

Results of Antegrade Closed Static Femoral Interlocking Nailing for Closed Femoral Shaft Fractures

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Abstract

Objective: To evaluate the results of closed antegrade static femoral nailing for closed Winquist type III and IV fractures of shaft femur.

Methodology: A descriptive study conducted at department of Orthopedic surgery in Al Kadhimya hospital from March 2008 to July 2010. Twenty eight patients are included, twenty male patients and eight females, three were missed during follow-up period, admitted to the emergency department and operated on with closed reamed interlocking ante grade nailing under general or spinal anesthesia within 72 hours. Followed up for one year looking for union rate, malunion, infection, knee joint stiffness and trendelinburg gait.

Results: Union was achieved within twenty weeks in (twenty two 88%) patients, delayed union until thirty six weeks in (two 8%) patients and (one 4%) patient developed non union proved clinically and radiologically.

Infection developed in two patients (8%) at the site of distal screw insertion, both were superficial and resolved conservatively.

Knee joint stiffness developed in six patients (24%), from which five resolved completely within six weeks of physiotherapy and one with long term less than twenty degree knee joint stiffness.

Trendelenburg gait developed in four (16%) patients, three (12%) resolved completely within ten weeks and one patient (4%) continues with Trendelenburg gait after one year.

The mean operative time was 90 minutes.

Malunion as shortening less than one cm developed in two cases (8%) and angulations less than 10 degrees in one case (4%).

Key words: Closed, reamed, ante grade, static interlocking nails, femoral shaft fracture.

الخلاصة

الهدف من الدراسة: لتقييم نتائج استعمال مسمار مقفل من الجهة العليا لكسور ساق عظم الفخذ المسدودة لنوع ونكست الثالث والرابع

طريقة البحث: بحث وصفي في مستشفى الكاظمية من اذار 2008 الى تموز 2010 شملت 28 مريض ادخلوا ردهة الكسور وتم إجراء العملية خلال 72 ساعة و تم متابعة نسبة الالتحام و الالتهاب و قوة العضلات الاليوية و وقت العملية و تيبس الركبة و نسبة التغير في استقامة الكسر .

النتائج: أظهرت الدراسة إن نسبة الالتحام كانت 88% و تأخر الالتحام 8% و عدم الالتحام 4% و إن تيبس الركبة كان بسيطاً في 24% تحسن كلياً بالعلاج الطبيعي و الالتهاب السطحي 8% و تغير طريقة المشي 16% و إن وقت العملية كمعدل 90 دقيقة و تغير استقامة الكسر كان بسيطاً في 12%.

Introduction

Fractures of femoral shaft are a major cause of morbidity and mortality in lower limb injuries. Most fractures are sustained in young adults during high velocity injuries⁽¹⁾. Even with survival after initial trauma, disability usually results from femoral shortening, fracture malalignment or prolonged immobilization of the extremity

by traction or casting in an attempt to maintain fracture length and alignment during early phases of healing⁽²⁾.

There is considerable debate regarding the best method of treating femoral fractures⁽³⁾. The unattainably perfect method of fracture treatment would safely fix the fractures so firmly that soft tissue and joints could be mobilized early and continuously during

healing and offer sufficient strength to maintain fracture alignment ⁽⁴⁾. A method closely approaching this perfection is intramedullary interlocking nails. Interlocking intramedullary nailing of femur greatly improves rotational stability and can be used for axially unstable diaphyseal fractures ⁽⁵⁾. They have the advantage of providing greater fatigue strength, better stability in all planes and providing reamed bone at the fracture site ⁽⁶⁾. This treatment modality has been the subject of controversy since its introduction because of concern of damage to medullary circulation and possibilities of fat embolism ^(7,8).

Intramedullary fixation may be categorized biomechanically as dynamic and static, the decision between the two is dedicated by the anatomical level, fracture pattern and the comminution of the fracture which is categorized by the method of Winquist and Hansen ⁽⁹⁾

Early mobilization of patients is an important factor in treating the fractures of long bones. If internal fixation is indicated the ideal treatment for the fractures of shaft femur is intramedullary nailing which allows early mobilization and weight bearing. The fractures of femur are treated by different methods like plating which is not ideal because the patient has to be not weight bearing for long time. K-nail fixation is liable for shortening and rotational deformity especially in comminuted fractures. In external fixation for comminuted fractures as pines are going through the soft tissues patients feel pain and stiffness of the knee joint in addition to the risk of pin tract infection and prolonged non weight bearing ⁽⁴⁾.

