out by using t test and classified with percentage. The statistical analysis was done in SPSS software. The ratio of male and female was 2:1.

Observation and Results

Table-1: Comparison of operation details in both groups

Duration (time in minutes) 40.30 (±6.11) in PEN in surgery and 35.20 (±5.03) in PENA surgery, t test is 38.2 p value $p<0.004$, p value is highly significant

Blood loss (ml) – 75.76 (±14.33) in PFN, 59.39 (± 11.98) in PFNA surgery, t

test was 5.18, p value, $p<0.001$ p value is highly significant

Fluoroscopy Images – 27.48 (± 3.44) in PFN, 16.28 (± 3.11) in PFNA surgery, t test was 27.48, p value $p<0.001$

Table-2: - Comparative study of complication

Cut out / z-effect – 4 (11.4%) in PFN and 1 (2.85%) in PFNA

Re-operation – 3 (8.57%) in PFN and 1 (2.85%) in PFNA patients

Table 3: Comparative study of loss of reduction –

Shortening > 1cm – 6 (17.1%) in PFN, 3 (8.57%) in PFNA surgery

Varus Malalignment – 4 (11.4%) in PFN, 1 (2.85%) in PFNA surgery

Table 4: Comparison of Final outcomes in both groups

Mortality 4 (11.4%) in PFN, 2 (5.71%) in PFNA surgery

Persistent pain – 5 (14.2%) in PFN and 4 (11.4%) in PFNA patients

Use of walking aids – 11 (31.4%) in PFN patients, 7 (20%) PFNA patients

Return to pre-fracture status 17 (48.5%) in PFN, 19 (54.2%) PFNA patients Harris Hip score – 86.4 (± 10.28) in PFN, 89.24 (± 6.65) in PFNA patient, t-test was 1.35, p value is p<0.18 (p value is Insignificant)

Table 1: Comparison of operation details in both groups

Sl. No	Details	PEN (35)	PFNA (35)	t test	p value
1	Duration Time (in minutes)	40-30 (SD±6.11)	35-19 (SD±5.03)	3.82	p<0.004
2	Blood loss (ml)	75.76 (SD±14.33)	59.39 (SD±11.98)	5.18	p<0.001
3	Fluoroscopy Images	27.48 (SD±3.44)	16.28 (SD±3.11)	14.2	p<0.001

Table 2: Comparative study of post-operative complications

Sl. No	Complications	PEN (35)	PFNA (35)
1	Cut out z-effect	4 (11.4%)	1 (2.85%)
2	Re-operation	3 (8.57%)	1 (2.85%)

Table 3: Comparative study of loss of reduction

Sl. No	Loss of reduction	PEN (35)	PFNA (35)
1	Shortening of > 1 cm	6 (17.11%)	3 (8.57%)
2	Varus Malalignment	4 (11.4%)	1 (2.85%)

Table 4: Comparative of Final outcomes in both groups

Sl. No	Final outcomes	PEN (35)	PFNA (35)
1	Mortality	4 (11.4%)	2 (5.71%)
2	Persistent pain	5 (14.2%)	4 (11.4%)
3	Use of walking aids	11 (31.4%)	7 (20%)
4	Return to pre-fracture status	17 (48.5%)	19 (54.2%)
5	Harris Hip score (1 year post-operatively) Range (Minimum to Maximum)	86.4 (SD±10.28) (50 to 95) t test 1.35	89.24 (SD±6.65) 64 to 95) P value p>0.18 (Insignificant)

Discussion

Present comparative study between PFN and PFNA intra-troncheric fractures. Duration of surgery was 40.30 (SD± 6.11) minutes in PFN, 35.19 (SD±5.03) in PFNA, loss of Blood (in ml) 75.76 (SD± 14.33) in PFN, 59.39 (SD± 11.98) in PFNA patients. Fluoroscopy images 27.48 (SD± 3.44) in PFN, 16.28 (SD± 3.11) in PFNA patients (Table-1). Post-operative complications were cut out z-effect 4 (11.4%) in PFN, 1 (2.85%) in PFNA. Reoperation were 3 (8.57%) in PFN only, 1 (2.85%) in PFNA (Table-2). In the loss of reduction study the shortening > 1cm 6 (17.11%) in PFN, 3 (8.57%) in PFNA varus Malalignment 4 (11.4%) in PFN, 1 (2.85%) in PFNA (Table-3). The final out comes were mortality was 4 (11.4%) in PFN, 2 (5.71%) in PFNA. Persistent pain 5 (14.2%) in PFN, 4 (11.4%) in PFNA, Use of walking Aids 11 (31.4%) in PFN, 7 (20%) in PFNA, Return to pre-fracture status 17 (48.5%) in PFN, 19 (54.2%) in PFNA patients Harris HP score was 86.4 (± 10.28) in PFN, 89.24 (± 6.65) in PFNA patients, t test was 1.35 and p >0.18 (p value was insignificant)

(Table-4). These findings are more or less in agreement with previous studies[6][7][8].

Delayed ambulation is related to the development of postoperative pneumonia, delirium and increased length of hospital stay and care time [9]. Closed fracture reduction preserves the haematoma, an essential element in fracture healing [10]. PFNA allows surgeons to minimize soft tissue dissection, therapy reducing surgical trauma, blood loss, and infection and wound complications [11][12]. This may be due to processed helical shaped PFNA blade tail which could result in reduced skin and fascia stimulation. In addition, the PFNA insertion was a simpler and less invasive surgical procedure than PFN technique. Moreover using PFN (screw) or PFNA (helical blade) instrumentation, the degree of osteoporosis has to be given a more important base line or criteria because as age advances, calcar femorale present in the neck degenerate. Hence severe osteoporosis may feel the burden of implantation of instrumentation can lead to re-fracture. Assessment functional outcome post-operatively Harrison Hip score will confirm the degree or gravity of osteoporosis.

Summary and Conclusion

Present comparative study between PFN and PFNA in unstable fractures in Andhra Pradesh Population. PFNA is associated with reduction in duration of surgery intraoperative blood loss, rate of post-fixation failure and post-operation failures were least in PFNA techniques. But this study demands further, genetic, nutritional, musculo-skeletal, patho-physiological studies because the exact mechanism of healing fractures of bone is still unclear.

Limitation of Study – Due to tertiary location of research patients, small number of patients, lack of latest techniques, we have limited findings and results.

- This research paper was approved by Ethical committee of Nimra Institute of Medical Sciences Ibrahimpatnam, Jupudi, Vijayawada-521456
- **No Conflict of Interest**
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