

FUNCTIONAL OUTCOME OF PROXIMAL FEMORAL NAIL A2 IN TROCHANTERIC FRACTURES OF FEMUR

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Abstract

Background: Inter trochanteric fractures are extracapsular fractures that involve the proximal femur between the greater and lesser trochanter, extending sometimes up to the sub-trochanteric segment. The incidence of complications like pressure sores, pulmonary complications were high with conservative management and hence surgical management gained significance. Options of surgical management include DHS, Proximal Femoral Nail (PFN), PFN A and PFN A2. Thus, this study have opted PFN A2 as the fixation option in the management of intertrochanteric fractures. **Materials and Methods:** This prospective study was carried out among the patients admitted in Trichy SRM Medical College Hospital from October 2019 to September 2020. Thirty patients having unstable intertrochanteric fractures were included in this study and follow-up at 3rd week, 3rd month and 6th month was done and assessed by Modified Harris Hip score. **Result:** Most of the patients belonged to the 6th and 7th decades of life with a female preponderance. Mean incision length was 6cms and the Mean operating time was 50 minutes. The average union time was 12 weeks. Almost all patients were encouraged to weight bear partially by 6th week. **Conclusion:** PFN A2 in the fixation for unstable intertrochanteric fractures proves to be an excellent surgical option by means of a shorter duration of surgery, less blood loss, small incision, early rehabilitation and less chances of implant failure.

INTRODUCTION

Inter trochanteric fractures are extracapsular fractures that involve the proximal femur between the greater and lesser trochanter, extending sometimes upto the subtrochanteric segment. This metaphyseal region composed of the dense trabecular bone has an abundant blood supply that attributes to high union rate and less chances of osteonecrosis. The stability of these fractures are determined by the involvement of the posteromedial aspect of neck of femur referred to as calcar femorale.

Osteoporosis attributes to its high incidence among elderly population, where even a trivial fall may remain the mechanism of injury (McLaurin and Lawler, 2008). Intertrochanteric fractures in a young bone are usually due to high velocity traumas or pathological fractures. Conservative management such as Derotation boot, Upper Tibial skeletal

traction was preferred in earlier days. But the incidence of complications like pressure sores, pulmonary complications were high with conservative management and hence surgical management gained significance (Franco, 2008). Options of surgical management include DHS, PFN nailing, PFN A and PFN A2. By keeping the above observations and literature, we have opted an objective to analyze the PFN A2 as the fixation option in the management of intertrochanteric fractures.

MATERIALS AND METHODS

This is a prospective study that includes 30 patients who had history of trauma to hip and suspected to have a trochanteric fracture who came to the casualty and Orthopaedic outpatient department from October 2019 to September 2020 at Trichy SRM Medical College Hospital and Research

Centre, Tiruchirappalli, Central Tamilnadu. This study was done after getting clearance from the Ethical committee and informed written consent from the study participants. Initially all the patients were given Analgesics for pain relief followed by a detailed history on the mode of injury and clinical examinations.

Radiographs of the pelvis with both hips anteroposterior (AP) view with lateral view of the injured hip were done. Fractures were classified by Boyd and Griffin's types and the patients were put on skin traction without manipulations. Patients were subjected to the study after satisfying the inclusion criteria. Postoperatively, patients were followed on the 6th week, 3rd month and 6th month, and will be assessed by the Modified Harris Hip Score.

Inclusion Criteria

All adult patients (above 18 years of age) and both genders with unstable intertrochanteric fractures

Exclusion criteria - Patients with Open, Pathological, Paediatric and Peri-prosthetic fractures

Methods: Pre surgical anaesthetic work up done for all the patients and the patients were taken up for surgery as early as possible. Patients were given spinal or epidural anaesthesia and pre scrub given. Patients were put on fracture table; through longitudinal traction, adduction and minimal internal rotation fracture reduction was done. Once closed reduction was found satisfactory in fluoroscopy, the surgical procedure was started.

Parts prepared, painted and draped under aseptic precautions. Greater trochanter (GT) tip was palpated and marked, and 5cm proximal to it, a curvilinear incision of nearly 5 to 7cm was made. Superficial dissection was done following which the fascia and abductor muscles were dissected for access to the entry point.

