A STUDY OF UNSTABLE INTERTROCHANTERIC FEMORAL FRACTURES TREATED BY TROCHANTERIC FEMORAL NAIL

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ABSTRACT

BACKGROUND

Intertrochanteric fracture is one of the most common fracture of the hip especially in the elderly. The incidence of intertrochanteric fracture is rising because of the increase in number of elderly population along with superadded osteoporosis.

MATERIALS AND METHODS

Study included cases of unstable intertrochanteric fractures (AO and OTA Classification 31-A2 and 31-A3 fracture patterns) that were operated with the short trochanteric femoral nail, which fitted into the inclusion criteria done in medical college hospital, Vijayanagara Institute of Medical Sciences, Bellary, from February 2015 to September 2016.

RESULTS

The age distribution was from 40 to 80 years. The largest group of patients were from 61 to 70 years. The average age was 60.5 years. The number of male patients in our series was 20 (66.7%) and female was 10 (33.3%). Right side was affected in 11 cases (36.7%) and left side in 19 cases (63.3%). Good reduction was achieved in 23 patients (76.7%). Acceptable reduction was achieved in 7 (23.3%) patients due to severe comminution. In our study, 25 patients (83.33%) had no complications. We encountered one intraoperative complication in the form of greater trochanter splintering, while inserting the nail. In our study, we encountered following postoperative complications. We noticed one case of delayed union, one case of Z effect and 2 cases of varus malunion.

CONCLUSION

We conclude that short trochanteric femoral nail provides good fixation for unstable intertrochanteric fractures if proper preoperative planning, good reduction and surgical technique are followed leading to high rate of bone union and minimal soft tissue damage especially for Asian patients with relatively small femora.

KEYWORDS

Intertrochanteric Femoral Fracture, Kyles Criteria, TFN.

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BACKGROUND

Intertrochanteric fracture is one of the most common fractures of the hip especially in the elderly. The incidence of intertrochanteric fracture is rising because of the increase in number of elderly population along with superadded osteoporosis. These fractures are 3 to 4 times more common in women and the mechanism of injury is usually due to low-energy trauma like a simple fall. By 2050, the incidence is estimated to be doubled in the world. In India, the figures maybe much more.[1]

More than 50% of intertrochanteric fractures are unstable. Unstable patterns occur more commonly with increased age and with low bone mineral density.[2]

The surgical stabilisation of unstable intertrochanteric fracture remains a persistent challenge. Dissatisfaction with the use of the extramedullary devices like the dynamic hip screw in unstable intertrochanteric fracture patterns led to the evolution of intramedullary devices.

The purpose of this study is to know the effectiveness and drawbacks of one such newer intramedullary device and the short trochanteric femoral nail in the management of unstable intertrochanteric fractures.

MATERIALS AND METHODS

This study is a prospective, hospital-based study conducted in medical college hospital, Vijayanagara Institute of Medical Sciences, Bellary. The study included cases of unstable intertrochanteric fractures (AO and OTA Classification 31-A2 and 31-A3 fracture patterns) that were operated with the short trochanteric femoral nail, which fitted into the inclusion criteria.

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All patients were informed about the study in all aspects and an informed consent was obtained.

Method of Collection of Data

- By interview.
- By clinical using the Kyle's criteria 3 and radiological examination.
- By analysing case papers.
- By follow up at intervals at 1.5, 3, 4.5 and 6 months.

Inclusion Criteria

a. Patient who has been diagnosed of having unstable intertrochanteric fractures based on clinical signs and symptoms.
b. Radiological findings confirming unstable intertrochanteric fracture. AO and OTA classification 31-A2 and 31-A3 fracture patterns.
c. Patients who are medically fit and willing for surgery.

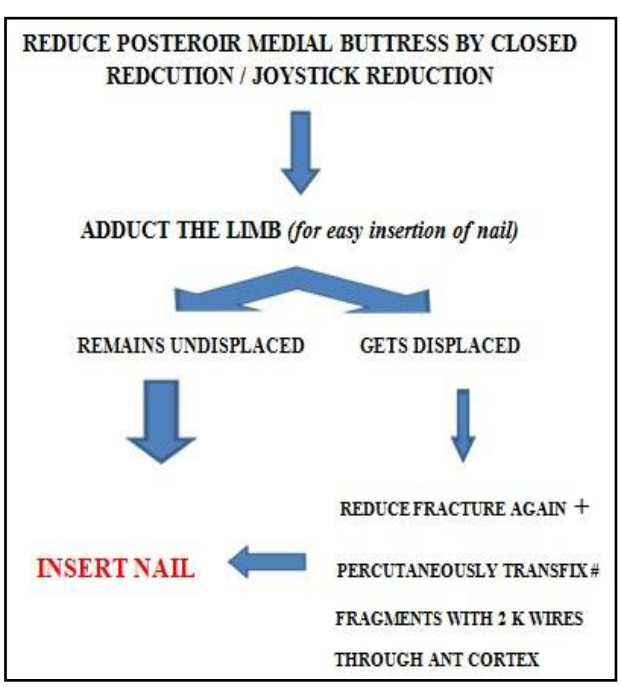
Data Collection and Analysis

After the patient with unstable intertrochanteric fracture (AO and OTA classification- 31-A2 and 31-A3 fracture patterns) was admitted to hospital, all the necessary clinical details were recorded in the proforma prepared for this study. All fractures were treated using a trochanteric femoral nail. Intraoperative data were recorded.

