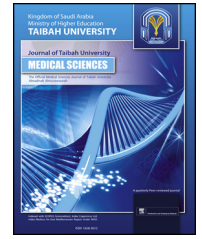




Taibah University
Journal of Taibah University Medical Sciences

www.sciencedirect.com



Original Article

Effectiveness of ilizarov frame fixation on functional outcome in aseptic tibial non-union cases at Abha, Kingdom of Saudi Arabia: An experimental study



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Received 1 March 2014; revised 5 September 2014; accepted 6 September 2014; Available online 23 December 2014

المخلص

أهداف البحث: تهدف الدراسة إلى تقييم أثر استخدام التثبيت بجهاز اليزاروف على المحصلة الوظيفية في حالات عدم الالتئام غير المنتن لكسور عظم الظنوب.

طرق البحث: عدد حالات الدراسة ١٢ حالة؛ منتقاة من حالات عدم الالتئام غير المنتن لكسور عظم الظنوب وذلك بعد فحوصات الدم المخبرية والفحص السريري. تم عمل التدخلات الجراحية بواسطة جهاز اليزاروف. قيست الحالة الوظيفية قبل وبعد التدخل الجراحي لكل حالة باستخدام نظام التقييم الوظيفي المعدل لكارتستورم اوليرود.

النتائج: من بين الحالات ٣ إناث و ٩ ذكور. لدى خمس من الحالات عدم التئام نوع "أ" عولجت بضغط طرفي الكسر، والحالات السبع الأخرى من نوع "ب" عولجت بنقل العظم. تم الالتئام العظمي بشكل كامل لكل الحالات. التقييم الوظيفي لأربع حالات كان جيدا ومقبولا لحالتين ومتوسطا لأربع حالات وضعيفا لحالتين.

الاستنتاجات: الاستخدام الجراحي لجهاز اليزاروف يعتبر طريقة فاعلة في علاج حالات عدم الالتئام غير المنتن لكسور عظم الظنوب.

الكلمات المفتاحية: غير منتن؛ وظيفي؛ اليزاروف؛ عدم الالتئام؛ عظم الظنوب

Abstract

Objectives: The Objective of the study is to evaluate the effect of Ilizarov frame fixation on functional outcome in aseptic tibial non-union cases.

Methods: In this clinical study, 12 cases of post-traumatic aseptic tibial non-union were selected. After blood analysis and clinical assessment, the aseptic nonunion cases underwent ilizarov fixation for their problem. The pre and post-surgery functional outcome was measured by modified functional evaluation system by Karlstrom-Olerud.

Results: Out of the 12 patients, 3 females and 9 males, 5 had non-union of type A and were treated by compression technique. the other 7 had non-union of type B and were treated using bone-transport. Tibial union was achieved in all the cases. The functional outcome has shown 4 good, 2 satisfactory, 4 moderate and 2 poor.

Conclusion: The Ilizarov technique is an effective method in treating the aseptic tibial non-union.

Keywords: Aseptic; Functional; Ilizarov; Nonunion; Tibial

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Peer review under responsibility of Taibah University.



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Introduction

Ilizarov fixator is an external fixation device used in orthopedic surgical procedure to lengthen or correct the angular deformities in limb bones, to treat compound or open bone fractures and infected non-union fractures.¹ Tibial fracture is one of the most common in the long bone of the body. High-energy collisions, such as road traffic accidents or motorcycle crashes and gunshot injuries, are common causes of tibial shaft fractures. Non-union or delayed union is a common complication of tibial fracture and indicates that the fracture did not heal in a timely fashion.² Factors that predispose to non-union are severity of injury, comminuted fracture, fractures in the distal third of tibial shaft, an open fracture, infection, open reduction and insufficient immobilization.³

Treatment options for tibial non-union are extracorporeal shock wave therapy,⁴ low intensity pulsed ultrasound,⁵ electrical stimulation,⁶ functional cast bracing,⁷ intramedullary nailing,⁸ exchange reamed nailing,⁹ plate fixation,^{10,11} and external fixation with bone graft.¹² According to the classification of Paley, fracture non unions are divided into type A and type B.¹³ In type A there will be bone loss of less than 1 cm and in type B there will be bone loss of more than 1 cm. The orthopedic management was usually as per the type of defect. Type A can be managed with reamed exchanged nailing.¹⁴ Type B requires additional bone grafts or bone graft substitutes in addition to reamed exchange nailing¹⁵ or Ilizarov external fixator and bone transport or vascularized fibular graft and lengthening over a nail.^{16,17}

The Ilizarov external fixator is best indicated for tibial fractures, because of its advantage of allowing early weight bearing.¹⁸ A Large amount of literature supports the use of the Ilizarov external fixator where large defects can be reconstructed by compression-distraction or by bone transport.

