

## **Complications of closed reamed intramedullary nailing in Diaphyseal closed fractures tibia.**

**Dr.Ahmed Sabeeh Abid Ali Al- Zubaidi (F.I.C.M.S) .**

*Department of surgery, College of Medicine, Al-Nahrain University.*

**Dr.Ali Farouk (F.I.C.M.S)**

*Department of surgery, College of Medicine, Al-Nahrain University*

**Dr.Firas Mohamed Abdul Ghani. (F.I.C.M.S).**

*Department of surgery, College of Medicine, Al-Nahrain University.*

A prospective study performed in Al-Kadhimiya Teaching hospital from April 2007 to Dec. 2009.

### **ABSTRACT:**

Fractures tibia are common and many modalities for the treatment are available the most recent one is intramedullary nails with closed and reamed method, however other modalities like casting are still used.

*Objectives:* To evaluate the complications of closed interlocking intramedullary nailing in closed diaphyseal fractures of tibia regarding the infection rate, time for union, malalignment and knee joint pain and stiffness.

*Design:* Prospective study.

*Setting and Timing:* Department of orthopedic surgery in Al-Kadhmiya Teaching Hospital from Dec. 2007- Dec.2009.

*Patient and Methods :* All the patients admitted to the emergency department of the hospital and operated within 72 hours . The study is based on 35 patients including males and females having closed tibial diaphyseal fractures of skeletally mature persons (closed proximal and distal physes)

*Results:* Out of the thirty five (35) patient, follow up was missed in two patients, the other (33) patients were followed for a period of one year. The mean time for union was 14.4 weeks. Union rate was 91 %, delayed union in two patients (6 %). Non union in one patient (3%). Infection was noticed in three patient (9%). Loss of the reduction in two patient (6%) in a proximal third fracture. Knee joint pain in four patients (12.1%) all of them of mild grade and easily ignored.

*Conclusion:* From the study we concluded that closed intramedullary nailing of closed tibia diaphyseal fractures is advantageous because of early mobility, low risk of infection, good union rate, low risk of malalignment and low risk of significant knee joint pain.

**Key words:** Fracture tibia, closed fracture, diaphyseal, reamed intramedullary nail

### **الخلاصة**

إن كسور عظم القصبة تمثل احد أهم الكسور وأكثرها شيوعا وهناك عدة طرق لعلاجها ويعتبر التثبيت الداخلي بواسطة العامود المقفل داخل نخاع العظم أهم واحد هذه الطرق.

هذه دراسة بحثية أجريت في مستشفى الكاظميه التعليمي من كانون أول 2007 إلى كانون أول 2009 في ردهة الكسور و جراحة العظام على 35 مريضا مصابا بكسر مغلق في عظم القصبة تم إدخالهم إلى صالة العمليات خلال 72 ساعة وأجريت لهم عملية التثبيت الداخلي المغلق بواسطة العامود المقفل داخل نخاع العظم وتم متابعة المرضى لمدة سنة كاملة أو لحين اكتسابهم الشفاء وتم تسجيل أية مضاعفات حدثت لهم خلال هذه الفترة وتم متابعتهم شهريا بواسطة الأشعة السينية .

أظهرت الدراسة إن نسبة الالتحام العظمي خلال إل 24 أسبوعا الأولى هي 92 % وان تأخر الالتحام حدث في 6 % وعدم التحام في 2 % وان متوسط مدة الالتحام كانت 14.4 أسبوعا. وحدث التهاب جرثومي سطحي في مكان إدخال البراغي البعيدة في 9 % وحدث تحرك في الكسر في 6 % جميعها في الثلث القريب من عظم القصبة وتم تسجيل 12.1 % يعانون من الآلام حول الركبة .

أظهرت هذه الدراسة إن طريقة التثبيت هذه تعتبر جيدة من ناحية المضاعفات القليلة نسبيا مع نسبة التحام جيدة وحركة حرة للطرف السفلي مقارنة مع الطرق الأخرى.