Entry was then made with a bone awl at the medial aspect of GT tip. Guide wire was then passed through the proximal fragment and negotiated through the fracture site. Guide wire position was confirmed under C-arm; serial reaming done until isthmus catch felt. Proximal reaming was done with the 13mm proximal reamer. Appropriate size nail was selected and nail assembly was done; guide wire checking done through the nail assembly in vitro. For long PFN A2 nails, it was made sure the anterior bow of the nail corresponded to that of the femur. Nail was then advanced gently into the medullary canal with the help of Jig until the helical blade portal reaches the level of lesser trochanter (LT) and the proximal tip reaches the tip of GT. In cases, where there was a LT fracture, calcar was kept as a reference point for helical blade portal.

A stab incision was made on the lateral aspect of thigh corresponding to the helical blade portal and the protection sleeve advanced till the lateral cortex.

Guide wire for helical blade passed centrally in both AP and Lateral views. A Tip Apex Distance (TAD) of 20mm was kept as reference ending just proximal to the subchondral region of femur head. Screw size was measured by advancing the depth gauge till the protection sleeve. Lateral cortex entry was made using lateral cortex opener and reaming done.

The appropriate size PFNA2 helical blade was fixed to the impactor and attached to it by counter clockwise turns prior to the impaction. Then the impactor is advanced through the guide wire into the metaphyseal region by gentle hammering. Once impacted, the helical blade was locked by clockwise turns. The significance of this step was observed to be a compression at the fracture site to a maximum of up to 5mm and this compression was checked under fluoroscopy after locking.

Distal locking was done and final reduction was checked under C-arm. Thorough wound wash was given and wound closure was done in layers with drain tube in situ.

Post-OP Protocol

All patients were started on IV antibiotics and continued for 2 days. Mechanical DVT prophylaxis started for all patients. Patients who were suspected to have high risk of DVT were given LMWH (0.4 ml subcutaneously once a day) for 5 days prophylactically followed by Tablet Aspirin (75 mg once daily) for 6 weeks. Wound inspection was done subsequently on 2nd, 5th and 10th post op days.

High sitting motivated on the 1st post op day along with initiation of Quadriceps strengthening exercises. Non weight bearing walking started on the 2nd post op day. In stable fixations, patients were allowed partial weight bearing.

Suture removal done on 12th post op day and patients were reviewed on 4th week, 6th week, 3rd month and 6th month. Check X-rays were done during each visit. All patients were started on Calcium and Vitamin D supplements along with a high protein diet. Patients with severe osteoporosis or no signs of union till 3 months were started on Inj. Teriparatide (20mcg subcutaneously once a day) for 45 days.

The Modified Harris Hip Score was employed to assess the functional outcomes during the follow-up period. The score being classified into Poor (<70); Fair (70 to 80); Good (80 to 90) and Excellent (90 to 100) was assigned according to the outcomes of each patient and were compared with the previous scores. Time for union was estimated for each patient. Patients who had complications were noted and appropriate management was given.

The recorded values were analyzed with a p-value (significant when <0.05). SPSS version 21.0 (IBM inc, Armonk, NY) was used for measurements.



Figure 1: surgical technique and intra operative images. 1a-Post reduction C-arm images, 1b-Incision site marked, 1c, d, e, f –showing guide wire entry, serial reaming, nail entry and helical blade insertion.

