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ORGINAL ARTICLE

Management of Fracture lateral malleolus using Minimally Invasive Percutaneous Technique Overview guidelines.

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ABSTRACT

Background: Fracture of the lateral malleolus is one of the most common skeletal injuries encountered in clinical practice. Its incidence has been increasing because of the increased prevalence of osteoporosis and the increasing activity of the population. Within the majority of management of fracture Lateral malleolus, the standard is open reduction and internal fixation (ORIF) with plates and screws.

Purpose: to evaluate the outcome of percutaneous fixation of lateral malleolus by K wire augmented with syndesmotic screw.

Settings and design: Prospective cohort study.

Patients and methods: This study was conducted on 18 patients with Weber B and C fracture lateral malleolus were prospectively reviewed after that they had done closed reduction and percutaneous internal fixation by kischner wire size 3 augmented with syndesmotic screw 3.5 mm, fully threaded.

Results: Results: Operation time was within 40.83±5.752 minutes with a minimum 30 minutes and a maximum 45 minutes, All fractures united within an average time to a union of 8.44±2.95 weeks, There were no deep wound infections or complaints of painful hardware. at the latest follow-up, the functional results were excellent in 12 cases, good in 4 patients, fair in 2 patients.

Conclusion: Percutaneous intramedullary K.wire fixation augmented with syndesmotic fixation is considered a good easy technique in the management of lateral malleolar fracture that provides good clinical and radiological results because it is rapid, minimally Invasive with minimal soft tissue disruption, low cost and without prominent hardware.

Keywords: Ankle fracture; lateral malleolus: smooth intramedullary fixation.

INTRODUCTION

Intramedullary fixation of fibula fractures was first described by the utilization of the Inyo nail in 1986. This device was made with malleable stainless steel and attempted to maintain rigid fixation. This system had complications secondary to nail migration and malunion. In other early intramedullary designs, rotational and length instability and malreduction and poor radiographic results[(1)]

In intramedullary fixation of fibular fractures had less soft tissue dissection and less hardware prominence and periosteal stripping. This technique offers an alternative to traditional plating and had fewer complications, with good outcome [(2)].

In our study, we use Percutaneous fixation with Kirschner wire augmented with a syndesmotic screw which is a minimally invasive technique that offers simple

operation and reliable fixation for Lateral malleolus fracture weber type B and C, with a smooth percutaneous Kirschner wire along the axis of fibula augmented with a syndesmotic screw that prevents rotation provide an excellent method of fixation as simple procedure, cheap, very small wound incision, minor complication, and give excellent result as open reduction and internal fixation.

PATEINT AND METHODS

the study was approved by the research ethical committee of Faculty of Medicine, Zagazig University**.**

The purpose of this study is to evaluate the treatment of lateral malleolar fractures with percutaneous smooth intramedullary fixation augmented with a syndesmotic screw. This study was a prospective cohort study conducted in the Orthopedic Department, Faculty of Medicine, Zagazig University, and Tripoli university hospital 18 patients were included in the study, Their mean age was 37.9 years old. There were 9 males and 9 females. 7 patients had isolated lateral malleolus fractures, the other 11 patients had associated medial malleolus fractures.

Inclusion criteria:

Age range from 18-70 years. **1-**

Isolated fracture Lateral malleolus or Bimalleoli. **2-**

Patients. **3-** With Weber B or C lateral malleolus fractures

With or without a Syndesmosis injury. **4-**

Exclusion criteria:

1-Open fractures

Pathological fractures **2-**

The work has been carried out in accordance World Medical Association **(Declaration of Helsinki)** for studies involving humans before prospective collection of patient's data and after informed consent was obtained from patients.

Surgical technique:

The operation was carried out under spinal anesthesia for all patients, Image intensifier was used to aid the close reduction of the fracture, the starting point is the distal tip of the fibula, A small (approximately 1 to 2cm) longitudinal incision is made approximately 2cm distal to the tip of the fibula **Fig(1),** distal enough to allow the drill with k.wire to drill in line with the fibular shaft. **Fig(2)**

K wire size 3 in drill With the help of an image intensifier drilling to distal fibula in line with the diaphysis of the fibula on both A-P and lateral images, Medial Malleolus fracture was fixed e k wires and tension band.

