EVALUATION OF RESULTS OF INTERLOCKING NAILS IN FEMUR FRACTURES DUE TO HIGH VELOCITY GUNSHOT INJURIES

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Background: Femoral shaft fractures are common in adult population due to vulnerability to road traffic accident and firearm injuries. There are various treatment modalities to treat the femur shaft fracture i.e. Plating & screws, Intramedullary nailing, External fixator and Interlocking nails. Comminuted fractures due to gun shot injuries are a challenging problem for orthopaedic surgeons. The objective of this study is to evaluate the role of interlocking nailing in the management of femoral fractures due to high velocity gunshot injuries. **Methods:** This descriptive study was conducted on 68 patients at Orthopaedic unit Postgraduate Medical Institute, Lady Reading Hospital Peshawar, from March 2002 to March 2004. The patients of each gender from age fifteen years onward having femoral shaft fracture due to high velocity gunshot injuries who had not previous surgical intervention were included in the study. The exclusion criteria were intertrochanteric, supracondylar femoral fractures and those who failed the follow-up. All the patients were treated with close or open interlocking nails. The outcome measures were graded excellent, good and poor according to radiological and clinical results. Follow-up was for eighteen months and in some cases up to thirty months. **Results:** Out of 68 patients 64 (94.12%) were male and 4 (5.88%) were female patients. The age range was from 15 to 65 years (average age of twenty nine years. The close interlocking nails were done in 64 patients (94.12%) and open interlocking nails were done in 4 patients (5.88%). The static interlocking nailing was performed in 58 patients (85.29%) while dynamic interlocking nailing was performed in 10 patients (14.71%). Knee flexion contracture in 5 cases (7.35%) and limb shortening of less than 2 Cm in 2 patients (2.94%). Non-union were in 4 cases (5.88%). Excellent results were in 42 patients (61.76%), good in 18 patients (26.47%) and poor in 8 patients (11.77%). **Conclusion:** Interlocking nailing is one of the best options for the management of femoral shaft fractures due to high velocity gunshot injuries.

KEY WORDS: Femoral fractures. High velocity gunshot, Interlocking nailing.

INTRODUCTION

The availability of high velocity modern military weapons to the civilian population in this part of the world, combined with the rise of violent crime and an increase of ethnic and social society disputes has made our hospitals resemble to front line military hospitals. Majority of the survived patients have injuries to the extremities and thus involved the orthopaedic surgeon in the management of these patients.

Open fractures of the femur are limb threatening and potentially life threatening emergencies. Fractures of the femur caused by high velocity missiles are difficult to manage because of severe comminution at the site of the fracture and difficulty in maintaining an acceptable reduction.[1,2,3] The poor outcome of application of external fixators, plates and screws and simple intramedullary nails lead many surgeons to manage these fractures in skeletal traction.[3] The missile tracks, soft tissue injuries, open fractures, contamination and involvement of nerves and blood vessels lead to complexity in the management of these injuries. Damage control surgery and intensive treatment has improved the general outcome and allows early functional rehabilitation of the patients with open fractures of the femur.[4]

The goal of treatment in open fractures is to prevent infection, promote fracture healing and restore normal limb alignment and function.[5] The non-surgical techniques for the treatment of open fractures of the femoral shaft are outdated and application of external fixators is not a good method of treatment for union of the bone.[6] Interlocking nailing is considered as goal standard in the treatment of closed diaphysial fractures.[7,8] It is a method of choice for many unstable shaft fractures and open comminuted fractures.[9,10]

The purpose of this study was to evaluate the role of interlocking nailing in the treatment of femoral fractures due to high velocity gunshot injuries.

MATERIAL AND METHODS

This study was carried out in orthopaedic unit Postgraduate Medical Institute, Lady Reading Hospital Peshawar from March 2002 to March 2004 on 68 patients with femoral fractures due to gunshot injuries. The patients of each gender from age fifteen years onward having femoral shaft fracture due to high velocity gunshot injuries (a muzzle velocity of more than 600 meters [2,000 feet] per second), modified Guestillo and Anderson type III A fractures who did not undergo surgical intervention in the past were included in the study. The exclusion criteria was intertrochanteric, supracondylar femoral fractures, and modified Guestillo and Anderson type III B and type III C[11,12] and those who failed the follow-up.

