Original Article

Comparison of Solid versus Cannulated Interlocking Nail in Fracture of Shaft of Femur in Adults

Muhammad Javaid Iqbal, Ajmal Yaseen, Sajjad Rasool, Rasul Ahmed Chaudhary

ABSTRACT

Objectives: The aim of this study was to compare the outcome of solid versus cannulated interlocking nails as a method of internal fixation in closed femoral shaft fractures in adults. **Study Design**: Quasi Experimental. **Place and Duration of Study:** Orthopaedic Department Allied Hospital, Faisalabad a teaching hospital affiliated with Punjab medical college, Faisalabad. Duration of study was from Jan 2007 to Dec 2008. **Patient & Methods:** The study was based on sixty cases. Thirty cases were included in either group of solid and cannulated intramedullary interlocking nails. The solid interlocking nailing group was designated as group A, the cannulated as group B. The most common cases were road traffic accidents. The average hospital stay was 6 days. The follow up time was 9 months. **Results**: : In group A we have union time within 3 months in 26(86.66%) patients, delayed union in 3(10%) patients & non union in one patient(3.33°%).Three patients in group B(10%) went into non union, one due to deep infection, one due to implant failure & breakage of nail & one with no apparent cause. Regarding infection we had superficial infection in one patient of group A & two patients of group B which was corrected with appropriate antibiotics. No case of deep infection occurred in group A but one in group B which went into non union. Regarding implant failure, we had no implant failure in group A & four cases of implant failure in group B with one nail breakage, two distal locking screw breakage &one proximal locking screw breakage. **Conclusion:** The most common cause of femoral shaft fractures is road traffic accident with male adult population affected the most. There was no statistical difference in union & infection in both groups. (p value >0.05).There was significant difference in implant failure in both groups with no patient in group A & four in group B (p value <0.05). So solid interlocking nail is stronger than cannulated one. **Key Words:** Fracture shaft femur, interlocking nail.

INTRODUCTION

Fractures of the shaft of femur are among the most common fractures encountered in orthopaedic practice[1] .The majority of these injuries occur in young active working community and is result of high energy mechanism such as motor vehicle accident, falls from height or industrial accidents.[2, 3] Because of traumatic nature of these injuries and intensive surgical intervention required, soft tissue pathology is common. It may limit the return of patients to their previous level of function.[4] Almost half of the patients treated for limb fractures at level one trauma centers have some residual disability even 12 months after injury & up to 20% of patients treated surgically for femoral shaft fractures are unable to return to work even three years after surgery.[5] Several treatment options are available for treatment of femoral shaft fractures.[6] Management of patients with an intramedullary nail inserted into the femur is the standard of care for surgical fixation for most femoral shaft fractures.[1,2] Intramedullary locking nail have proved to be of considerable advantage when treating complex, comminuted or segmental femoral shaft fractures. Intramedullary nailing has many theoretical & practical advantages over other forms of external & internal fixation in terms of stable and reliable fixation with early weight bearing[6]. The straight tubular anatomy of femoral shaft is ideally suited to intramedullary nailing. Nails are inserted with relative ease without the extensile exposure. Various designs of

interlocking nailing systems allowing closed nailing techniques have been used in the treatment of femoral shaft fractures since the first "de tensor" nail was described by Kuntscher in 1968. These systems control shortening, angulations and rotations in complex fractures via screws / bolts that may be inserted transversely and or obliquely through the nail both proximally and distally to the fracture site. These nail systems served as load bearing devices. Intramedullary nails can be solid or cannulated; these differ in their physical properties of stiffness, axial load, bending and torsion. Solid nail is said to be stiffer in comparison to cannuIated.[7,18] Fracture healing after intramedullary interlocking nailing is effective with union rates between 95% to 99%[5]. The bone healing can be demonstrated both clinically and radiologically. Impairments and functional limitations however may persist following injuries and surgical procedures long after bone healing and these may be attributable to soft tissue injuries as a result of trauma at the time of injury or surgery or both.[4] Common complications seen after fixation of femoral shaft fractures are limb shortening, deformities which may be rotational, valgus or varus, infections both deep and superficial, delayed union, non union, knee stiffness and implant failure. Fractures were considered to be united clinically in the absence of movements and pain at the fracture site. Radiological union was achieved in the form of uniform and continuous callous with consolidation and development of trabeculae across the fracture site. Union time more than 26 weeks in closed and 39 weeks in open fractures were considered to be delayed union.[8,9,10] The non union was labeled in the presence of abnormal movements at fracture site after 9 months of injury and with no progressive signs of healing for at least 3 months despite continuing treatment[10]. The purpose of this study was to compare the results of solid and cannulated interlocking nails in treatment of femoral shaft fractures. This comparison was on the basis of union, implant failure and infections.