At the fracture site, A closed reduction technique was applied, such as axial traction or blunt manipulation of the fracture fragments, After reduction by drill pass the K wire until mid-shaft of the fibula, then after achieving a good position the proximal end of the k wire was cut by wire cutter then bent and impeded inside **Fig(3).**

After that we prepare for Syndesmosis fixation by syndesmotic screw, the foot is held in neutral dorsiflexion and the leg in internal rotation. Reduction of Syndesmosis by using pointed reduction clamp, Then Making a 1 cm 2 incision on the lateral aspect of the distal fibula at the level and above the level of the Syndesmosis 2 –3 cm above the ankle joint 20°–30° anteromedially (verify position by X-ray screening, Drilling through three cortices into the 2 cortex fibula and one cortex tibia using a 2.5 mm drill bit from lateral to medial, Insert tow 3.5 mm cortical screw of appropriate length after tapping syndesmotic screw must be angled from posterolateral to anteromedial to engage the tibia, Verify the position of the screw by X-ray screening **Fig (4),** The wounds then irrigated and closed with sutures **Fig(5).**

A sterile dressing and short leg cast in neutral position were applied for six weeks, Non-weight bearing, and regular follow-up x rays. **Fig(6a)** and **(6b)** showing preoperative and post-operative X-rays.

Statistical Analysis

Data were analyzed using Microsoft Excel software. Data were then imported into Statistical Package for the Social Sciences (SPSS version 20.0). The difference and association of qualitative variables were analyzed by the Chi-square test (X2). Differences between quantitative independent groups by unpaired t. P-value was set at <0.05 for significant results &<0.001 for a highly significant result.

RESULTS

The current study show mean age was average was 37.39±11.27 with a minimum 21 and maximum 65 years and regard sex distribution male and female were equally 9/9. **(Table 1)**

The majority were left-sided 72.2% , regarding the mechanism of injury the majority were RTA with 50.0%, regard weber classification the majority were B with 55.5% followed by C 44.4%, regard type Bimalleolar were majority 61.1% and 38.9% were isolated and regard Syndesmosis founded in 38.9%. **(Table 2).**

Mean Operation time was 40.83±5.752 minutes with minimum 30 minutes and maximum 45 minutes. **(Table 3) Fig (7),** mean Time union was 8.44±2.95weeks, and mean weight-bearing was 10.94±3.22 weeks. **(Table 4).**

2 cases had superficial wound infection only one case had a Metal failure and Joint stiffness, delay union founded in 2 cases, regard outcome 12 cases were excellent, 4 good and 2 fair. **(Table 5)**

Table (1): Demographic data distribution among studied group

		AGE	
Mean± SD		**37.39±11.27**	
Median (Range)		**36.5 (21-65)**	
		N	%
Sex	**Male**	**9**	**50.0**
	Female	**9**	**50.0**

Table (2): Fracture characters distribution among studied group

		N	%
Side	**Left**	13	72.2
	Right	5	27.8
Mechanism	**FH**	3	16.7
	RTA	9	50.0
	Twisted	6	33.3
Danis and Weber classification	**B**	10	55.5
	C	8	44.4
Type	**Bimalleolar**	11	61.1
	Isolated	7	38.9
Syndesmosis	**-VE**	11	61.1
	+VE	7	38.9
	Total	18	100

Table (3): Operation time distribution among studied group

	Operation time/ minutes
Mean± SD	40.83±5.752
Median (Range)	40.0 (30-45)

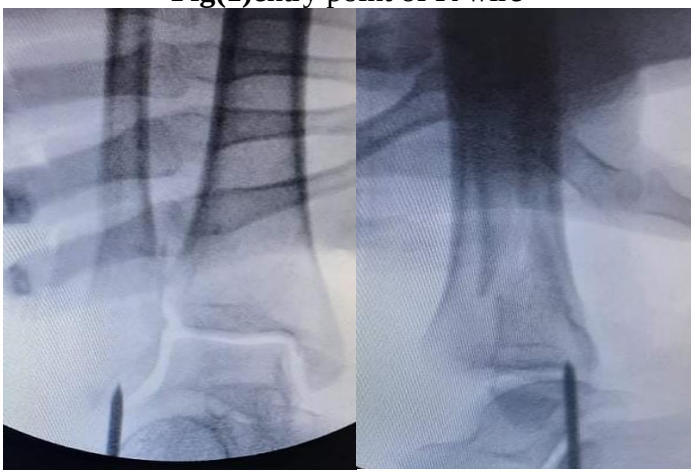
Table (4): Time union and Weight bearing distribution among studied group