Comminution of the fractures was graded according to Winquist-Hansen Classification.[13]

All patients were admitted through casualty department in the orthopaedics unit Postgraduate Medical Institute, Lady Reading Hospital Peshawar.

Diagnosis was confirmed by radiographs of the femur in antero-posterior and lateral views including the hip and knee joints. Screening of the patients was performed and material for culture was obtained from missile track. Skeletal traction applied, wound was covered with iodide dressing and limb was placed on a splint. First generation cephalosporin and amino glycosides were given intra-venously for 72 hours. We did not perform formal debridement of the wounds in routine.

In majority of the patients close reamed interlocking nailing of the femur was performed on seventh to fourteenth day after the injury. In patients who were not fit for surgery due to associated injuries to vital organs, were haemodynamically unstable or due to active infection at injury site, or were pyrexial, delayed interlocking nailing was performed when their over-all condition improved.

The method of interlocking nails was close or open femoral nailing under image intensifier. Patients were given spinal or general anaesthesia and were put on fracture table for surgery. The type of nailing is ante grade interlocking nails. The entry point is through piriformis fossa while using awl and then crossing the guide wire across the fracture site under image control followed by reaming with power drill and then putting the appropriate size interlocked nail.

Average time of surgery was approximately 90 minutes including set-up time on operation table and close manipulation.

Post operative advice with static interlocking nailing was to avoid weight bearing on the extremity and use two crutches until the appearance of radiological bridging callus. However active and passive program for the mobilization of knee and hip joints was encouraged from day first. In patients with dynamic interlocking nailing we encourage more weight bearing as soon as tolerated.

Follow-up was done for eighteen to thirty months with the first visit after two weeks then monthly visits till union achieved followed by three monthly visits.

The fracture was considered united when the patient was able to fully bear the weight and on radiographs the fracture appeared healed in both anterior-posterior and lateral projections. If the fracture did not unite after twenty four weeks we performed dynamization of static interlocking or dynamization with bone grafting to achieve the union in such patients.

The outcome criteria was designed by one of the authors. According to the criteria the results are graded excellent when the fractures unites within 16 weeks without any complication, good when union occur within 24 weeks with treatable complications like superficial infection and knee stiffness and poor when union occur before or after 24 weeks with one or more permanent complications like infection (osteomyelitis), implant failure, non-union, limb shortening and permanent knee stiffness. Follow-up was done according to these criteria.

RESULTS

Our study is on 68 patients who have completed the follow-up. The age range was from 15 to 65 years (average age of twenty nine years). The male patients were 64 (94.12%) and female were 4 (5.88%). According to Winquist[13] classification the type-II fractures was in 12 patients (17.64%), III in 22 patients (32.35%) and IV in 34 patients (50%). The incidence of fracture in different parts of femur is shown in Table-1. There were 2 types of interlocking nails shown in Table-2.

Table-1: Site of femur fracture (n=68)

Femur site	Number	%
Proximal 3rd	20	29.42
Middle 3rd	35	51.47
Distal 3rd	13	19.17

Table-2: Types of nails (n-68)

Types	Number	%
Static nails	58	85.29
Dynamic nails	10	14.71

Dynamization was performed in 10 patients (17.24%) out of 58 static interlocking nails patients from 24 to 30 weeks after surgery to achieve union. Bone grafting was done in 4 cases (5.88%) of nonunion during dynamization. There were certain complications in our study shown in Table-3.

Table-3: Complications of interlocking nails (n=68)

Complications	Number	%
Infections	7	10.30
Limb Shortening	2	2.94
Non Union	4	5.88
Knee stiffness	5	7.35

The close interlocking nails were done in 64 patients (94.12%) and open interlocking nails were done in 4 patients (5.88%) because the guide wide could no pass across the fractures site. Peripheral nerve injuries were in 6 patients (8.82%), i.e., 2 sciatic nerve and 4 peroneal nerves. These injuries were due to initial injury.