## **INTRODUCTION**

The tibia is strong and large bone. Its large part is subcutaneous. So it is liable for fractures and the majority is of high energy. Many modalities of treatment are invented, including casting ,external fixators and internal fixations including plate and screws and intramedullary nailing.<sup>(1)</sup>

In choosing the mode of treatment, the fracture pattern and degree of soft tissue injury play an important role. Tibia fracture have been treated successfully in past conservatively by casting<sup>(1)</sup>.many displaced fractures are unstable and they need more rigid fixation .For years there were so much discussions between closed reduction and external fixation and open reduction and internal fixation .Tibia being subcutaneous increase the risk of infection and non union<sup>(2)</sup>

Introduction of closed intramedullary nailing has changed the management policies of fracture tibia and femur .The treatment for fracture tibia by intramedullary nailing has gained popularity mainly by introduction of closed nailing facilities<sup>(3)</sup>.After intramedullary reaming, a large size nail can be used without jamming and a small type nail used in non reamed type<sup>(4)</sup>.

Interlocking intramedullary nailing greatly improve rotational stability<sup>(5)(6)</sup>. The fracture below the level of tibial tubercle and above the plafond can be treated with intramedullary nail stabilization<sup>(7)</sup>.The small size of nails is associated with increased rate of nail or screw breakage<sup>(8,9)</sup>.Reaming may lead to vascular damage and thermal necrosis of the bone<sup>(10)</sup>.Reamed nailing have comparable results to non reaming especially in open fractures<sup>(11)</sup>. This procedure reduces hospital stay ,early mobilization and better outcome anatomically as well as functionally, as claimed by the advocates of this type of management.

This study was conducted to estimate the effectiveness and the complications of this type of management in closed tibia diaphyseal fractures,

## **PATIENTS AND METHODS.**

This prospective study was conducted in orthopedic unit in the teaching hospital of Al-Kadhimya from Dec. 2007 – Dec. 2009 , it involves thirty five patient with closed tibia shaft fractures with unacceptable displacement (can not be managed conservatively), were operated on within seventy two hours, meanwhile were stabilized by back slab temporarily (till the time of operation).

All fractures were reduced closely and fixed with reamed intramedullary nail with proximal and distal locking screws with no application of tourniquet and no traction table was used. No other modalities of fixation were added post operatively. Ankle and knee movement were encouraged as soon as the pain subsides, non weight bearing policy is adopted till the evidence of callus formation. Distal screws removal when the patient can fully weight bear with no pain and obliteration of fracture site as evident radiologically. All the patients were followed by a regular monthly visits with x rays examinations for a maximum of one year follow up. The patient were followed for infection rate, time for radiological proved fracture union. Loss of reduction and knee joint pain .

There were 25 patients(75.7%) males and 8 patients (24.3%) females. The mean age was 34.4 years ranging from 22-56 years. The cause of fractures were RTA in 25 patients (75.7%), industrial in two patients (6%), fall from height in 4 patients (12%) and sport injury in two patients (6%). There were three (9%) cases of proximal third , 24 (72.7 %) of middle third and 6 (18.1%) of distal third tibia fracture. There were 8 (24.2%) with transverse fracture, 6 (18.1%) with short oblique, two (6%) with spiral and 17 (51.5%) with comminuted fracture pattern. Fibula was broken in 3 (9%). Blood transfusion was necessary in two (6%) cases in the emergency department before the operation and no blood was required during or after the operation (the average external blood loss during the operation was about 25 c.c ). The nailing was performed within 72 hours closely and under X ray control and no tourniquet was used. Non weight bearing policy till evidence of callus formation followed by partial weight bearing till obliteration of the fracture site is evident radiologically then full weight bearing is allowed for at least 6 weeks followed by dynamization by removal of the distal locking screws.

### **Inclusion criteria:**

Closed Tibial diaphyseal fractures in the middle three fifths.