Patients and methods

This descriptive study was carried out at orthopedic department in al kadhimiya hospital. Twenty male and eight female patients, all the

patients were explained about the treatment plan, hospital stay after surgery ,complications of anesthesia and their follow up after operation till the time of union or to a maximum of nine months. Examination of patients was done thoroughly at time of admission to exclude other injuries.

Inclusion criteria:

Skeletally mature patients with closed fractures of the middle two thirds of the femoral shaft with winquist type three and four.

Exclusion criteria:

Patients with multiple injuries or previous injuries to the same limb, medical illnesses especially peripheral vascular disease.

Patients were laid down on the fracture table with traction via foot piece (fig. 1, 2, 3). The fracture was reduced by traction and manipulation under image intensification. After preparing the femur in standard manner, skin incision was performed on the proximal tip of the greater trochanter, the fascia of the gluteus maximus incised in line with its fibers. Subfascial plain of the gluteus maximus identified and piriform fossa palpated. Hollow manual reamer was introduced over a beaded wire to locate the exact entry points which is verified by X-ray fluoroscopy. Guide rode was introduced and advanced into the centre of distal fragment until the tip reached the superior patellar pole. Reaming with power reamer was done up to the isthmus corticalis. Nail with 1 mm diameter less than the last reamer was selected and introduced over a spike wire, with appropriate length as gauged by the standard length of the guide wire. Proximal locking was done with jig and distal locking free hand technique. Wound was closed in standard manner and antiseptic dressing was done.

Full mobility at bed is allowed immediately postoperatively, touchdown weight bearing was started as soon as the pain subsided. Patients were kept on oral antibiotics for two weeks, the time of stitch removal. Those patients were assessed periodically every month and assessed especially for gait (trendelenburg), infection rate, knee joint stiffness, looking for signs of radiological union and any malalignment till a maximum of nine months or till a bone union is proved.

