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Closed intramedullary interlocking nailing for fracture shaft of femur: Prospective study

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Abstract
Introduction: Diaphyseal fractures of femur are most common due to increase in road traffic accidents and fall from height from building constructions. Closed or open reduction and intramedullary interlocking nailing is the surgical treatment of choice for the closed diaphyseal fractures of femur. Open reduction and internal fixation with intramedullary interlocking nail is associated with complications like infection, long surgical scardelayed union and nonunion to combat these problems. We have done a study in our institute by closed reduction and internal fixation using intramedullary interlocking to know the clinical outcome.
Materials and methods: Thirty cases of closed diaphyseal fracture of femur were managed with closed reduction and internal fixation using intramedullary interlocking nail between April 2010 and December 2013. And post operatively we evaluated the clinical and radiological outcome at 6, 12 and at 20 weeks.
Results: Based on the Friedman and Wyman scoring, we achived 83.34 % good, 6.67% fair and 10% poor results.
Conclusion: Closed reduction and internal fixation using intramedullary Interlocking nailing excellent method for the management of diaphyseal fractures of femur. This reduces the complications like infection, long surgical scar, delayed union and non-union.

Keywords: Diaphyseal fracture, closed reduction, Interlocking nail, Friedman and Wyman

Introduction
Diaphyseal fractures of femur are most common injuries encountered in emergency, probably due to the increased incidence of road traffic accidents. The treatment for closed fractures in adults ranging from closed manipulation skeletal traction application on bholer braun splint, closed reduction and internal fixation with intramedullary interlocking nailing, open reduction internal fixation with intramedullary interlocking nailing, open reduction intrernal fixation using dynamic compression or locking plates. Closed reduction and internal fixation or open reduction and internal fixation using intramedullary interlocking nailing is the surgical technique of choice. Here we have made an attempt to study the clinical and radiological outcome by closed reduction and internal fixation using intramedullary interlocking nailing.

Materials and methods
We studied thirty cases of diaphyseal fractures of femur, admitted in Department of Orthopaedics in our hospital between April 2010 and December 2013. And post operatively we evaluated the clinical and radiological outcome at 6, 12 and at 20 weeks. This included both males and females within the age group of 20 – 60years. Fractures were classified using Winquist and Hansen Classification of Fracture Comminution.

Grade Degree of Comminution
No comminution.
1. Small butterfly fragment or commuted segment with at least 50% cortical contact remaining between the diaphyseal segments.
2. Large butterfly fragment or comminuted segment with <50% cortical contact between the diaphyseal segments.
3. Large butterfly fragment or comminuted segment with <50% cortical contact between the diaphyseal segments.

4. Complete cortical comminution such that there is no predicted cortical contact between the diaphyseal segments. Segmentally comminuted.

All cases were operated by closed reduction and internal fixation using intramedullary interlocking nail.

Surgical technique

Under spinal anaesthesia with appropriate aseptic precautions, using fracture radiolucent table. Lateral approach was used. The incision from the tip of the greater trochanter extended proximally about five centimetres. The tensor fascia lata was split, the abductors are separated. The awl was put from the pyriform fossa in to the medullary canal. Beaded guide wire was passed in to the medullary canal and closed reduction was done under the guidance of the image intensifier. And the guide wire was passed in to the distal fragment. Reaming done, using flexible reamers. The nail length was measured using the identical length guide wire. Exchange the guide wire through Teflon tube that is to the non-beaded one. Nail was passed over the guide wire. Distal locking done using image intensifier by bull's eye technique and proximal locking with the help of the zig. All four bolts were put in all our cases. The wound was washed with normal saline and closed over layers, sterile dressing done. Postoperatively check X-ray was taken to know the fracture reduction and fixation of the fracture.

Observations and Results

In our study 8 patients were between 20 and 30 years, 6 between 31 and 40 years and 9 between 41 and 50 years and 7 were in 50 to 60 years. Most of them were males 19(63.34%), females 11 (36.67%). Majority of the injuries were due to road traffic accident, i.e., in 23 (76.67%) followed by fall from height in 3 (10%) and history of assault in 4 (13.34%) case. The right femur was affected in 22 cases (73.34%) and the left leg in remaining 8(26.67%). Fracture at mid 1/3rd constituted the majority at 21(70%), lower third 4(13.34%), upper third constituted 5 (16.67%). According to the win quest Hansens classification type I was common with 16(53.34%), type 0constituted 6 (20%) each, type II in 3(10%), type III in 4(13.34%) and type IV in 1 (3%).

Preoperative, Operative and Complications: All patients in our series were operated under spinal anaesthesia. All were operated within forty eight hours of admission. In our series, we have used intramedullary nails ranging from 9 to 11 mm in diameter and from 380 to 440 mm in length. All four bolts were put in our 30 cases.