### **Exclusion criteria:**

- Skeletally immature bone.(open proximal or distal physes)
- Multiple injured patients
- Previously injured limb
- Patient with peripheral vascular disease
- Patient with medical illnesses.

### **Results:**

In this study the intramedullary nails were performed in 35 patients with closed diaphyseal tibial fractures. Among them 33 patients (94.2%) were followed to complete recovery or to a maximum of one year and two patient (5.8%) were lost during the follow up period .

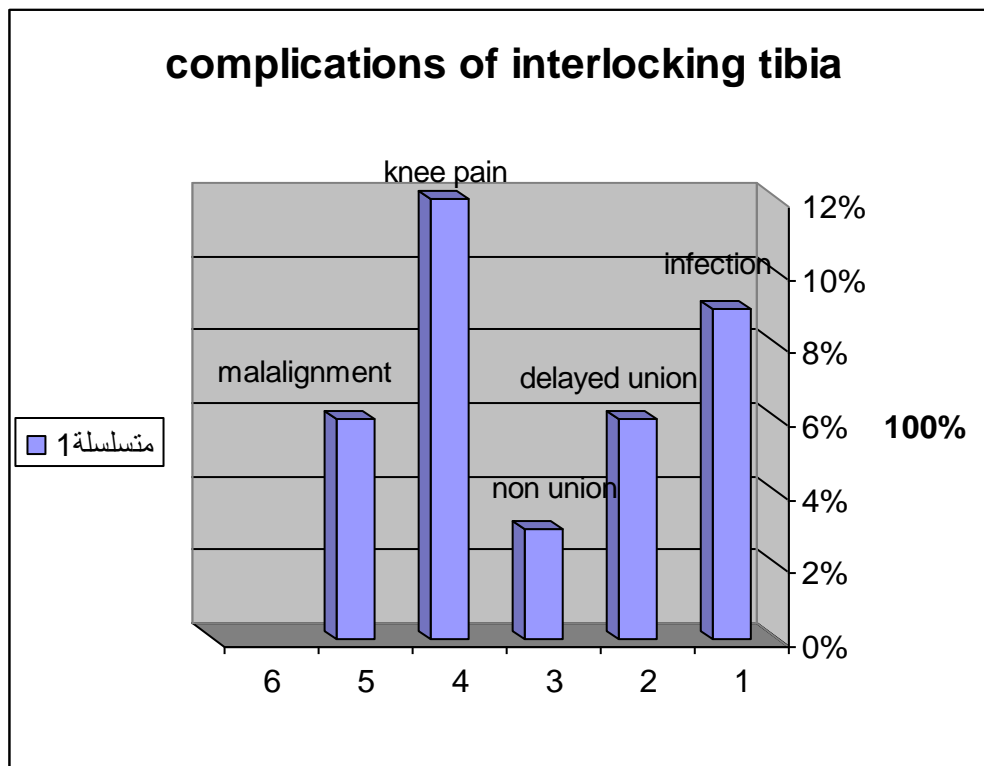
The results showed that bony union occurred in 30 (90.9%) of the cases within 24 weeks, delayed union (more than 24 weeks) was seen in two patients(6 %) and non union in 1 (3%) in a distal fracture. Mean union time was 14.2 weeks ranging from 11-24 weeks. Infection occurred in three patient (9%) was a superficial wound infection at the distal locking screw resolved well with oral antibiotics. Malalignment (loss of the reduction) observed in two (6%) patients both were in proximal third fracture and in form of anterolateral angulations of more than 10 degrees compared with the immediate post operative x ray images. Prolonged knee pain occurred in four(12.1%) and no cases of knee stiffness was reported.

The results were evaluated as (excellent ) in 21 (63.6%) when no pain or stiffness , no infection , no loss of reduction and healed within 24 weeks. Evaluated as (Good) in 3 (9%) when no pain or stiffness and had only infection and united within 24 weeks, and (Fair) when developed knee joint pain or delayed union 6 (18.1%) and evaluated as (poor) in three (9%) when developed unacceptable malalignment or non union.

