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Research Paper

Study of subtrochanteric fracture of femur treated with proximal femoral nail.

Medical Science

KEYWORDS : Subtrochanteric fracture, PFN

Dr. Parag Tank Assistant professor, department of orthopedics, M P Shah medical college, Jamnagar

Dr. Romin Sanghavi Assistant professor, department of orthopedics, M P Shah medical college, Jamnagar.

ABSTRACT

Background : Subtrochanteric region is junction between cortical and cancellous bone, thus healing is not as good as in I/T fracture (cancellous) and non unions are frequent. The subtrochanteric region, being surrounded by large muscles is a stressful region even during rest. Due to medial position of head of femur, large stress is concentrated on medial and posterior cortex of femur, hence also the frequent site of combination, and thus creating unstable fracture patterns.

Aims : To study the results of proximal femoral nailing & to assess the functional outcome as per harries hip scoring system in the treatment of subtrochanteric fractures of femur

Material & methods : Retrospective study of 40 patients with subtrochanteric fractures of femur treated with PFN and evaluated with functional Harris Hip Score at interval of one year.

Results : We have 33 males and 7 females with mean age of 47 years. We found Seinsheimer type IIIa fracture in majority of cases. On post-operative follow-up, we found two non-unions, two lag screw back out, two lag screw breakage and rest shows good to excellent outcome on Harris Hip Score.

Conclusion : PFN is a closed nailing procedure which achieves a Biological Fracture Fixation with minimal blood loss, preserving the fracture hematoma and helping easy healing of the unstable subtrochanteric femoral fracture in young and elderly age groups.

Subtrochanteric fractures typically occur in the proximal femur between inferior aspect of lesser trochanter and distance of about 5 cm distally, or the centre of isthmus of femoral shaft. These fractures of femur are one of the most difficult fractures to treat. They represent challenges to achieving stable fixation and appropriate reduction regardless of age. These fractures differ significantly from femoral shaft fractures and more proximal femoral fractures in mechanisms, treatment and complications.[1]

Management of this fracture is difficult because this zone of femur is subjected to maximum amount of mechanical stress; tensile and compressive stresses can exceed several multiples of body weight (causing failure of implants), cortical bone (slow healing), associated comminution and short proximal fragments (which are deformed by hip flexors and abductors) make reduction of fractures difficult. In spite of great advances made in the field of trauma in last 50 years management of this fracture has always remained subject of debate. There are several internal fixation options for managing these fractures that generally fall into two categories: some form of intramedullary fixation or some form of plating.

In present series, we have studied cases of subtrochanteric fractures and their management with proximal femoral nailing.

MATERIAL AND METHODS :

We have done a retrospective study of subtrochanteric fractures of femur in 40 patients operated with proximal femoral nailing at our institute with follow up of 9- 36 months. On admission, patient was first examined thoroughly in primary survey for vital data and other major associated injuries in head, thorax, abdomen or spine along with local appendicular injuries.

PROXIMAL FEMORAL NAILING

Patient were given spinal or epidural anesthesia and shifted to a radiolucent fracture table in a supine position with perineal post. Operative leg was slightly adducted and put on traction. Opposite limb was put in a full abduction as to give space for the C-arm in between the legs. Reduction was achieved by traction and internal rotation primarily and adduction or abduction as required. Reduction was checked in a C-arm with anterior-posterior and lateral view.

Methods to achieve reduction by closed means

If indirect reduction was not satisfactory the following methods were used

- Insertion of steinmen pin in the proximal fragment and manipulation so as to correct the deformity.
- Manipulate the proximal fragment with nail insertion
- Maintaining relative adduction of the limb by

- Pulling the chest and abdomen part of the patient towards the normal unaffected side by servant or chest straps.
- Keeping the jig close to the body and inserting the nail in this position.