Operative Technique

Anaesthesia- Spinal or epidural anaesthesia was given to all patients.

Patient Positioning- The patient was placed in supine position on a fracture table with the unaffected leg, flexed and abducted as far as possible in order to accommodate the image intensifier. Operative leg was put on traction.



Approach- The tip of the greater trochanter was located by palpation in thin patients and in hefty patients. We used the image intensifier and a 5 cm longitudinal incision was made proximal to the tip of the greater trochanter. An incision was made in the fascia lata and gluteus medius was split in line with the fibres. Tip of the greater trochanter was exposed.

In AP view on C-arm, the entry point was just medial to the tip of the greater trochanter. In lateral view, guidewire position was confirmed in line with the medullary cavity. Entry was made with a bone awl. Over the guidewire, a 14 mm cannulated reamer was inserted through the protection sleeve and manual reaming was done till the stopper on the protection sleeve. After satisfactory fracture reduction, an appropriate size nail as determined preoperatively was assembled to the insertion handle/jig. Before insertion of the nail, the drill sleeves for the proximal screws and distal bolts were inserted into the jig and confirmed if they matched with the holes on the nail. Now, the nail was inserted manually into the femoral opening with limb in adduction. This step was done by twisting movements of the hand under C-arm guidance until the hole for 8 mm screw is at the level of inferior margin of neck. Light blows with the hammer maybe done, if needed carefully. If the nail is inserted to the correct depth, proximal tip of nail usually corresponds to tip of greater trochanter. The anti-rotation screw was inserted first to prevent the possible rotation of the medial fragment when inserting the compression screw. Under C-arm guidance, drilling was done over the guidewire with 6 mm cannulated step drill bit upto a depth of anti-rotation screw previously measured. Intraoperatively, a measuring device can be inserted over the guidewire until it touches the bone to measure the length. Tapping was not done as these screws are self-tapping. The selected size anti-rotation screw was inserted with the help of hexagonal cannulated screwdriver. Length and position was confirmed with C-arm. Guidewire was then removed.

The drill sleeve for the compression screw was first inserted appropriately into the jig and pushed up to the lateral femoral cortex after making a stab incision. The 8 mm compression screw was inserted in the same manner. Reaming was done with the 8 mm cannulated step drill bit. Reaming was done 10-15 mm short from the desired length in osteoporotic bone. Desired length of the screw was measured in the same way, which should be up till less than 10 mm from the subchondral bone. Final position was confirmed with image intensifier. Before doing the distal locking, traction was released. Drill sleeve for distal locking was inserted through the jig after a stab incision. Stability of the construct was then assessed. Wash was given using normal saline. Incision was closed in layers over a negative suction drain (if required). Sterile dressing was applied over the wounds and compression bandage was given.

Postoperative Evaluation of Reduction

According to Baumgaertner criteria modified by Fogagnolo et al.[4]

I - Alignment.

Anteroposterior Plane
Normal collodiaphysial angle or slight valgus.
Lateral Plane- Angulation less than 20 degrees.
II - Displacement of main fragments.

i. More than 80% overlapping in both planes.
ii. Shortening less than 5 mm.

RESULTS

Good	Meets both criteria.
Acceptable	Meets only one criteria.
Poor	Does not meet both criteria.

After the completion of the hospital treatment, patients were discharged and called for follow up at outpatient level at regular intervals at 1.5, 3, 4.5 and 6 months for serial clinical and radiological evaluation. If possible, further follow up was done.

All patients were clinically assessed by using the Kyle's criteria[3] at the end of 6 months. Radiological assessment for progression and time of union, fracture alignment and implant-related complications were analysed. Data collected at the end of the study was statistically analysed.

RESULTS

The study included 30 cases of unstable intertrochanteric fractures (14 patients had 31-A2 fractures and 16 patients had 31-A3 fractures) that were operated with the short trochanteric femoral nail. The age distribution was from 40 to 80 years. The largest group of patients were from 61 to 70 years. The average age was 60.5 years. The number of male patients in our series was 20 (66.7%) and female was 10 (33.3%). Right side was affected in 11 cases (36.7%) and left side in 19 cases (63.3%). The most common mode of injury was trivial fall in 23 cases, which accounted to 76.7% of injuries followed by road traffic accidents in 6 cases and fall from height in one case. 14 patients had grade IV osteoporosis, 15 patients had grade V and 1 patient had grade III osteoporosis according to Singh index of osteoporosis. 7 of the 30 patients had associated medical illness and none of the patients had associated injuries and deformities. 30 cases were reduced by closed reduction method. In one case, Steinman pins were used as joysticks to reduce the fracture percutaneously. In 23 patients, 135-degree nail assembly was used and in 7 patients 130-degree nail assembly was used. The anti-rotation screw was 15 mm shorter than the compression screw on an average. Good reduction was achieved in 23 patients (76.7%). Acceptable reduction was achieved in 7 (23.3%) patients due to severe comminution. In our study, 25 patients (83.33%) had no complications. We encountered one intraoperative complication in the form of greater trochanter splintering, while inserting the nail.