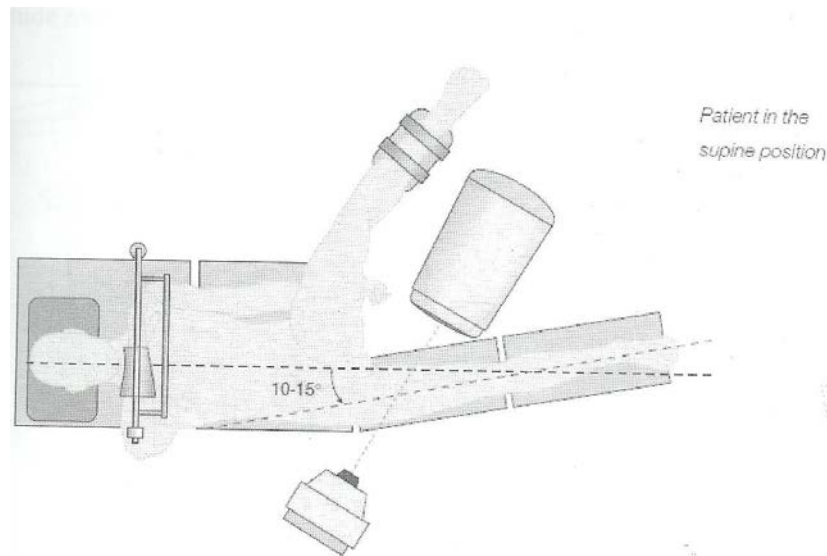


Figure 1. Positioning of the patient

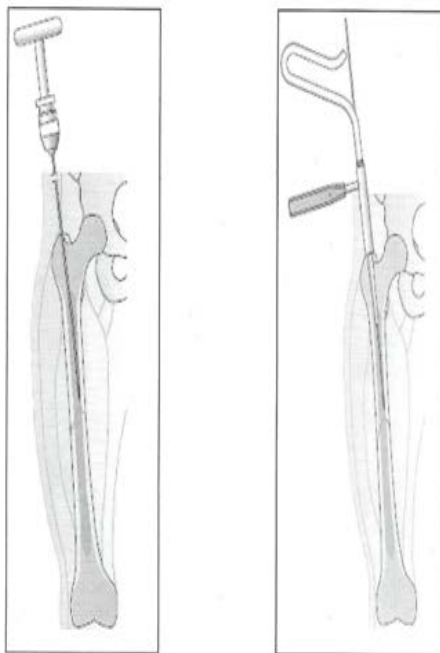


Figure 2. Reaming over a beaded wire

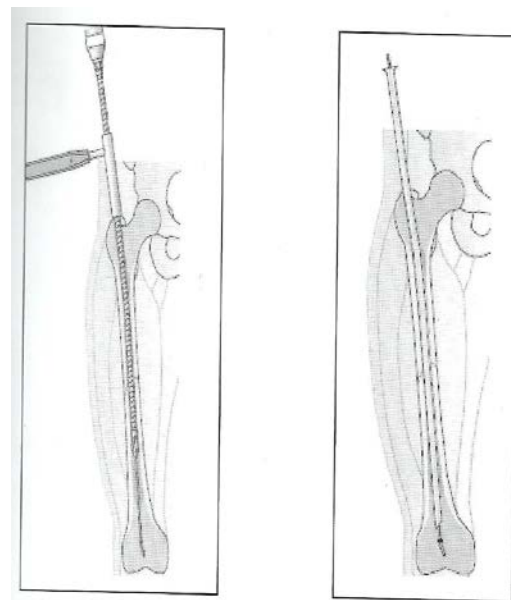


Figure 3. Insertion of the guide wire

Results

The age range was from 13-65 years, the average age was 34 years.

The mechanism of injury was road traffic accident in 18 (72%), fall from height in 7 (28%). Among all (15) patients (60%) were winquist type three and (10) patients (40%) were winquist type four. Union rate was 22 patients (88%) within twenty four weeks, delayed union in (2) patients (8 %) and non union in one case (4%). Infection rate was (2)

cases (8 %),and the trendelenburg gait was in four cases (16 %), three (12%)resolved completely with normal gait at ten weeks post operative examination, one (4%) continues with Trendelenburg gait after one year . Knee joint stiffness was in six (24%) cases, all but one case (4%) resolved within six weeks of physiotherapy to full flexion-extension, the only one case (4%) ended with 0-120 flexion - extension degrees.

Malunion in form of less than one cm shortening observed in two patients (8%) and

angulation of less than 10 degrees was observed in one patient (4%).

The mean operative time was around 90 minutes, ranging from (55 -130) minutes. (Fig. 4, 5, 6)