PFN was fixed in a following manner:

Entry Point is taken with awl/guide pin over a protector sleeve. It should be on the tip of the greater trochanter AP and lateral position. 2.8mm guide wire is inserted in to the femoral shaft and across the fracture site in 6º of valgus and the entry is widened with the owl. Reaming of the proximal femur is done upto the proximal part of the nail to be introduced. Nail is fixed on the jig and the alignment is checked. Then the nail is inserted into the femur. Guide wires for the screws are inserted via the jig and the drill sleeve. The ideal position of the guide wires is parallel and in the lower half of the neck in AP views, in a single line in the center of the neck in the lateral views. The guide pins are inserted up to 5 mm from the articular surface of the femoral head and size of the lag screw determined. Reaming and tapping for lag screw done**.** First the 8mm hip screw is inserted after reaming over the distal wire and then the 6mm neck screw. The hip screw should be 5mm away from the subchondral bone. One or two static or dynamic 4.9mm interlocking bolts are inserted in to the distal part of the nail. Patient was asked to come for follow up 1,2,3 and 6 months from the date of surgery. At each follow up patient was assessed clinically as per Harris Hip score and x ray AP/LAT view of hip with femur is taken.

OBSERVATION :

The age distribution was from 20 to 84 years with mean age of 47 years. In younger and adult injury was caused by high velocity. Out of the three young adults who had a low velocity trauma one was of very poor socioeconomic strata and the other was a chronic alcoholic. In elderly age group low velocity trauma causes this fracture (weakened osteoporotic bone may be the cause).

Most of the patients (approx. 82.5%) in our study were males. Most common cause of injury in our study was a 'Fall Down' closely followed by Road traffic accident. Overall 22.5% of the patients had Associated injuries.17.5 % of patients had associated injury in form of #shaft femur , distal end radius and calcaneum fractures etc. 5% of the patients had other system injuries both of them had head injuries. Right extremity was more involved in our study.

Patients were classified on various types based on Seinsheimer classification. Overall most common pattern were type II (two part fracture). Subtype IIIA(L.T. being the third part) was the most common individual pattern. Least common pattern seen was type I (non displaced), no case. Average time of surgery in our series for PFN was 72.25 minutes. 15 (37.5%) patients were given blood transfusion.

The average radiological union time in our series is 5.1 months ranging from 3 months (in majority) to 11 months in one patient. The average full weight bearing walking time is in our series 4 months ranging from 1.5 months (6 weeks) to 9 months. Partial weight bearing was started early post-operative around 6 weeks time in majority of the patients. 2 patients had non union at the end of final follow up. In PFN nail 2 patients with long spiral fracture encirclage wiring was done to hold fragments by opening fracture site. In one patient we had to do bone grafting because of non union. Infection in 2 cases occurred in PFN of which none was significant enough requiring later removal. (Table 1)

DISCUSSION :

The subtrochanteric fractures are more difficult fractures because the proximal fragment has the tendency to ante flex relative to the distal fragment, owing to psoas muscle activity and shorter distance from locking screw hole to fracture. Non-surgical treatment of subtrochanteric fractures has little or no place due to the high rates of non-unions & malunions due to inability to control muscle forces pulling the fracture fragments in different directions, as well as the morbidity and even mortality associated with the prolonged immobilization. We have studied 40 cases of subtrochanteric fracture of femur treated with proximal femoral nailing. Mean age of the present study population was 47 years, and 62.5% of them were younger than 50 years. Male predominance was seen in number of cases and most of them belonged to age group of 20-50 years mainly because of more active life and so are more exposed to trauma (high velocity esp.). The Seinsheimers [1] series had a younger age group.