Out of 76 patients with femoral fracture due to gunshot injuries there were additional systemic injuries also in 17 (25%) patients.

Failure of interlocking screws were recorded in 3 cases (4.41%); 2 proximal and 1 distal at 8, 12 and 14 weeks after static interlocking nailing. Cause of failure was premature weight bearing. Fractures healed without additional operations or loss of reduction. The outcome of interlocking nails is shown in Table-4.

Table-4: Outcome of results of interlocking nails (n=68)

Outcome	Number	%
Excellent	42	61.76
Good	18	26.47
Poor	8	11.77

All 68 fractures united at an average of 24 weeks (range, from 16 to 48 weeks) after the nailing.

DISCUSSION

Fracture due to high velocity gunshot injury is a unique type of open fracture. These fractures are usually so comminuted that it is very difficult to achieve and maintain reduction of the bone. We have found little information in the literature about the surgical management of open fractures of the femur due to high velocity gunshot injuries.

There are various treatment modalities for open comminuted femoral fractures like plates and screws, intramedullary nails, external fixators and skeletal traction. High rates of complications have been reported with application of external fixators for the treatment of femoral fractures.[14] The disadvantages of external fixators include; pin tract infections, osteomylitis, mal-union, delayed union, non-union and joint stiffness.[15,16]

In recent years, closed intramedullary nailing has become the treatment of choice for close diaphysial fractures of the femur.[17,18] But in comminuted fractures and fractures associated with loss of bone it may result in excessive shortening or rotation around the nail. The basic concept of interlocking nailing is to combine the advantages of closed interamadulary nailing with the added fixation of transfixing screws; this prevents axial sliding and rotation.[9] Interlocking nailing has biological and biomechanical advantages in comparison with plate osteosynthesis.[19,20]

In early studies all the patients treated with static interlocking nailing had dynamization of the static nail by removal of the proximal or distal locking screws. As the study progressed, it is believed that static interlocking nailing should be converted to dynamic nailing only if evidence of delayed union is present as shown in our study.[9,16,21]

Close interlocking nailing required appropriate pre-operative management, preventive antibiotics together with excellent operative techniques and skills and is not without complications.[9,22] Errors in the positioning of the patient, incorrect portals of entry and inadequate reduction can lead to angulatory deformities, to inequalities in limb lengths and to implant failure

In our study mostly male patients got femur fracture due to gunshot injuries were 94.14% as compare to female 5.88%.

Middle part of femur shaft was more involved 51.47% as compare to proximal 29.42% and distal part 19.17%. In our study the static interlocking nails was 85.29% and dynamic nails was 14.71%.

In our study all knee flexion contractures were due to delayed surgery because the patients remained in skeletal traction for longer period before surgery due to unstable condition and all resolved with physiotherapy.

There were 2 patients (2.94%) who developed limb shortening of 2 Cm and 4 patients (5.88%) got non-union.

Post-operative infection occurred in 7 cases (10.29%). In all these cases the site of infection was missile track. In 3 cases out of 7 it was superficial infection and settled down after daily dressing and appropriate antibiotic therapy. In 2 cases, living in a refugee camp, the infection subsided by administration of anti-tuberculosis therapy. While in 2 cases with chronic discharge and signs of delayed union we performed proper excision of infection track with curettage of fracture site, bone grafting and dynamization after 32 and 36 weeks respectively after the surgery.

Bone grafting was done in 4 (5.88%) cases of non-union. No rotational deformity occurred in the series. Six patients (8.82%) had peripheral nerve injury of the affected limb due to initial injury. One patient with sciatic nerve palsy recovered completely and the other had incomplete return of function.

In our study excellent result were in 61.76%, good in 26.47% and poor in 11.77%. The incidence of infection, delayed union and non-union in our series were comparable with reports of interlocking nailing in closed femoral shaft fractures.[9,21,23]

CONCLUSION

Interlocking nailing is one of the best options for the treatment of comminuted femoral fractures due to high velocity gunshot injuries, providing and maintaining proper reduction (alignment) of the fracture through minimal exposure. It reduces the chances of infection, providing early mobilization of the patient and thus facilitating early union of the fracture.

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