

PFN in Trochanteric Fractures- Clinico Radiological Outcome Study.

Dr. V. Jaiganesh, Dr. Agniraj R, Dr. Sabari Selvam

Abstract:

Introduction: Intertrochanteric fractures are common in elderly osteoporotic population. Our study aims to analyse the clinico radiological outcome in these fractures operated using Proximal Femur Nail. **Materials & Methods:** This is a prospective study conducted multiple department involving 52 patients between June 2015 to June 2017. All patients more than 18 years of age with intertrochanteric fractures less than 2 weeks of injury were included. Pathological fractures, patients with previous hip surgeries, polytrauma and associated neurological problems like stroke were excluded. Fractures classified by AO system and fixed using Proximal Femur Nail. Optimal position of cervical screw in immediate postop and mean lateral sliding of cervical screw during every follow up were analysed. Harris Hip Score is used to analyse the functional outcome at 1 year. **Results:** Optimal Placement of screw achieved in 76% of patients with mean clinico radiological union time of 15.4 weeks. Lateral sliding of lag screw is more in unstable A3 fractures with mean lateral slide of the lag screw at the end of 1 year was 4.9mm.

Conclusion: Proximal Femur Nail is useful impant in unstable intertrochanteric fractures. Complications can be minimised by strictly following the principles of fracture fixation.

Keywords: Intertrochanteric fractures, PFN, Harris hip score, screw cut out, "Z" effect.

Date of Submission: 30-01-2020

Date of Acceptance: 15-02-2020

I. Introduction:

Intertrochanteric fractures are one of the most common fractures in elderly osteoporotic population [1]. They cause significant increase in morbidity and mortality in these age group. These fractures if treated conservatively are associated with considerable period of immobilisation which increases the risk of deep vein thrombosis, bed sore related complications, etc.,. Therefore early stable fixation and early mobilisation becomes mandatory to prevent the potential complications of immobilisation. Though various implants are available for fracture fixation, Short Proximal Femur Nail (PFN) provides stable construct even in unstable fractures and allows early mobilisation and early weight bearing in this people.

The incidence of intertrochanteric femoral fractures has increased significantly during recent decades and this tendency will probably continue in the near future due to the rising geriatric population and increase in incidence of osteoporosis. The incidence of intertrochanteric fractures varies from country to country. Gulberg et al. has predicted that the total number of hip fractures will reach 2.6 million by 2025 and 4.5 million by 2050 (2). In 1990, 26% of all hip fractures that occurred in Asia were intertrochanteric fractures whereas this figure could rise to 37% in 2025 and 45% in 2050 (3). The goal of treatment of these fractures is stable fixation, which allows early mobilization of the patient. These fractures are associated with substantial morbidity and mortality. Associated co-morbid medical problem like diabetes, hypertension, pulmonary, renal and cardiac problems add to the insult of the fracture. Elderly patients are threatened with life-threatening complications such as hypostatic pneumonia, catheter sepsis, cardio respiratory failure and decubitus ulcer. All the circumstances mentioned above require using an urgent surgical solution for early rehabilitation and mobilization of the patient (4). They are also one of the most common fractures encountered in today's orthopaedic practice. Many treatment options are described aiming for stable fixation, which allows early mobilization of the patient as they are unable to even partially restrict weight bearing (5). Dynamic Hip Screw (DHS) is still considered the gold standard for treating intertrochanteric fractures by many. The advantages and disadvantages of the DHS have been well established in several studies done in the past (5). Many studies compare the DHS with Gamma nail (6-8). Not many studies compare the DHS with Proximal femoral nail (PFN), which is being preferred by many. This study was conducted to compare the functional and radiological outcome of Proximal femoral nail (PFN) with Dynamic hip screw (DHS) in treatment of Type II intertrochanteric fractures (Boyd and Griffin classification).

II. Materials And Methods:

Our study is a prospective study involving 52 patients admitted with intertrochanteric fractures in Government Royapettah hospital, Chennai and Govt Theni Medical College between June 2015 to June 2017. All patients with age more than 18 with intertrochanteric fractures less than 2 weeks of injury were included in our study. Patients with previous surgeries in hip or proximal femur, pathological fractures, associated comorbid like stroke and polytrauma are excluded from the study as they interfere with functional outcome. Each patient was stabilized hemodynamically in the casualty. Fractures classified using AO system of classification as below and about 65 % of patients belonged to AO type A2 pertrochanteric multifragmentary type.