Mechanism of injury	Number of patients	percentage
RTA	25	75.7 %
SPORT INJURIES	2	6 %
FFH	4	12%
INUSTERIAL INJURIES	2	6%

FRACTURE PATTERN	NUMBER OF PATIENTS	PERCENTAGE
COMMINUTED	17	51.5 %
TRANSVERSE	8	24.2 %
SHORT OBLIGUE	6	18.1%
SPIRAL	2	6%

	NUMBER OF PATIENTS	PERCENTAGE
EXCELLENT	21	63.6%
GOOD	3	9%
FAIR	6	18.1%
POOR	3	9%



## **DISCUSSION:**

This study was carried out on the closed reamed interlocking nailing in closed tibia diaphyseal fractures, the results were compared with the available data.

In this study the mean time of bone union for closed fractures was 14.2 weeks ranging from 11-24 weeks less than reported in the study of Court Brown and coworkers<sup>(12)</sup> who reported 16.9 weeks, Bostman and Hannien reported 15.3 weeks<sup>(13)</sup> and less than reported by Pervais who reported 16.4 weeks mean union time and 3.6% delayed union rate<sup>(14)</sup>. There were 4% non union rate in our study compared to 0% in the study of Brown et al<sup>(15)</sup>. Exchange nailing is useful method to promote union<sup>(16)</sup> of tibial fractures when slow consolidation occurs after treatment with non reamed nailing.

Delayed union was reported 20 % in the study of Karladni with average union time of 16.4 weeks with 3.8% non union rate<sup>(17)</sup> and 0 % delayed union with average union time of 12 weeks with 0% non union rate in that of Toivanin<sup>(18)</sup>, while average union time was 19 weeks with 1.8% non union rate in the study of Bone<sup>(19)</sup>.

Infection rate was 9% in our study, non was a cause of non union, more than reported by Court Brown and Coworkers<sup>(20)</sup> who reported 3.5% (16 out of 450).

Whittle et al reported 8% infection rate<sup>(21)</sup>. Santoro et al<sup>(22)</sup> and Melcher<sup>(23)</sup> reported an infection rate of 4%. In the study of Lang et al<sup>(24)</sup> reported thirty two proximal tibia fractures treated with locked intramedullary nailing, thirty out of the thirty two fractures healed while 84% had angulations of 10 or more degrees in the frontal plane, in our study the two cases of malalignment were in the proximal third tibia.

In our study no case of knee joint stiffness was reported only four cases (12%) of prolonged knee joint pain. Compared with 40% reported in Karladini<sup>(16)</sup> and 76 % in that of Toivanin (18) and 35 % reported by Toivanen<sup>(25)</sup>.

Our study showed that dynamization is necessary for bone union.

## **CONCLUSION**

From this study we can conclude that such technique of closed intramedullary nailing has many advantages and relatively less complications. Early mobilization, early weight bearing, lowest infection rate and acceptable union rate.

## **REFERENCES.**

1. Weissman SL, Herold HZ, Engelberg M. Fractures of shaft of middle two thirds of the tibial shaft. Results of treatment without internal fixation in one hundred and forty cases: JBJS 1966;48:257-267.
2. Kristian D. Kristansen. Tibial shaft fractures: Frequency of local complications in tibial shaft fractures treated by internal compression osteosynthesis: Acta Orthopaedica. 1979, volo. No. 5; 593-598.