Complications

In our study, we encountered following postoperative complications. We noticed one case of delayed union, one case of Z effect and 2 cases of varus malunion. Varus malunion was attributed to grade III and IV osteoporosis, severe comminution of the fracture and early weight-bearing. We noticed one case with lateral thigh discomfort. We had no cases of anterior thigh pain or femoral shaft fractures or nail breakage. 26 patients had no shortening. The average shortening was 1 cm. The average duration of hospital stay was 19.6 days. All patients were followed up at 1.5, 3, 4.5 and 6 months, respectively. Patients were followed up for a minimum of 6 months and maximum of 1 year. The average time of union was 21.1 weeks, the range being from 19 to 29 weeks in 30 cases. Maximum number of fractures united between 19 to 20 weeks.

In our study, good to excellent results were seen in 76.7% of the cases according to Kyle's criteria at end of 6 months. 23 patients had returned to their preinjury functional level. Further, in initial few patients in whom we could follow up upto 1 year, we noticed improvement in functional outcome. Even though short trochanteric femoral nailing is associated with technical and mechanical complications, it were mostly related to the operative technique, type of fracture, preoperative reduction, time to weight-bearing, instruments and implant quality. Short trochanteric femoral nail provides good fixation for unstable intertrochanteric fractures if proper preoperative planning, good reduction and surgical technique are followed leading to high rate of bone union and minimal soft tissue damage especially for Asian patients with relatively small femora.

Figure 1. Preop

Figure 2. Immediate Postop

Figure 3. Postop - 6 Months

DISCUSSION

Stable intertrochanteric fractures are those, in which posteromedial cortex remains intact and calcar femorale is not affected. Unstable intertrochanteric fractures are those, in which comminution of posteromedial buttress exceeds a simple lesser trochanteric fragment, those with subtrochanteric extension or those with reverse oblique fracture patterns. Stable intertrochanteric fractures are those, in which posteromedial cortex remains intact and calcar femorale is not affected. Unstable intertrochanteric fractures are those, in which comminution of posteromedial buttress exceeds a simple lesser trochanteric fragment, those with subtrochanteric extension or those with reverse oblique fracture patterns. Surgical management is the preferred treatment for unstable fractures. Successful treatment of intertrochanteric fractures depends on surgeon independent variables like bone quality (osteoporosis), fracture pattern and fracture stability and surgeon dependent variables like quality of fracture reduction, choice and placement of implant.[5] The dynamic hip screw is accepted as the gold standard for stable trochanteric fractures. It provides controlled compression at the fracture site. Despite the general success of the sliding hip screw for stabilisation of stable intertrochanteric fractures, there has been dissatisfaction with DHS to stabilise unstable fracture patterns. Cutting out of the sliding hip screw, excessive medialisation of the distal fragment and collapse upon weight-bearing are major concerns.[6,7] In addition, this open technique entailing the sliding hip screw may result in deterioration of pre-existing comorbidities in elderly patients owing to increased blood loss, soft tissue damage and longer rehabilitation.[6] In unstable proximal femoral fractures, control of axial telescoping and rotational stability are essential. Intramedullary implants inserted in a less-invasive manner are better tolerated by the elderly.[8]

The newer gamma nail is a less invasive technique, but is associated with cutting out of the screws, thigh pain and femoral shaft fractures.[9,10] It is associated with technical and mechanical failure rate of about 10%.[10] Gadegone WM, Salphale Y. S. (April 2010)[11] reviewed outcomes of 100 Asian patients who underwent trochanteric nailing for stable and unstable intertrochanteric fractures. They concluded that trochanteric nail is a superior implant for stable and unstable intertrochanteric fractures in terms of operating time, surgical exposure, blood loss and complications, especially for patients with relatively small femora.

CONCLUSION

We conclude that short trochanteric femoral nail provides good fixation for unstable intertrochanteric fractures, if proper preoperative planning, good reduction and surgical technique are followed leading to high rate of bone union and minimal soft tissue damage especially for Asian patients with relatively small femora. Intramedullary fixation has biological and biomechanical advantages over extramedullary fixation. It is a closed method, thus preserves the fracture haematoma and yields early healing and early union. The procedure is less invasive, less time consuming, provides stable fixation and allows early weight-bearing that in turn enhances the process of union, especially in unstable intertrochanteric fractures. Further, it can be used in all unstable configurations of trochanteric fractures with equally good results. However, functional outcome in fractures with severe osteoporosis varied. Most of the complications of short trochanteric femoral nailing are related to the operative technique, type of fracture, preoperative reduction, time to weight-bearing, which can be brought down by proper preoperative planning. Trochanteric femoral nailing requires a higher surgical skill, good fracture table, good instrumentation and good C-arm control. The implant is comparatively expensive and it has a steep learning curve and should be used after proper training.

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