1. A1-Pertrochanteric Simple,

2. A2-Pertrochanteric Multifragmentary,

3. A3-Intertrochanteric fracture.

Standard preoperative evaluations were done and surgery done in supine position on fracture table under C arm guidance under spinal anesthesia. The 135° angled Short PFN of length 250mm was used. The diameter of nail was assessed intraoperatively. Our hospital protocols for antibiotic and DVT prophylaxis were followed. Standard rehabilitation protocol were followed in all patients such as hip, knee, ankle mobilization exercises from 2nd post operative day (POD), toe touch weight bearing from 3rd POD, partial weight bearing from 7th POD and full weight bearing after 3 weeks. Suture removal done on 12th day and all patients were followed at 2nd, 6th week and then once in two months. All patients were followed up for minimum period of one year and data like duration of surgery, blood loss, optimal placement of cervical screw, mean union time, lateral sliding of cervical screw were analysed. Functional outcome using Harris Hip Score was analysed at the end of one year. As a standard protocol, intra-venous cefoperazone and sulbactam 1.5 gms was administered intravenously prior to the skin incision. The same combination was used for 48 hours postoperatively in standard doses. Intra-operatively the duration of surgery, the radiation exposure, intra-operative blood loss (method of Lee et al.), size of the incision and any associated complications were noted. All patients in our study underwent a similar rehabilitation protocol involving mobilization from the second postoperative day depending upon the physical condition of the patient, static quadriceps, knee and ankle mobilisation exercises. All drains were removed by 48 hrs. The wounds were inspected on the 2nd post operative day. Stitches were removed between 10th-14th day. Functional outcome was assessed using Harris Hip Score and radiological findings were compared at 3 months, 6 months and 12 months post operatively. All patients were followed up for a minimum period of 1 year. There were no drop-outs in the study. Statistical analysis was performed with the SPSS version

III. Observation And Results:

Demographic characteristics and various observations including average duration of surgery, blood loss, placement of the lag screw, lateral sliding of the lag screw, clinic-radiological union time, functional outcome based on Harris hip score were analysed and documented. Of the 52 patients, 28 patients (54%) were male and 24 patients (46%) were female. Average duration of surgery was 45 mins and average blood loss was about 150ml.

Based on Morihara et al.^[2] study, optimal position of the lag screw in the post operative radiograph analysed by drawing to parallel lines in AP radiograph dividing the femoral head into three equal parts and drawing two parallel lines in lateral radiograph dividing the femoral head into three equal parts as shown in the figure 1.



Fig 1. To calculate the optimal position of the lag screw placement based on Morihara et al. study.

Optimal placement of lag screw i.e. Infero-central position is achieved in 76 % (40 out of 52 patients). Lateral sliding of the lag screw was analysed in AP radiograph during post op follow up and its mean at the end of one year was found be 4.9mm. Mean Clinico radiological union time was 15.4 weeks. On functional outcome evaluation at the end of one year 28% had Excellent, 42% had Good , 18% had Fair, 12% had Poor results based on Harris Hip Score.

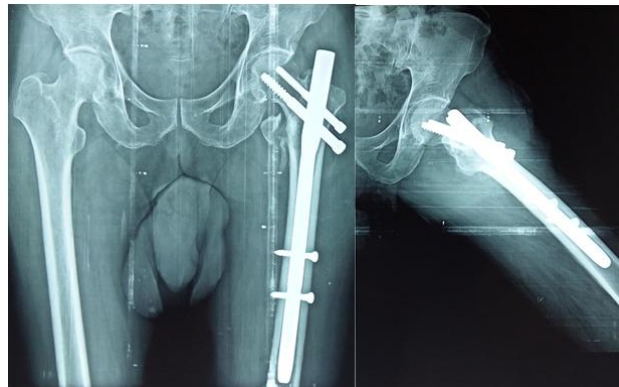
We encountered 3 complications with respect to implant failure such as Z effect, Reverse Z effect, screw cut out that were managed by implant removal and cemented hemiarthroplasty. One fracture at the distal lock site at the end of surgery managed by revision with long PFN . One patient had deep infection that lead to implant removal. Overall complication rate is about 10%.