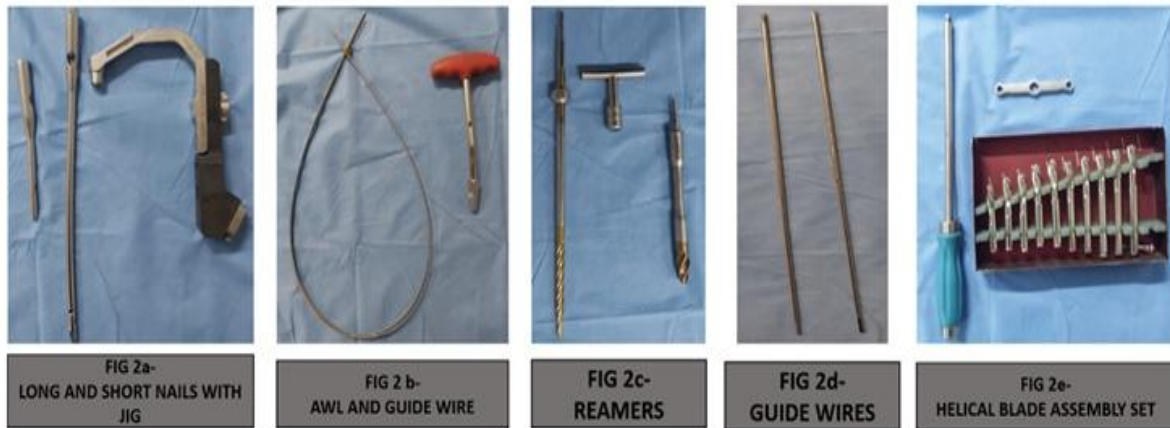


Figure 2: Implant Profile

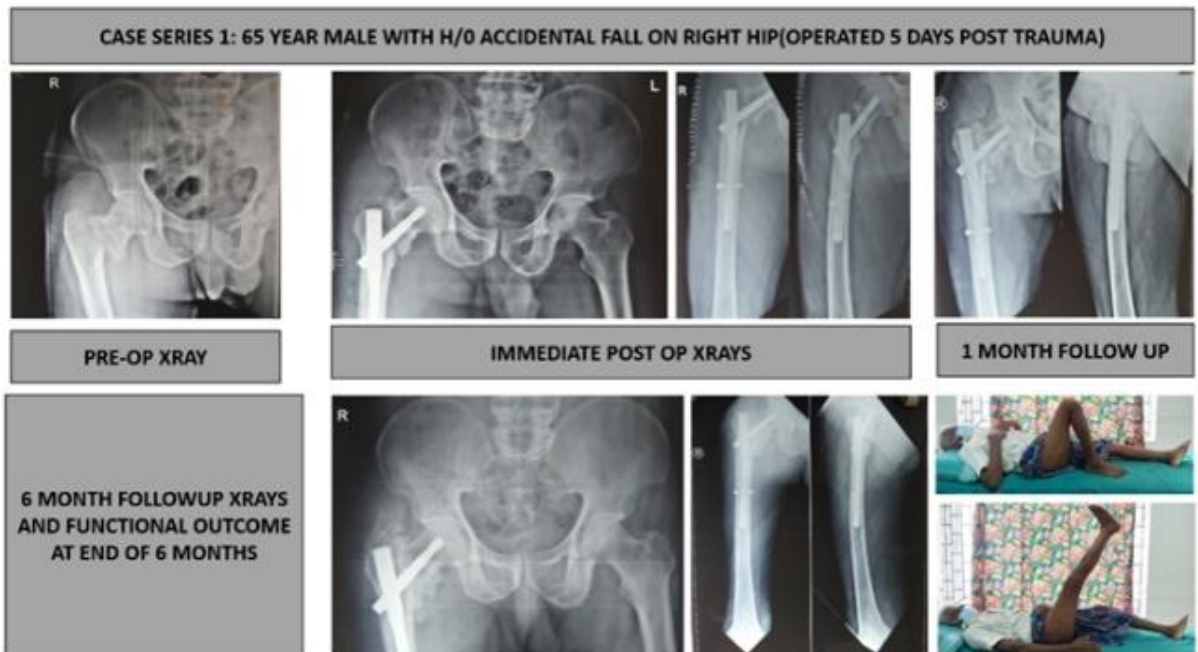


Fig 3: Description of Case series 1



Fig 4: Description of Case series 2

RESULTS

A minimum follow up period of 6 months was done and the clinico functional and radiological outcomes were assessed. The interpretations of our study are as follows.

Most of the patients belonged to the 6th and 7th decades of life with a female preponderance (17 females and 13 males).

The most common mode of injury in the elderly was domestic self-fall on the hip; whereas RTA contributed to the injury in young individuals.

In our study, Boyd and Griffin Type 2 was the most common in nearly 18 patients. 6 patients belonged to type 3 and 6 belonged to type 4.

Type 2 diabetes mellitus, systemic hypertension and coronary artery disease were the common comorbidities encountered in our study population (8 patients were both diabetic and hypertensive out of which 3 had associated CAD, 6 were diabetic and 5 were hypertensive). One patient had post-polio residual paralysis of the contralateral limb and had a hand on knee gait. All other patients had a good ambulatory status prior to the trauma.