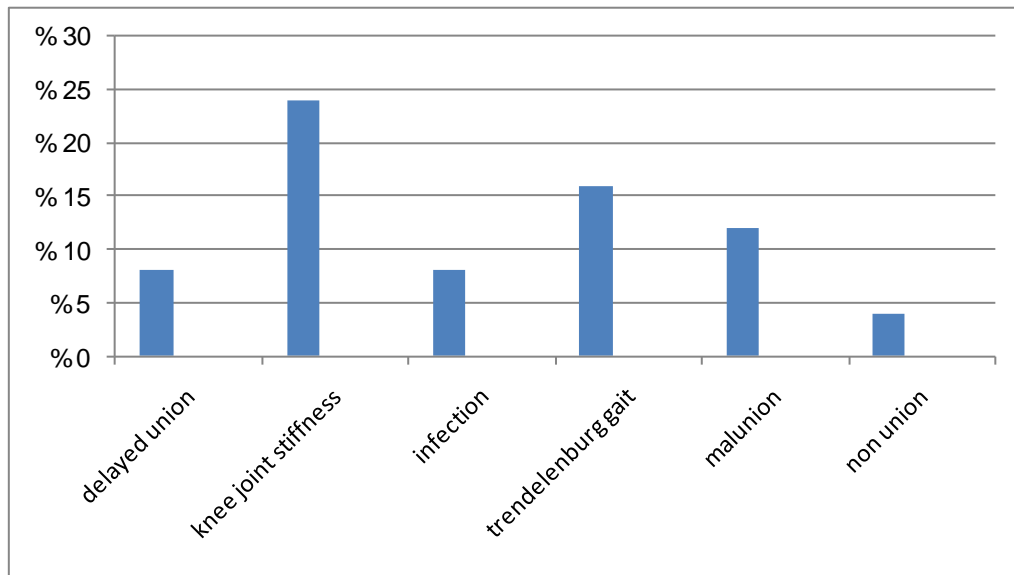


Figure 4. Complications of static antegrade interlocking femoral nailing

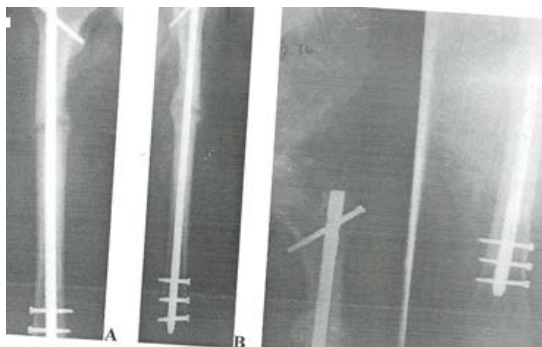


Figure 5. X-rays of non-comminuted fracture



Figure 6. X-rays of comminuted femoral fracture

Discussion

Closed femoral shaft fractures occur as a result of road traffic accidents or fall from height, they can be life threatening and associated with multiple injuries^(6,10), treatment goals include allowing early mobilization of the patient, restoration and maintenance of normal length and alignment, achieve union and maintain a normal functional range of motion in both hip and knee, the sum of hip and knee range of motion and flexion should

total at least 160 degrees to allow the patient comfortable stair climbing^(11,12).

At present time the ideal treatment for skeletally mature patients with closed fracture femur shaft from the level of lesser trochanter to within 6-8 cm of the distal subchondral bone is closed intramedullary nailing, orthopedic literatures also supports closed nailing in adolescents⁽⁶⁾.

To confirm the union rate in static nailing and to prevent the complication of malunion from not locking the nails in unstable fractures, Brumback et al⁽¹³⁾, in a prospective study of one hundred cases of femur shaft

fractures treated with static nailing. all fractures united ,the only two required dynamization for union.

In a study from Pakistan ⁽¹⁴⁾, forty seven out of fifty cases united, ten of them necessitate dynamization.

Numerous studies have documented 97-100% union rate after reamed locked nailing, Kropfl et al reported a union rate of 100 % in a study of 81 femoral fractures treated with locked nailing ⁽¹⁵⁾. Imran, et al ⁽¹⁶⁾ reported a study of 37 cases in which union rate was 100%. Javaid, et al reported in their study that reamed nailing reported 100% union rate, without any complication ⁽¹⁷⁾.

Clatworthy MG et al ⁽¹⁸⁾ reported delayed union in one case out of 27 patients.

Giannoudis PV,et al ⁽¹⁹⁾,reported non union in one out of 27 cases with mean operative time of 105 min.

Selvakummer K,Saw KY,Fathima M. ⁽²⁰⁾, reported average operative time of 109 min,with delayed union in two out of 52 cases.

Orler R,et al ⁽²¹⁾ reported 3% delayed union and 4% non union after reamed nailing

Most of large series ^(22,23) of femoral shaft fractures treated with closed nailing report a non union rate of less than 1%.Non union is propably due to lack of blood supply at the fracture site caused by either open reduction and surgical manipulation, or inadequate stabilization of the fracture site, wound infection or over distraction .

Delayed union is seen more commonly the non union, and is seen more commonly in multiple injuries and segmental fractures ^(10, 11, 24).In our study (8 %) had delayed union, mostly in Winquist type IV.

Malunion after femoral shaft fractures has been discussed. Shortening up to 1 cm is quite acceptable, we used static nailing therefore the problem of shortening is not so significant (less than one cm is acceptable in 8%), angulatory malunion after IM nailing also reported (4%) compared with 1.5% in Winquist series ⁽⁹⁾.

Conclusion

This study showed that static IM nailing is a successful method for managing wiquist type 3 and 4 femoral shaft fracture with high union rate and few complications without the need for dynamization in the majority of cases,it is

the treatment of choice for such unstable fractures, the technique is time consuming but is simple to learn and it is recommended to adopt this procedure in all trauma centers in Iraq , the main disadvantage is the relatively long operative time.