In majority of our patients, active Hip, Knee, ankle movements and quadriceps exercises were started on the first postoperative day. Majority of patients were mobilized with the axillary crutches from the third postoperative day, non-weight bearing on the operated leg. Suture removal was done in all patients on 12th day. Complete relief of pain was seen in majority of patients in two weeks.

Depending upon the type of fracture and stable fixation of fracture, partial weight bearing was started. In our series, partial weight bearing was started in 22 patients by the end of 4th week. Superficial infections occurred in 1(3%) patients at the site of proximal surgical incision and healed by dressing and antibiotics. In our series one case had postoperatively fat embolism, was managed by steroids, heparin and ventilator support for two weeks. We had no neurological or vascular injury in our study.

Full Weight bearing: Full weight bearing in our series was started at 12th week in 22 patients (73.34%) and at 20th week in 8 patients (26.67%). The appearance of bridging callus on radiographs and clinical assessment was done before the patient has borne full weight.

Fracture Union: In our series, all the fractures united within 20weeks (30 patients). The average time of union was 16.84 weeks. Second surgery in the form of Dynamization was successful in 14 cases.

Results Based on the Friedman and Wyman scoring. We achived 83.34 % good, 6.67% fair and 10% poor results. (Table 1)

Table 1: Friedman and Wyman scoring

Results	Activities of daily living	Pain	Range of motion	Cases	%
Good	No limitation	Nil	<20% loss of hip or knee motion	25	83.34
Fair	Mild limitation	Mild tomoderate	20-50% loss of hip or knee motion	2	6.67
Poor	Moderate limitation	Severe	>50% loss of hip or knee motion	3	10

Complications: we observed one superificaial infection in our study which was healed by regular dressings and antibiotics based on culture report. One case with post-operative fat embolism managed by steroids, heparin and ventilator support for two weeks.

Discussion

Diaphyseal fractures shaft of femur is most common fracture encountered by the orthopaedic surgeon in emergency department. Cinically patients will be having pain, swelling, deformity, unable to walk and in some shock due to hypovumia. Examination show tenderness, swelling, abnormal mobility at the fracture site. X ray examination of the femur full length including hip and knee joint anteroposterior and lateral views confirm the fracture and helps in grading using winquest Hansen classification.

In the Winquist and Hansen system [1], fracture comminution is categorized as from Grade 0 to Grade IV based on the percentage of intact femoral shaft at the fracture site.

Grade Degree of Comminution

No comminution.

1. Small butterfly fragment or commuted segment with at least 50% cortical contact remaining between the diaphyseal segments.
2. Large butterfly fragment or comminuted segment with <50% cortical contact between the diaphyseal segments.
3. Large butterfly fragment or comminuted segment with <50% cortical contact between the diaphyseal segments.
4. Complete cortical comminution such that there is no predicted cortical contact between the diaphyseal segments. Segmentally comminuted.

Over the decades various treatment modalities have been evolved for the fracture shaft of femur in adults, ranging from closed reduction skeletal traction application over the bholer braun splint, external fixator application, open reduction internal ficaion using dynamic/locking compression plate and screws and open reduction and internal fixation using intramedullary interlocking nail and closed reduction and

internal fixation using intramedullary interlocking nail [2, 3]. The closed reduction and skeletal traction application and immobilizatio over bholer braun splin has got complications like prolonged immobility over a period of six to ten weeks, malunion, deep vein thrombosis, plmanary infections and psychological disorders like depression. Open reduction and intenal fixation using plate and screws has got various disadvantages like highly prone for infection, implant failure and needs additional support like thigh brace. Open reduction and internal fixation using intramedullary nailing has got the disadvantages like infection, delayed and non-union lengthy surgical scar. Closed reduction and internal fixation using intramedullary interlocking nail has advantages over all the methods described above in the form of short incision, less bleeding, less morbidity, early mobilization, speedy recovery, less incidence of infection and delayed and non-union. Hence we have opted closed reduction and internal fixation usning intramedullary nailing as choice surgery in all our thirty cases suffering from closed fracture shaft femur. Fracture Union: In our series, all the fractures united within 20weeks (30 patients). The average time of union was 16.84 weeks [4-6]. We achieved 83.34 % good, 6.67% fair and 10% poor results by closed reduction and internal fixation using intramedullary interlocking nail. Our results are comparable to other standard studies [7-9].

Conclusion

By our study Interlocking nailing using distal locking jig is an excellent tool for the distal locking for the diaphyseal fractures of femur. This reduces the hazards of image intensifier to the patient and surgical team. And it's a tool where the centres not having image intensifier.

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