The more recent ones Erhan et al[2] 2005, Asian studies by Shieng et al[3] ,SS Sangwan et al[4] had a majority of MALE subjects >60% and a YOUNGER age group. These demographic results were similar to the current study. The mode of injury in young 92% is due to a high velocity trauma similar to the Indian series by SS Sangwan et al[4], which had 75% of patients with high velocity motor vehicular accidents. The fractures in older population were due to low velocity injuries (80%). Rahme, Harris et al[5] infer that majority o elderly present with low energy osteoporotic fractures. Most common type was the II accounting for 35% of fractures followed by III accounting for 32.5% fractures. Different series in the literature shows that most common type of fracture is II and III type and the results of the present study are in accordance with the rest of series. Variables like injury operation interval, operative time and methods and so are subjected to fluctuation. We had stated that fixation with PFN takes less time as compared to fixation with other intramedullary and extramedullary devices, results of our study show that surgery with intramedullary implants like PFN takes a shorter time. (Mean duration of 72 minutes in our series) compared to extramedullary implants like DHS / DCS and blade plates on comparison with other series. Reviewing the literature, it was seen in different series the time taken for surgery was variable and dependent on number of factors like the type of fracture, bone structure of the patient, the skill of the operating surgeon etc and not solely on the implant used. As many of these fractures, are due to high velocity trauma, associated injuries also affected various factors like post operative mobilization and weight bearing irrespective of the modality and reduction of fracture and thus the final outcome. Initially due the closed procedure PFN was preferred but in few cases where fracture was mini-opened good results were obtained (cases with encirclage). In spite of some inaccurate anatomical reductions (seen on x-rays) very good functional results were seen and patients with PFN had a low nonunion rate (2 cases). There were two mortalities in our study. Both were attributable to concomitant medical problems, and the intramedullary nailing (PFN) did not appear to have contributed to patients' medical complications and deaths.

Distal locking was always done and patient was mostly allowed bedside hip and knee bending on the 2nd post operative day (if not contraindicated by associated injuries) and very good patient compliance was seen. Prolonged immobilization and non weight bearing (>9 months) seen in other implants causes significant joint space narrowing.[6] The chances of post-operative infections in PFN are much less owing to small incisions, less surgical dissection and not exposing the fracture site. We have seen two cases of infection of which only one was deep.

In all cases with comminution, in subtrochanteric fracture, the construct (like here the encirclage were done to approximate butterfly and spiral fragment) will try to increase the contact at the fracture site, thus increasing the chance of union of the fracture. The amount of blood loss during operation was less because the femoral head is not reamed and the fracture site is not exposed compared to other intramedullary implants like Gamma nail or extramedullary implants like DHS[7]. Some series with DCS have reported blood transfusion rates of as high as 95% of their patients.[7] We have found a significant shorter mean duration hospital stay in our patients on comparison with other studies of extramedullary implants. The average union time in our study was 5.1 months, lower than some of the union rates of series with other extramedullary implants (AO Blade Plate 7.7 months).[2] There were 2 non unions (5%) in our study. Non union rate of 28% (Rahme et al[5]), 10% (Erhan et al[2]) for Angled plate, (5.3%) for DCS (Sadowski et al[7]) have been reported. Similar studies with PFN have reported nonunion rates of 0% (Shieng et al[3]). Rahme and Harris et al [5] have found non union rates of only 3% in PFN when they compared it with blade plate group(28%). Preservation of fracture hematoma, controlled collapse and less chance of post-operative infection aids early fracture union in PFN and reduces the cases of nonunion. The eccentrically placed extramedullary implants are more prone to fatigue breakage due to their mechanical load-bearing effect. The fixation of subtrochanterric fractures with intramedullary nail is significantly stronger than DCS and DHS (other extramedullary screw plate devices).[8] Based on the Harris Hip scoring system only 4 (10%) of the patients had poor results. One of them had multiple medical co morbidities (DM, HTN, Ca.Breast Grade-IV), the other patient had ipsilateral shaft femur fracture which went into nonunion. The other two were cases of nonunion (one had severely comminuted subtrochanteric fracture with no contact between major fragments, the other patient had old ipsilateral intertrochanteric fracture for which DHS had already been done, he had recurrent fall and fractured the subtrochanteric region of the same limb).

We operated most of the patients within 5 days. The patients operated early had a better outcome than those in whom surgery was delayed. Thus, the conducive environment provided by PFN allows early mobility, independence to the patient and lessens the complications due to the bedridden state and decreases the

time in returning to work.

Table 1 : Results (based on HHS system)

Results	No. of patients (%)
Excellent	17(42.5)
Good	9(22.5)
Fair	10(25)
Poor	4(10)

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