MATERIALS AND METHODS

60 patients were included in this study. In group A 30 patients were included in which solid intramedullary interlocking nail was used for fixation of fracture shaft of femur. In group B 30 patients were included in which cannulated intramedullary interlocking nail was used for fracture fixation. Sample technique was non probability purposive sampling. Inclusion criteria was all patients between the age of 18—60 years presenting in accident and emergency department of Allied Hospital Faisalabad, with closed non comminuted femoral shaft fractures. Exclusion criteria was patients with poly trauma, open fractures, patients unfit for anesthesia, pathological fractures, fractures more than 3 weeks old and non union fractures. Patients were assigned group A or B randomly by lottery method. All the patients were explained the nature of intervention and informed consent was obtained. The patients were examined thoroughly for the evidence of any other injuries. X-rays were done to confirm the fracture of shaft of femur and to exclude other injuries like pneumothorax and other fractures. Routine investigations like complete blood count, random blood sugar, urea, serum creatinine were done. The patients were resuscitated with intra venous fluids or blood transfusions as the case may be. Strong analgesic was given to relieve the pain and skeletal traction applied until definitive surgery. The patients were assessed regarding fitness for anesthesia and fit patients underwent surgery. A single shot of broad spectrum antibiotic was given to all patients at the time of induction of anesthesia. An incision was made at the fracture site to expose and reduce the fracture .The patients were discharged on third post operative day. Post operatively broad spectrum antibiotics were given for 7 days. For the first three days intravenous and the rest 4 days oral. Skin stitches were removed on 10th post operative day and further follow up was done at 6, 12, 16, 20 and 24 weeks up to 9 months. At each visit clinical examination was done and radiograph was taken to see union, implant failure and infection. Presence of infections were assessed by fever, rise in local temperature, local redness and any discharging sinus. If there was infection culture sensitivity was done and appropriate antibiotic was given. Partial weight bearing was allowed when there was radiological evidence of union defined as when strands of ossified callus could be seen to be stretching continuously from one bone to another. Clinical union was declared when fracture could not be angulated with normal loads and weight bearing was

pain free. Signs of infection included raised local temperature, localized redness, localized tenderness and discharging sinus. Data analysis were done using SPSS version 10 software programme.

RESULTS

We had a total of 60 cases with 30 each in either group A & B. Solid nails was used in group A and cannulated in group B. There were 53 males and 7 females. Group A had 27 males (90%) & 3 females (1O %). Group B had 26 males (86.66%) & four females (13.33%).The youngest patient was 25 years old & oldest one was 60 years. The mean age was 37.4 ± 1.6l years. Most of the fractures occurred between ages 25-40 years. The most common site of fracture was middle third 32 cases (55%) followed by upper third, 16,(25%) & distal third 12 (20%).Most common mode of injury was road traffic accident. The average duration of hospital stay was 6 days. In group A 29 patients had union one had non union in which bone grafting had to be done after 9 months to achieve union. Out of 29 patients who got union, 26 united within 3 months & 3 went into delayed union which united ultimately. In group B 27 patients got union & 3 patients went into non union. Out of these 3 non unions, one was due to deep infection, second was due to nail breakage and in the third no apparent cause was found. The infection rate was different in both groups A & B. Superficial infection occurred in one patient of group A & 2 cases of group B. All the cases of superficial infection were treated by appropriate antibiotics according to culture & sensitivity reports. No case of deep infection was found in group A while one occurred in group B which lead to non union. Regarding implant failure no case was found in group A & 4 cases were found in group B. Among them one was nail breakage which lead to non union, two cases had distal locking screw breakage and one had proximal locking screw breakage.

DISCUSSION

Orthopedic surgeons often encounter diaphysial femur fractures.[1,2,3] Because most often as a result of high energy trauma, one must have a high index of suspicion for complications and other injuries. While the mainstay of treatment has been reamed interlocking intramedullary nailing, a variety of treatment options exist for solitary fractures or fractures with associated injuries.[11] Non surgical options usually used in younger patients and children include skin traction, skeletal traction or cast brace and spica casting. Surgical options used in the adults are intramedullary nailing either antigrade or retrograde, plate fixation & external fixation are used less frequently, but these have place in decision making process for the ideal treatment in certain cases.[12] In paediatrics cases flexible nails can also be used in addition to other options. However one must consider the patients immature bones, open physis and growth potential when forming treatment plan in children.[4] In our study no patients in group A had implant failure but 4 cases in group B had it. This much difference might be due to multiple reasons. Firstly as studied by Schaandelmaier P et al.[13] The relative stiffness of unslotted solid nail is more (0.6-1.8Nm/degree) as compared to slotted (cannulated) nail (0.2Nm/degree).Secondly the quality of material used may matter. We used solid nails donated by an American NGO but cannulated nails used were local made so quality of material may matter. We compared our results regarding infection, non union and implant failure to many studies like Borel JC et al[14], umer M et al[15] ,Hafiz ur rehman et al[16] and Brumbeck et al[17] etc. Our results were comparable to these studies with minor differences.