The current study aims to see the effect of Ilizarov frame fixation on functional outcome in aseptic tibial non-union cases.

Materials and Methods

This prospective study was conducted in the Department of Orthopedic Surgery at Aseer Central Hospital in Abha, Kingdom of Saudi Arabia. Ethical clearance was taken from hospital ethical committee. The patients were selected and treated between June 2011 to February 2013. Patients having a septic tibial nonunion with no signs of clinical, radiological and biomechanical evidence of infection and bone defect up to 12 cm were included in the study. Patients with history of other injuries, those aged above 50 or under 13, and those suffering from rheumatoid arthritis, diabetic mellitus, and fracture in the other limb were all excluded from the study.

After fulfilling the inclusion and exclusion criteria, 12 patients (9 males and 3 females) aged between 14 and 50 were enrolled as study subjects based on clinical findings along with erythrocyte sedimentation rate, C-reactive protein levels and tissue culture reports. The patients pre-operative X-rays and functional assessment were done using modified functional evaluation system by Karlstrom-Olerud¹⁹. After general anesthesia or spinal anesthesia, patients underwent standard circular method of Ilizarov frame fixation. After a

latency period of 10–14 days, the lengthening was started for compression technique.

The compression technique was used when there is hypertrophic nonunion with no shortening or shortening less than two centimeters. The compression of the fracture was done by moving the rings together and compressing the fracture site and maintaining the ring until radiological evidence of union is seen.

Compression and distraction technique was used when the hypertrophic nonunion showed bone shortening of more than two centimeters. In this method, we have compressed the both ends of the fracture for 10–14 days and then distracted the compressed site slowly at the rate of 0.25 cm every six hours or 1 cm per day.

Bone transport technique is used in cases of oligotrophic or atrophic nonunion with bone shortening of more than two centimeters. In this method, the patient will be kept on a circular frame and corticotomy is usually done in the metaphysis to ensure good regeneration. The aim is to mobilize the middle segment, and lengthening will be done through the corticotomy site. Both ends of the fracture segment approximation are called docking, usually iliac crest bone grafting was done in this region. The frame would remain in this position until there is a radiological evidence of bone union.

All patients were operated on by the same orthopedic surgeon using the standard Ilizarov fixator technique. Immediately after surgery, X-rays and clinical assessment were done. Physical Therapy was started as soon as the patient was comfortable, and gentle active assistive exercises and active exercises were done for ankle and knee within the pain free ranges. Weight bearing on affected leg was progressively increased from toe touching to full foot touching in the first week. After the first week walking was initiated with partial to full weight bearing as per patient tolerance. Isometric quadriceps exercise and gentle knee mobilization were started up to the available range within the first week. In the first few days after surgery, patients were on oral analgesics. Prophylactic antibiotics and wound care were strictly followed to prevent any further problems.

Patients were educated and properly trained on how to wash fixator and pins and were discharged from the hospital ward when they started walking with partial weight bearing and were able to go to the toilet independently. They were then followed up in the outpatient department, first on a weekly basis and then twice a month. The fixators were removed by admitting the patients for day surgery care. After the removal of the fixators, patients received physical therapy and were dispensed above or below the knee braces to use for the duration of 4 weeks. The patients were allowed to walk with full weight bearing, and after 5 weeks of regular physical therapy, functional scoring with modified functional evaluation system by Karlstrom-Olerud was performed again.

Statistical package for social sciences version 14 was used to analyze the data. Patients' characteristics were analyzed with descriptive statistics and different properties of aseptic tibial non-union were correlated by Pearson correlation coefficient.

Results

12 patients aged between 14 and 46 participated in this study nine of whom were males and three were females; six

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