References

1. Salminen ST, Philajamaki HK, Avikainen VJ, Bostman OM, Population based epidemiologic and morphologic study of femoral shaft fractures. Clin Orthop. 2000;373:241.
2. Catagni MA,Mendlick RM. Femoral fractures. Tech Orthop 1996;11:160
3. Anderson RL. Conservative treatment of fractures of the femur. J Bone Joint Surg(Am) 1967;49-A:1371
4. Zickle RE. Fracturesof the adult femur excluding femoral head and neck: a review and evaluation of current therapy. Clin Orthop 1980;147:93
5. Sultan S. Interlocked nailing of comminuted fractures shaft of femur. J Ayub Med Coll Abbotabad 2001;13(3):14
6. Beaty JH, Austin SM, Warner WC , et al. Interlocking intramedullry nailing of femoral shaft: preliminary results and complications ,J Ped Orthop 1994;14:178-83
7. Bone LB, Babikian G, Stegemann PM. Femoralcanal reaming in poly trauma patients with chest injury: a clinical perspective. Clin Orthop 1995;318:91
8. Norris BL. pulmonary dysfunction in patients with femoral shaft fracturs treated with intramedullary nailing. J Bone Joint Surg (Am) 2001;83-A:1162
9. Winquist RA, Hanssen ST, Jr, Clawson DK . Closed intramedullary nailing of femoral shaft fractures: a report of five hundred and twenty cases. J Bone Joint Surg 1984;A66A:529-39
10. Brumback RJ, Ellison PS, Poka A, et al. Intramedullry nailing of open fractures of femoral shaft. J Bone Joint Surg 1998;71A:1324-30
11. Brumback RJ, Handal JA, Poka A,et al. Radiograph analysis of theBrooker-Wills interlocking nail in the treatment of comminuted femoral fractures J Bone Joint Surg 1997;71A:1372-30
12. Galpin RD, Willis RB, Sabano N. Intramedullarynailing of pediatric femoral fractures. J Pediatr Orthop 1994; 14:184-9
13. Brumback RJ, Toal TR Jr, Murphy-Zone MS,Immediate weight bearing after treatment of a comminuted fracture of femoral shaft with statically locked intramedullry nail. J Bone Joint Surg(Am) 1999;81:1538.

14. Muhammed Karaman Pak J Med Sci October-December 2008(part 1) vol.24 No.5 598-701
15. Kropf A,Naglik H,Primavesi C,Hertz. Reamed intramedullary nailing of femoral fractures. J Trauma 1995;38:717
16. Imran F,Tussadaq N, Ahmed Z, khan AR, Malik G. Interlocking nail for long bone fractures. Faugi Found Health J 2001;2(1):14
17. Zubair M Javid ,Mateen MA, Hussain A. Closed intramedullary nailing versus dynamic compression plating for femoral fractures in adults. J Pakistan Inst Med Sci 1997;7(2)8(1,2):499-504
18. Clatworthy MG, Reamed versus unreamed femoral nailing. A randomized prospective trial. J Bone Joint Surg Br. 1998 May; 80(3):485-9.
19. Giannoudis, PV, et al. Reamed against unreamed nailing of the femoral diaphysis: a retrospective study of healing time, Injury.2001 May; 32(4):343-5
20. Selvakumar K., Saw, K.Y., Fathima, M., Comparison study between reamed and unrigged nailing of closed femoral fractures. Med J Malasia. 2001 Dec; 56 Supp 1 D:24-8
21. Patton, J.T., Cook,R.E.,Adams, C.I., Robinson, C.M., Late Fracture of hip after reamed intramedullary nailing of the femur.J. Bone Surg. Br. 2000;82=B:967=971.
22. Brumback RJ, Reily JP,Poka A et al. Intramedullary nailing of femoral shaft fractures. Part 1:Decision –making errors with interlocking fixation. J Bone Joint Surg 1988;70 A:1441-52
23. Wiss DA,Brien WW, Becker V. Interlocking nailing for the treatment of femoral fractures due to gunshot wounds. J Bone Joint Surg 1991;73A:598-606
24. Lhowe DW, Hansen ST. Immediate nailing of open fractures of femoral shaft.J Bone Joint Surg 1988;70A:812-20