

# PRELIMINARY EXPERIENCE WITH INTRAMEDULLARY INTERLOCKING NAIL SYSTEM

HASSAN DOST AFRIDI, NADEEM KHALID, I. A. JOKHIO

Department of Orthopaedics, Dow Medical College & Civil Hospital, Karachi

Correspondence : Dr. Hassan Dost Afridi

**ABSTRACT :** This is the preliminary report of an ongoing study where 23 cases of simple and compound fractures have been fixed with interlocking nail system, from Feb. to Nov. 1995. The results were good, even when compound fractures were fixed after 6 hours of initial injury. We recommend fixation of such compound injuries after taking tissue samples for culture and thorough wound excision/debridement under cover of parenteral 3rd generation cephalosporins. Solid nails without reaming are ideal for use in compound fractures while reaming with hand is better.

**KEY WORDS :** Simple Fractures, Compound Fractures, Intramedullary Interlocking Nails.

## INTRODUCTION

There are different methods of treating fractures of the shaft of long bones. The recent evolution of improved internal and external fixation devices have merely served to increase the controversy regarding the best method of treating these fractures. Generally speaking, the majority of tibial shaft fractures can be treated with closed reduction<sup>1</sup> and cast immobilization, but a 50% union rate has been reported in such cases. Hence, such fractures are better treated by the AO dynamic compression plate<sup>2</sup>. However, intramedullary nailing<sup>3-5</sup> with or without a supplementary device (splint, cast or traction) has also been advocated as the best technique.

The introduction of interlocking nails<sup>6</sup> have greatly increased the scope of intramedullary nailing. Excellent results have been obtained in the treatment of femoral<sup>6</sup>, humeral<sup>7</sup> and tibial<sup>8</sup> shaft fractures using this technique. Interlocking nailing was first introduced in 1968 by Kuntscher and is now accepted as the method of treatment in diaphyseal fractures.

The aim of this study was to observe the effectiveness of the interlocking nail system, especially reaming with hand, and fixing fractures even after 6 hours of initial injury including compound Gustilo type 3A, 3B and 3C fractures.

## PATIENTS & METHODS

From February to November 1995, 23 cases of frac-

tures involving shaft of long bones were treated with interlocking nails at Orthopaedic Department of Dow Medical College and Civil Hospital, Karachi. Of these there were 22 (95.65%) males and one (4.35%) female. Their ages ranged from 20 to 60 years. Various long bones involved are shown in Table 1. Fourteen (60.87%) had simple fracture whereas 9 (39.13%) cases had compound fracture as seen in Table 2.

**Table 1. Long Bones involved in fractures**

Bone Involved	Number	%
Femur	9	39.13
Tibia	9*	39.13
Humerus	5	21.74
Total	23	100.00

\* one patient had bilateral tibial fracture

**Table 2. Breakup of Compound Fractures**

Gustilo Type	Number	%
1	3	33.34
2	2	22.22
3A	1	11.11
3B	1	11.11
3C	2	22.22
Total	9	100.00

Both Gustilo type 3C fractures were due to gunshot injury. One fracture humerus had brachial artery and one femur fracture, femoral arterial injury. In both

cases angiography confirmed the vascular trauma besides establishing good collateral supply thereby obviating the need of vascular grafts. The patient with femoral arterial injury was referred from a peripheral hospital and developed acute renal failure due to hypovolaemic shock. He was operated 3 weeks after the initial injury.

In all compound fractures debridement was done after initial resuscitation in the casualty department and parenteral antibiotics started. In 3 patients blood was transfused, one with the bilateral tibial and two with the Gustilo 3C fractures. No blood was transfused during or after the interlocking nail procedure. Tourniquet was not used in all cases.

Time interval between injury and operation in simple fractures was 2-38 days (average 13 days), in case of compound fractures it was 2-21 days (average 9 days). Operating time ranged from one and half to 3 hours (average 2 hours, 15 mins).

#### Technique

In case of femur fractures the patient was kept in the supine position and traction applied through the foot. In cases of tibia with the patients in the supine position, a calcaneum pin was passed and a bar kept under the knee joint. Traction was applied by attaching the stirrup to the calcaneum pin and medial parapatellar approach used. In case of femur and tibia distal locking screws were put by Steinmann's pin method under image intensifier and drilling done. Radiolucent drill was not used as it was not available in our unit.

In humerus fractures with the patients in the supine position, the affected arm was adjusted over the radiolucent area of the operation table and a nail passed from the upper end of the bone. Humerus locking screws, proximal and distal were fixed by target devices.

In simple fractures reaming was done manually whereas no reaming was done in compound fractures. After intramedullary reaming a 1mm larger size interlocking nail (Biomet) was inserted. Skin losses were covered by partial thickness skin grafts. As our theatres do not have Charnley's ventilating system, antibiotics were used routinely. Post-operative pain was controlled by giving appropriate analgesics. Two fractures had to be explored due to difficulty in passing the guide wire in the distal fragment of the

fractures, one a 38 days old fracture humerus while the other was a 20 days old fracture femur. In one case wrong placement of the proximal locking screws led to splintering of the proximal bone fragment.

