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Original research article

A study on clinical profile of patients with subtrochanteric femur fracture attending tertiary care hospital

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Abstract

There are four main factors affecting the healing process in subtrochanteric fractures, the first and the foremost important factor is the high stress in the subtrochanteric region, especially in the posteromedial cortex. Frankel and Burstein showed that the hip joint reaction forces reaches almost 3 times the body weight upon muscle contraction. Second the abundant large amount of cortical bone hinders the healing process because of the decreased vascularity to the cortical bone when compared to cancellous bone. This study was carried out to study the epidemiology of subtrochanteric fractures and to testify the radiological and functional outcomes of treatment with long proximal femoral nail. All these 30 patients included in the study were followed up at regular intervals. 5 of the 30 patients had associated injuries. Two patients had got fracture colles fracture, one treated with closed reduction with k wiring and other patient treated conservatively by closed reduction and below elbow cast. One patient had bartons fracture treated with open reduction with plates and screws.

Keywords: Subtrochanteric femur fracture, bartons fracture, clinical profile

Introduction

Subtrochanteric Region is defined as a zone extending from the lesser trochanter of the femur to 5cm distal to the lesser trochanter. This area is subjected to higher stresses and compressive forces anatomically. Anatomically this part of the femur is prone for non-union and slow healing. Due to the predominance of cortical bone in this area and decreased vascularity to the cortical bone, healing capacity is impaired. A large amount of significant weight transmission occurs to this area even with normal day to day activities [1].

Forces applied to the hip during ambulation produces stresses in the proximal femur due to the combined effects of axial, bending and torsional loads. Major compressive stresses in the femur are greatest in the medial cortex 5-7cm below the lesser trochanter, i.e. the subtrochanteric region and this region is considered to be one of the highly stressed areas in the body. Tensile stresses of about 25% less occur at the lateral cortex slightly proximally [2]. Following a subtrochanteric fracture, deforming muscle forces play a vital role in causing malunion and produce difficulty in achieving union. Typically, the proximal fragment undergoes flexion, abduction and external rotation due to the unopposed pull by the glutei muscles which gets attached to the greater trochanter, the iliopsoas attached to the lesser trochanter will produce flexion of the proximal fragment. The short external rotators are responsible for the external rotation of the proximal fragment. Distal fragment because of the unopposed pull from the adductor magnus, always displaces it medially and further aggravates the deformity, hamstring muscles are responsible for shortening of the distal fragment. In addition comminution of the medial cortex further adds to the insult of this highly stressed area. By using eccentrically placed devices which include plates and screws, higher forces are generated as compared to the intramedullary devices [3].

There are four main factors affecting the healing process in subtrochanteric fractures, the first and the foremost important factor is the high stress in the subtrochanteric region, especially in the posteromedial cortex. Frankel and Burstein showed that the hip joint reaction forces reaches almost 3 times the body weight upon muscle contraction. Second the abundant large amount of cortical bone hinders the healing process because of the decreased vascularity to the cortical bone when compared to cancellous bone. Furthermore, stripping of the muscles and soft tissue damage occurring during surgical procedure will further devascularize the area. Thirdly, Fromison described the concept of deforming forces in the subtrochanteric area as a factor for slow healing of subtrochanteric fractures. By keeping the fractured bone segments stationary relative to each other and allowing some micromotion, union can be accelerated [4].

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Methodology

This study was carried out to study the epidemiology of subtrochanteric fractures and to testify the radiological and functional outcomes of treatment with long proximal femoral nail. All these 30 patients included in the study were followed up at regular intervals.

Inclusion criteria

- All patients with Subtrochanteric femur fracture.
- All skeletal mature patient (>18years).
- Pathological fracture.

Exclusion criteria

- Patients not willing for surgery.
- Patients medically unfit for surgery.
- Immature Skeleton.
- Open fractures.
- Segmental fractures.
- Patients with neurovascular deficit.
- Pre-existing deformity in the same hip.

Emergency management in casualty

Emergency management of all life-threatening conditions was carried out in casualty with respect to airway breathing circulation,
IV fluids.
IV antibiotics.
Monitoring of vital parameters.
Blood transfusion SOS.
Immobilisation of affected extremity in BB splint by skin traction and if surgery is delayed then skeletal traction is used.
Management of associated injuries to vital organs like chest, abdomen head injury etc.
After stabilisation of vitals, radiographs of the affected extremities were carried out. The fracture pattern was grouped according to classification/inclusion criteria.

Pre-operative management

All routine investigations were done

- Random blood sugar level.
- Hemoglobin level.
- Blood grouping, Rh typing.
- HIV, HCV, HbSAg.
- Serum urea, creatinine.
- Serum electrolytes.
- Chest X-ray.
- ECG and Cardiology opinion and ECHO was taken for relevant cases.