	Time union/W	Weight bearing/ W
Mean± SD	8.44±2.95	10.94±3.22
Median Range	7.0 (6-20)	10.0 (8-22)

Table (5): Complication and outcome distribution among studied group

		N	%
Superficial wound Infection	**-VE**	**16**	**88.9**
	+VE	**2**	**11.1**
Metal failure	**-VE**	**17**	**94.45**
	+VE	**1**	**5.55**
Joint stiffness	**-VE**	**17**	**94.45**
	+VE	**1**	**5.55**
Delay union	**-VE**	**16**	**88.9**
	+VE	**2**	**11.1**
Outcome	**Fair**	**2**	**11.1**
	Good	**4**	**33.3**
	Excellent	**12**	**55.6**
	Total	**18**	**100.0**

Fig(1)entry point of K wire



Fig(2) drill hole entry at Ap :anteroposterior and Lat: Lateral views

DISCUSSION

The importance of stable, anatomic fixation of lateral malleolus is highly recommended to achieve excellent results in ankle fracture, many methods of fixation for lateral malleolus had been utilized, intramedullary fixation has been introduced, With a small skin incision and minimal soft tissue dissection the rod offers less prominent hardware, fewer wound complications and potentially greater mechanical stability[3]

Regarding the studied group; The present study included males were 50% and females 50%. **Yuen et al.,**) [4] found that the male to

female ratio was 3--1 ratio. In contrast**, Hermans et al.,**[5] defined that male/female ratio was (0.5:1.) among patients operated by percutaneous smooth intramedullary fixation of the lateral malleolus.

The current study defined that age was distributed as **37.39±11.27** with a minimum of 21 and a maximum of 65years,

Concerning the side of the lesion, the present study defined that The majority were left-sided 72.2% in Consistence with **Tutega et al.,** [6] who noticed that affected Side – right: left ratio 7:14 among studied patients managed percutaneous smooth intramedullary fixation of the lateral malleolus.

In the present study, the underlying cause of injury of a studied group the majority was RTA with 50.0%, (16.7%) due to FH, (11.1**%)** due to Twisted. Difference from **Seo,** [7] who defined that lateral malleolus injury was operated on 86.7% of patients due to FH.

In this study, there were 12 patients (66.6%) who had no associated injures and 6 patients (33.3%) had associated injures; In this study, all patients had excellent union with duration ranging from 8.44±2.95 weeks.

Siddhartha Venkata et al[8]**;** the mean time for a radiological union was 21.4 weeks with a range of 16-32 weeks. 16 fractures (32%) healed at 20 weeks and 48 fractures (96%) united within a period of 25 weeks.

In this study 2 cases had infection only, one case had a Metal failure and Joint stiffness, delay union founded in 2 cases.

The infected cases healed after treatment with appropriate antibiotics and aseptic dressings and the infection did not appear to have any long-term effect on fracture healing or the rehabilitation of the patient. **Siddhartha Venkata et al** [8] ;

5 patients (10%) had postoperative superficial wound infection and 1 patient (2%) had deep infection. **Lau and colleagues** [0] noted a delayed union rate of 10%, deep infection in 8%, and hardware removal in 48% in a series of 48 patients treated with medial locked plating, although prolonged healing times were observed in simple fracture patterns.

In spite of the complications in this study, there were no complications purely related to the implant, all patients had normal stability of the ankle joint, and there were no cases of varus or valgus malalignment. Regard outcome 12 cases were excellent, 4 good, and 2 fair. The fair cases were old age; diabetes and hypertensive with irregular follow-up.

Our study may be limited upon in several areas :

First of all, lack of comparing this percutaneous method of lateral malleolus fixation with open reduction and internal fixation, as well as with that of standard AO technique.

Lack of a long-time follow-up.

CONCLUSION

Smooth Intramedullary fixation augmented with syndesmotic screw of Lateral malleolus fractures Weber B and C require minimal soft tissue dissection, without prominent hardware And gave good clinical outcome, good stability, and achieve good union, The associated complication are minor in nature, With the addition of syndesmotic screw, it controls the rotation of the distal tibiofibular joint.

RECOMMENDATION

There is insufficient evidence for changing practice from plating of distal fibular fractures to intramedullary fixation based on the current literature. Adequately powered randomized controlled trials comparing well-matched patient groups with long-term follow-up are required to limit systematic error and enhance external validity. Specific outcome measures should include union, functional assessment, complications, and cost-benefit analysis

Conflict of interest None.

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