CONCLUSION

The most common cause of femoral shaft fractures is road traffic accidents & effects the adult male population. There was no difference in superficial infection & union in both groups but one patient in cannulated group had deep infection & went into non union. There is significant difference of implant failure in both groups. No patient in group A had implant failure but 4 patients in group B had implant failure. So solid interlocking nail is stronger than cannulated interlocking nail.

REFERENCES

1. Whittle AP, Wood GW II. Fractures of the lower extremity. In: Canale ST, editor. Campbell's operative orthopedics. Vol.3. 10th.ed. Newyork: Mosby; 2003;2725-872.

2. Blustrode CJK, Kinninmonth A. Lower limb trauma. In: Russell RCG, Williams NS, Bulstrode CJK, editors. Bailey & Love's short practice of surgery. 24th ed. London: Arnold; 2004; 397-405.
3. Hafeez UR, Ghulam MKK, Haq NU, et al:Interlocked intramedullary nailing in open femoral shaft fracture: JPOA 2010 ;22:82-86.
4. Bednar DA, Ali P. Intramedullary nailing of femoral shaft fractures: reoperation and return to work. Can J Surg 1993;36:4.
5. Wolinksy P, Tejwani N, Richmond JH, Koval KJ, Egol K, Stephen EK. Controversies in intramedullary nailing of femoral shaft fractures. Instr Course. Lect 2002; 51:291-303.
6. Haque MA, Hossain MZ,KabirMH:Interlocking intramedullary nailing in fracture shaft of the femur:Mymensingh Med J.2009;18:159-64.
7. Bong MR, Kummer EJ, Koval KJ ,Egol Ka.Intramedullary Nailing Nof Thelower Extremity: Biomechanics and Biology.J AM Orthop surg 2007;15:9.
8. Ricci WM, Gallager B, Haidukewych GJ:Intramedullary nailing of femur shaft fractures;Current concepts:J Am Acad Orthop Surg.2009;17:296-305.
9. Ali MA, Hussain SA, Khan MS: Evaluation of results of interlocking nails in femur fractures due to high velocity gunshot injuries:J Ayub Med Coll Abbottabad 2008;20:16-9.
10. Mirad T .Operative treatment of femoral shaft fractures in children:a nine year experience in Saudi population. Injury 2000;31:769-71.
11. Innocent CI,Johnson DO, Henry RI:Achieving interlocking nails without using image intensifier: Int Orthop.2007 ;3:487-490.
12. A Qayyum, BA Mir, MA Halwai: Biological outcome of single proximal and single distal screw in intramedullary interlocking nailing of fractures of femur: The internet Journal of Orthopaedic Surgery 2009Vol.14 No.2.
13. Schandelmaier P, Farouk O, Krettek C, Reimers N, Mannss J, Tscherne H. Biomechanics of femoral interlocking nails. Injury 2000;31:437.
14. Borel JC, Dujardin F, Thomine JM, Biga N. Closed locked nailing of complex femoral fractures in adults. Apropos of 68 cases. Rev Chir Orthop Reparatrice Appar 1993; 79:553-64.
15. Umer M, Niazi AK, Hussain D, Ahmad M. Treatment of acute fractures of the femoral shaft with reamed intramedullary interlocking AO nails. J Pak Med 2004; 54:423-7.
16. Hafiiz-ur-Rehman, Anjum MP, Kaimkhani G, Memon MA, Qureshi MA.. Interlocking versus Kuntscher nails in the management of femoral shaft fractures. Pak J Surg 2007;23:265-9.
17. Brumback RJ, Ellison TS, Molligan H. Pudendal nerve palsy. Complicating intramedullary Nailing of the femur. J Bone Joint Surg 1992; 74:1450-5.
18. Augat P,Penzkofer R, Nolte A, Maier M ,Panzer S ,V Oldenburg G ,et al. interfragmentry movement in diaphysial tibial fractures fixed with locked intramedullary nails. J orthop trauma 2008; 22:30-6.

AUTHORS

- **Dr. Muhammad Javaid Iqbal**
  Assistant Professor Orthopaedic
  Allied Hospital, Faisalabad
- **Dr. Ajmal Yaseen**
  Associate Professor Orthopaedic
  Allied Hospital, Faisalabad
- **Dr. Sajjid Rasool**
  Postgraduate Resident Orthopaedic
  Allied Hospital, Faisalabad
- **Dr. Rasul Ahmad Chaudhry**
  Professor of Orthopaedic Department
  Allied Hospital, Faisalabad