Figure 2: Case Illustration



70/M patient A2 type fracture

Instrumentation under C arm guidance



Two Year Follow Up

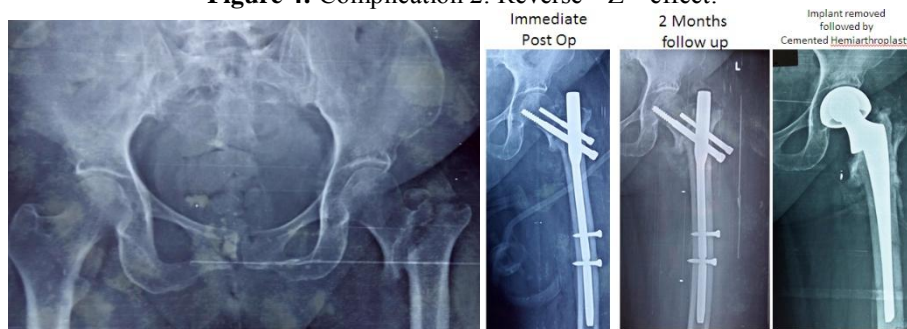
TWO YEAR FOLLOW UP



Figure3: Complication 1: “Z” effect



Figure 4: Complication 2: Reverse “Z” effect:



IV. Discussion:

Operating time and blood loss is minimal in PFN when compared to other procedures^[3,4]. The PFN is provided with 2 screws in head with different size. The larger Lag screw aids in carrying most of the load and comparatively smaller derotation screw provides the rotational stability. When the derotation was 10 mm shorter than the lag screw, the percentage of the total load carried by the hip pin ranged from 8 to 39% (mean, 21%)^[5], cut-out of the femoral head can be avoided and unacceptable implant failure or fracture displacement were reduced significantly^[6].

In a prospective study after analyzing the mechanical failure for the implant in series of 230 patients T.R.C. Davis et al.^[7] published that the reason behind the screw cut out is mainly due to the position of fixation device (posteriorly placed screw more cuts out more than centrally placed) followed by fracture pattern and least due to the bone quality.

To avoid the complications like “Z” effect, screw cutout and paradoxical reverse “Z” effect it essential to assess the sliding distance of lag screw from the early postoperative period. Excessive sliding of lag screw is early indication of the “Z” effect and restriction of normal sliding is an early indication of the screw cutout or penetration of screw into the joint^[2]. Changing the weight bearing protocol to non-weight bearing based on the sliding measurement can avoid such complications. In our study mean lateral sliding of lag screw is about 4.9mm at the end of one year with maximum of 6.1mm in A3 type of fractures.

In a study by Pajarinan et al.^[8], they found that fixing the unstable intertrochanteric fractures initially in a slightly valgus position helps in preventing the excessive varus that may occur during initial 6 weeks. In the article published in 2017 SICOT, Wasudeo M. Gadegone et al.^[9] went one step ahead to find the solution to prevent the implant failure in unstable intertrochanteric fractures by augmenting the fixation by additional Poller screw missing the nail or by using encircling wire thereby preventing the lateral blow out.

But in the critical analysis from the Norwegian Hip fracture register between 2005 to 2010, based on the observation of 7643 operated Type A1 simple two part fractures KjellMatre MD^[10] et al. concluded that sliding hip screw is better in Type A1 simple two part fractures than intramedullary nails like PFN as the later is associated with more number of reoperations within 1st postoperative year.

Good anatomical reduction of the fracture, and proper positioning and length of the lag screw and derotation screws are crucial for the PFN procedure and reported to yield excellent outcomes^[11, 12].

V. Conclusion:

Based on our results, we suggest that PFN is the implant of choice in intertrochanteric fractures but, complication may happen in any best hands that can be avoided by strictly following the principles of fixation, vigilant follow up and early identification of complication postoperative period.

Acknowledgements: NIL

Conflicts of interest: NIL

Funding: NIL

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Dr. V. Jaiganesh, etal. “PFN in Trochanteric Fractures- Clinico Radiological Outcome Stud”.
IOSR Journal of Dental and Medical Sciences (IOSR-JDMS), 19(2), 2020, pp. 15-19.