Pre-op planning

1) **Determination of nail diameter:** Nail diameter was determined by measuring diameter of the femur at the level of isthmus on an AP X ray.
2) **Determination of the neck shaft angle:** Neck shaft angle was measured in unaffected side in AP X ray using goniometer.
3) **Length of the nail:** Measured from greater trochanter to lateral knee joint line in unaffected limb.

Results

Table 1: Age distribution

Age (in years)	Number of patients	Percentage
20-30	3	10%
30-40	2	6.66%
40-50	8	26.66%
50-60	4	13.33%
60-70	6	20%
70-80	7	23.33%
Total	30	100%

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In our study maximum age was 80 years and minimum age was 27 years.
Most of the patients were between 61-80 years. Mean age was 55.66 years.

Table 2: Sex Distribution

Gender	Number of patients	Percentage
Male	22	73.33%
Female	8	26.66%
Total	30	100%

The number of male patients in our series were 22 and female were 8.

Table 3: Side affected

Side	Number of patients	Percentage
Right	19	63.33%
Left	11	36.66%
Total	30	100%

Right side were affected in 19 cases and left in 11 cases.

Table 4: Mode of Injury

Mode of injury	Number of patients	Percentage
RTA	16	53.33
FFH	9	30
Trivial fall	5	16.66
Total	30	100

The most common mode of injury in our series were road traffic accidents accounting for 16 cases, followed by fall from height in 9 cases and trivial fall in 5 cases.

Table 5: Method of reduction

Method of reduction	Number of cases	Percentage
Closed	23	76.66
Open	7	23.33
Total	30	100

In this study, open reduction was done for 7 cases (23.33%) out of total 30 cases.
5 of the 30 patients had associated injuries. Two patients had got fracture colles fracture, one treated with closed reduction with k wiring and other patient treated conservatively by closed reduction and below elbow cast. One patient had bartons fracture treated with open reduction with plates and screws.
One patient had fracture shaft humerus for which open reduction and internal fixation done with DCP. Another one patient had ipsilateral tibia fracture for which nailing was done. 3 patients had head injury for which conservative treatment was done.

Table 6: Classification

Seinsheimer classification type	Number of patients	Percentage
Type IIA	4	13.33
Type IIB	5	16.66%
Type IIC	1	3.33%
Type IIIA	9	30%
Type IIIB	6	20%
Type IV	1	3.33%
Type v	4	13.33%
Total	30	100

The 30 subtrochanteric fractures in our study were classified according to Seinsheimer classification. In our study we had 9(30%) cases of type IIIA, 6(20%) cases of type IIIB, 5(16.66%) cases of type IIB, 4 cases of type IIA and type V each and 1 case of type IIC and type IV.

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Discussion

Parker *et al*. [5] reviewed the epidemiology of subtrochanteric fractures and showed that the average age of the patients was 74 years. This is mainly due to the increase in the incidence of fractures in younger patients due to high energy trauma.

Our study mean age was similar to a study conducted by [6] Lei-Sheng Jiang *et al*. where the average age of patients was 53 years, a study similar to our study where comparative analysis of subtrochanteric fractures between locking plate and cephalomedullary nailing, by Philip N. Streubel *et al*., average age incidence was 63 years.

In our study there was a male predominance and 73% of the patients were males with 27% females. In a study conducted by [7] Wei Ting Lee *et al*., also a male pre ponderance was seen with 21 men out of 26 total cases. Indian studies like those conducted by [8] Shah *et al*. and [9] Pradeep *et al*. shows again a male preponderance, but many of the western studies like those by [10] Michael Moustoukas *et al*. showed an almost equal incidence in both sexes.

We observed in our study that the mechanism of injury in majority our patients was following road traffic accidents with 60% of cases sustained fractures following RTA and 40% of cases following accidental fall, a study conducted by Subramanyam Yadlapalli *et al*. also showed similar results.

As compared to extramedullary implants the duration of stay in hospital by Parker *et al*. which was 35 days, the average duration of stay in our series was 11 days.

Werner *et al*. was the first who introduced the so-called Z-effect, detected in 5 (7.1%) of 70 cases. The Z-effect phenomenon is referred as a characteristic sliding of the proximal screws to opposite directions during the postoperative weight-bearing period. In our study we didn't notice Z-effect.

The reverse Z-effect described by Boldin *et al*. occurred with movement of the hip pin towards the lateral side, which required early removal. The mechanism is similar, but here the hip pin is sliding back, whereas the neck screw remains impacted to the hole of the nail. In his prospective study of 55 patients with unstable intertrochanteric or subtrochanteric fractures, they had 3 cases with Z effect and 2 with reverse Z-effect. The authors in an effort to prevent the Z-effect phenomenon suggest the use of a "ring" in the lateral side of the hip pin. In our study we had no case with reverse Z-effect.

Conclusion

In our study of 30 cases, there were 22 male and 8 female patients with age ranging from 27 years to 80 years with most patients in between 60-80 years. 53% of the cases admitted were road traffic accidents, 30% due to fall from height and 17% due to trivial fall with right side being more common side affected.

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