All patients were operated within 7 days of post trauma, the average being 4.3 days. Mean incision length was 6 cm. Mean operating time was 50 minutes. Mean blood loss was 200 ml.

Union was achieved in all patients and the average union time was 12 weeks. Almost all patients were encouraged to weight bear partially by 6th week.

Among the 30 patients in our study population, 18 showed excellent outcomes; 6 showed good; 5 showed fair and one patient with blade back out showed poor outcome based on the modified Harris Hip Score.

Complications

A 65 year old female patient developed superficial wound infection which settled with an extended course of oral antibiotics and regular wound cleaning and dressing.

A 75 year old male had helical blade back out (Figure 5), probably due to very poor bone quality and was taken up for implant exit and proceeded with long stem Total hip arthroplasty.

Anterior thigh pain was a common complaint among a few patients during the initial follow-up, but the pain was not disturbing activities of daily living.

Using PFN A2 in younger individuals, while impacting the helical blade, it produces some distraction at the fracture site [Figure 6]. This can be avoided by over reaming the helical blade track over the guide wire.



Figure 5: Image showing helical blade back out



Figure 6: Image showing distraction at fracture site in a young patient

DISCUSSION

Fractures around the trochanteric region are usually associated with comminution making them unstable. This poses a serious risk of devascularisation of the fracture fragments (Barquet et al., 2014). In the recent days the implant option preferred by most orthopaedic surgeons for fixing these unstable trochanteric fractures is the Cephalo-medullary Nail. The reason behind this is intramedullary devices offer a better mechanical, technical and biological advantage over the extra medullary devices (Lu et al., 2022).^[1-3]

In addition, the intramedullary devices offer an additional advantage of a closed procedure and reaming the canal stimulates the periosteal reaction

and generates debris which acts as an autogenous graft at the fracture site (Bakker et al., 2011).^[4,5] Intramedullary insertion of the implant is a technically demanding procedure requiring the assistance of fluoroscopy. Less chance of infection and less soft tissue damage attribute to a higher rate of union. An early allowance of range of motion has decreased the morbidity rate significantly.

The PFN A2 implant is a recently developed one for reconstructing the proximal femur. It is fixed to the femoral head by means of a helical blade. The purpose of this helical blade was assessed by various studies and it has proved to provide both rotational and angular stability as a single component (Meredy et al., 2009). It also provides cancellous bone compaction around the impacted blade.^[6,7]

A multi-centric study has suggested that by controlling the metaphyseal impaction, the helical blade prevents the penetration into femoral head thereby allowing nearly 3/4th of patients with unstable fractures for full weight bearing (Simmermacher et al., 2008).^[8]

Blade back out, a rare complication is mainly caused by faulty techniques while implantation of the device that include the blade in the neck and inadequate fracture reduction or inadequate impaction at the metaphysis (Soucany et al., 2012).^[9]

The PFN A2 is better than PFN A in its construct as it has a diameter reduced from 17mm to 16.5mm and a mediolateral angle reduced from 6 degrees to 5 degrees and a flat proximal surface that avoids lateral cortex impingement (Macheras, 2012; Bobleet et al., 2017).^[10]

Klinger et al suggested that a shorter surgical duration; shorter hospital stay and early full weight bearing as the advantages of PFN A2 nailing over other surgical modalities (Klinger, 2005).^[11]

The biological advantages of PFN A2 nailing include a restoration of abductor lever arm mechanism; decreased tensile strength on the implant and maintenance of controlled fracture impaction.

In terms of operative time, bloodloss, soft tissue damage and overall functional outcome, the PFN A2 nail stands way ahead of DHS especially in unstable trochanteric fractures (Mahavirjangir et al., 2018).^[12] The regular PFN nail with a compression and anti-rotation screw has a drawback of screw back out termed as Z effect or reverse Z effect, which is overcome by the PFN A2 nail (Masuraj et al., 2020).^[13]

Also in short individual's especially Indian females it may not be feasible to put two screws, which is not necessary in PFN A2.

CONCLUSION

PFN A2 in the fixation for unstable intertrochanteric fractures proves to be an excellent surgical option

by means of a shorter duration of surgery, less blood loss, small incision, early rehabilitation and less chances of implant failure.

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