On second or third post-operative day partial weight bearing exercises were allowed. Patients were followed up in OPD at 4-6 weekly intervals and clinical and radiological healing progress recorded.

#### RESULTS

Wound healing took place in 10-40 days (average 14 days). Joint mobility at the time of discharge is shown in Table 3.

Table 3. Joint Mobility on Discharge

Result	Range of Movement	Pts. No.
Good	85-100%	15 (65%)
Fair	50-85%	08 (35%)
Poor	< 50%	00 (00%)

All patients returned to work within 6-35 days (average 20 days). Complete bony union was achieved in all 23 cases both clinically and radiologically. One case of compound Gustilo type 2 fracture tibia, developed infection which was treated by drainage and parenteral antibiotics. Neuropraxia was seen in 3 cases, radial nerve lesion in a fracture humerus and common peroneal nerve lesion in two cases of fracture tibia, due to over traction and bar pressing on the neurovascular structures in the popliteal fossa. All cases recovered on conservative treatment.

Bending and breaking of screws occurred in two cases of fracture tibia at the site nearest to the fracture. In one case the broken screw was removed whereas in the other it was left as such. Both fractures united satisfactorily. No mortality, deformity, fat embolism, compartment syndrome or D.V.T. was seen in any of these cases.

#### DISCUSSION

In this study early and proper fixation of fractures of femur, tibia and humerus gave very good results. Even in Gustilo type 2 and 3 fractures we were able to approximate wound edges and apply loose sutures after fixation of the fractures.



Fig. 1. Compound Fracture of Humerus



Fig. 2. Same Patient as in Fig. 1. showing healing with Interlocking Nail

In most studies<sup>3,4,8</sup> compound fractures were fixed within 6 hours of injury whereas we fixed them even after 6 hours. However, we did debridement before fixation of the fractures and took samples of tissue for culture.

C-Arm facilities were not available in our emergency operation theatre, hence fractures were fixed on the routine list. This gave us a new approach to deal with the problems faced in this part of the world.

Bending and breaking of screws were seen in two patients who did not follow the instructions of partial weight bearing. In cases of unreamed nails, removal of the distal screws after 6-8 weeks will dynamize the fracture and lead to early bone healing without breaking and bending of screws.

One of our patient, who was mentally retarded, would have difficulty with other methods but was managed successfully with the interlocking nail. He had a fracture femur Gustilo type 3B caused by gunshot injury. He fell from the hospital bed 3 times but the nail did not break.

Minimum interference with periosteal attachment and of fracture haematoma are important contributing factors for success in the interlocking nail system. As opposed to conventional reaming<sup>9,10</sup> we had used manual reaming in our study. Although it is time consuming and physically demanding we got good results i.e. no incidence of fat embolism, compartment syndrome or DVT.

## CONCLUSIONS

Our experience with the intramedullary interlocking nail system revealed fewer complications, early mobility and early return to work. Early fixation is better but compound fractures can be fixed even after 6 hours of initial injury. No blood transfusions required hence no danger of AIDS or Hepatitis B. Reaming with hands is relatively safer.

## REFERENCES

1. Cimino WG, Corbett ML, Leach RE. The role of closed reduction in tibial shaft fractures. *Orthop Rev.* 1990; 19 : 233-40.
2. Christensen J, Greiff J, Rosendahl S. Fractures of shaft of Tibia treated with AO compression osteosynthesis. *Injury.* 1982; 13 : 307-14.
3. Brumback RJ, Ellison PS, Poka AP, Lakatos R, Bathon GH, Burgess AR. Intramedullary nailing of open frac-

- tures of the femoral shaft. *J Bone Joint Surg (Am)*. 1986; 71 : 1324-30.
4. Chapman MW. The role of intramedullary nailing in open fractures. *Clin Orthop*. 1989; 212 : 26-34.
  5. Winquist RA, Hasen ST, Claswson DK. Closed intramedullary nailing of femoral fractures. *J Bone Joint Surg (Am)*. 1984; 66 : 529-539.
  6. Christie J, Court-Brown C, Kinninmoth AWG, Howie CR. Intramedullary locking nails in the management of femoral shaft fractures. *J Bone Joint Surg (Br)*. 1988; 70B : 206-10.
  7. Mingman A, Waters DA. Locked intramedullary nailing of humeral shaft fractures. *J Bone Joint Surg (Br)*. 1994; 76B : 23-9.
  8. Court Brown CM, McQueen MM, Ouaba AA, Christie J. Locked intramedullary nailing of open tibial fractures. *J Bone Joint Surg (Br)*. 1990; 72B : 959-64.
  9. Jone LB, Johnson KD. Treatment of tibial fractures by reaming and intramedullary nailing. *J Bone Joint Surg (Am)*. 1986; 68 : 877-87.
  10. Kessler SB, Hallfeldt KJ, Perren SM, Schweiberr L. The effect of reaming and intramedullary nailing on the fracture healing of long bones. *Clin Orthop*. 1986; 212 : 18-25.