- 3- Byron E Chalidis et al. Reamed interlocking intramedullary nailing for the treatment of tibial diaphyseal fractures and aseptic non unions. Can expect an optimum results:Strategies Trauma Limb Reconstruction, 2009 Oct;4 (2):89-94.
- 4-Speed K. A textbook of fracture and dislocations Philadelphia, Lea and Febiger, 1982.
- 5- Deam Cole ,Ansel J Lori and Randy Schwartzberg. A sequential protocol for management of severe open tibial fractures. Clin Orthop 1995; 315:84-103.
- 6- Tracy Watson J, Management strategies for bone loss in tibial shaft fractures.Clin Ortho 1995; 315:138-152.
- 7- Bohler L. The treatment of fractures.English 5<sup>th</sup> ed. Vol-3, New York,Grune and Stratton 1956-1958.
- 8- Whittle A. William Wester and Russle. A fatigue failure in small diameter tibial nail. Clin Ortho 1995;315:119-128.
- 9- Chistian Krettek, Peters Chandelmaire and Herald Tscheren. Non reamed interlocking nailing of closed tibial fractures with severe soft tissue injury. Clin Ortho 1995;315:34-47.
- 10- Leuning M and Hertel R. Thermal necrosis after tibial reaming for intramedullary nail fixation.J Bone Joint Surg 1996;8-B-584-7.
- 11-Vinett J, Ayush, Mehtani A et al . Primary undreamed intramedullary locked nailing in open tibial fractures. Indian Journal of Orthopaedics, Vol.39,(1): 30-32. 2005.
- 12- Court-Braun CM, Wili E,Christie, J , MC Queen MM . Reamed and undreamed nailing for closed tibial fractures. J Bone Joint Syrg 1996;78-B: 580-583.
- 13- Bostmann, O and Hanninen, A . Tibial shaft fractures caused by indirect violence . Acta. Orthop. Scand. 1982;53:981-990.
- 14-The Journal of Pakistan Ortho Association, Vol. 21 No. 2 :p36 Aug 2009 .
- 15- Court- Braun CM, Keating JF, Christic, J, and Mc Queen MM. Exchange intramedullary nailing : its use in aseptic tibial nonunion. J Bone Joint Surg 1994; 77-B:407-411.
- 16- Telmpleman D, Thomas M, Varecka TH and Kyle R. Exchange reamed intramedullary nailing for delayed union and nonunion of the tibia. Clin Ortho 1995; 315: 169-175.
- 17-Karladini AH, Granhed H, Edshage B, Jerri and Styf J (2000): Displacement tibial shaft fractures. A prospective randomized study of closed intramedullary nailing versus cast treatment in 53 patients. Acta Orthop. Scand 71:160-168.
- 18-Toivanen,Vaistoi O, Kannus P, et al : anterior knee pain after intramedullary nailing of fractures tibial shaft: a prospective study comparing two different nail insertion technique. J Bone and joint surgery 84 A:508,2003.
- 19-Bone LB,Sucato D,Stegmann PM, et al (1997): displaced isolated fractures of tibial shaft fractures treated with either a cast or intramedullary nailing. J bone and joint surg (Am): 79(9):1336-1341.
- 20- Court –Braun CM,Keating JF, Mc Queen MM , infection after intramedullary nailing of the tibia . J Bone Joint Surg 1992; 74-B :770-774.
- 21- Whittle, A.P, Russle, T.A., Taylor J.C. and Laveele, D.G. .Treatment of open fractures of of tibial shaft with the use of interlocking nailing without reaming . J Bone Joint Surg 1992; 74-A: 1162-1171.
- 22- Santoro, V., Henby, M., Benirscke, S. and Mayo. K. Prospective comparison of undreamed interlocking intramedullary nails versus half pin external fixation in open tibial fractures , J .O rthop. Trauma. 1991 ,5: 238-239.
- 23- Melcher. G.A., Ryf,C., Leutenegger,A. and Ruedi ,T. Tibial fractures treated with the AO tibial nails. Injury. 1993 , 24 :407-410.
- 24- Back,A .W. and Hansan, S.T. Jr. Plate versus external fixation in severe open tibial shaft fractures: A randomized trial. Clin. Orthop. 1989,241 : 89-94.
- 25-Toivanen, Vaistoi, randomized study comparing two different nail insertion techniques,j bone and joint surgery 84A:508,2003.