INTERNATIONAL JOURNAL FOR INNOVATIVE RESEARCH IN MULTIDISCIPLINARY FIELD ISSN: 2455-0620 Volume - 6, Issue - 7, July – 2020
Monthly, Peer-Reviewed, Refereed, Indexed Journal with IC Value: 86.87 Impact Factor: 6.719
Received Date: 26/06/2020 Acceptance Date: 10/07/2020 Publication Date: 31/07/2020

Mid tibia shaft fractures' outcome treated by intramedullary nailing with 4 versus 2 interlocking screws

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Abstract: *Intramedullary nails (IM nails) have been used for the fixation of closed and Gustilo type 1 open tibial shaft fractures in adults and old age patients for many years and is accepted the method of choice. There are lots of advantages with IM nailing techniques including fixation of the fracture with early mobility and loading permission and maintaining good soft tissue coverage around the fracture site. It has been approved that the union rate in group of patients whose IM nails are interlocked by two two screws at distal and proximal ends were better than those interlocked by one one screw, while in displacement rate there have been no difference between the two groups of patients.*

KeyWords: *Fracture, Metaphysis, locking screws, intramedullary nail.*

1. INTRODUCTION:

Since 1950s IM nailing technique for fracture fixation have gained universal acceptance. Reamed IM nailing technique was introduced by Kuntscher in 1958 and most of the reports documented its good results. Unlocked nails can be considered when a non communited fracture occurs through the narrowest part of the medullary canal; not only are side to side or shearing forces eliminated, but rotational forces are also well controlled. If the medullary canal is much larger in one fragment than in other, poor control of the rotational forces frequently results; in these situations, interlocking techniques are required. Generally, the interlocking screws should be positioned at least 2cm from fracture to provide sufficient stability and allow functional activity postoperatively. Correct entry portal is critical for all nails and should be in a region that will minimize insertional forces.

It is different in each bone! Incorrect entry portal can cause alignment problems in longitudinal and rotational directions in which correction is difficult and tricky. Stress fractures are reported due to its incorrect selection, therefore it is recommended to study the specific guidelines for each nail carefully and check the correct entry portal. (Rockwood & Green fractures in adults 2015) Locked IM nailing techniques should allow nailing of fracture to within 2 to 4 cm of the joint. These techniques require the use of locking screws or poller screws. (Rockwood & Green fractures in adults 2015). Closed nailing techniques should be used whenever possible. higher union rates and few infections have been reported with the use of these techniques; however, the surgeon should be familiar with both open and closed techniques. (Campbell's operative orthopaedic 2013).

Nails of suitable length and diameter must be available and identified before surgery.

The insertion of a nail in to medullary canal is inevitably associated with the damage of endosteal blood supply which was shown to be reversible within 8-12 weeks. Experimental data have also shown that the cortical blood perfusion is significantly reduced after reaming of medullary canal if compared to a series without reaming. Accordingly, the return of cortical blood flow takes considerably longer after reaming than in unreamed cases which have an influence on the resistance to infection especially in open fractures. Furthermore, tight- fitting nails appears to compromise the cortical blood flow to higher degree than loose – fitting ones. Finally locking can be done in static or dynamic mode, while it is advisable to use at least two locking screws at either end of the nail to control the rotation in a reliable way. (Rockwood & Green fractures in adults 2015)

2. RESEARCH OBJECTIVES: to evaluate the comparative outcome particularly the chance of union and re displacement rate during fixation of mid tibia shaft fractures by IM nails interlocked by 2 screws at distal and 2 at proximal end of nail versus 1 at distal and 1 at proximal end in 3 – month follow up after surgery.

3. METHOD AND MATERIALS:

In this descriptive research performed retrospectively, 80 patients were selected among the patients who were admitted at orthopaedic ward of Mazar e sharif regional teaching hospital with the diagnosis of tibia mid shaft fractures from April 2018 up to April 2019 and underwent surgery with IM nail. In 40 patients, the IM nails were interlocked by 2 screws at distal and 2 at proximal end, this group of patient was named the Alfa Group. In 40 others, the IM nails were interlocked by 1 screw at distal and 1 at proximal end, and this group of patient was named the Beta Group.

Out comes in both groups were compared from the point of chance of union, re displacement rate, sex, age, type of fracture, type of accident and method of reduction. Materials used in this research was: the patients follow up x rays, files and SIGN surgical data base

4. FINDINGS:

Table 1-1. The patients in Alfa and Beta groups according to age, sex and method of fracture reduction.

Group	Number of case	Age		Sex		Method of reduction	
Alfa	40	<45	28	Male	35	Open	17
		>45	12	Female	5	Closed	23
Beta	40	<45	34	Male	36	Open	15
		>45	6	Female	4	Closed	25

Table 1-2 Number of patients in Group Alfa & Beta according to causes of accidents and type of fractures during IM nails insertion.

Group	**Causes of accident**		**Type of fracture**	
Alfa Group	RTA	17	Open Gustilio 1	2
			Open Gustilio 2	1
	Fall	9	Closed Transverse	12
			Closed Oblique	16
	War wounds	2	Closed Segmental	6
			Closed Comminuted	1
	others	2	Closed Butterfly	2
	Total	**40**	**Total**	**40**
Beta Group	RTA	23	Open Gustilio 1	2
			Open Gustilio 2	2
	Fall	11	Closed Transverse	24
	War wounds	4	Closed Oblique	10
			Closed Segmental	1
	Others	2	Closed Comminuted	X
	Total	**40**	Closed Butterfly	1
			Total	**40**

Table 1-3 Percentage of union & redisplacement rates in Alfa & Beta group patients during 3 month follow up after surgery.

Alfa Group (40 patients)	Union	39	97,5%	Maintenance of reduction position	40	100%

	Delayed/non Union	1	2,5%	redisplacement	0	0%
Beta Group (40 patients)	Union	38	95%	Maintenance of reduction Position	40	100%
	Delayed/non Union	2	5%	redisplacement	0	0%

5. DISCUSSION:

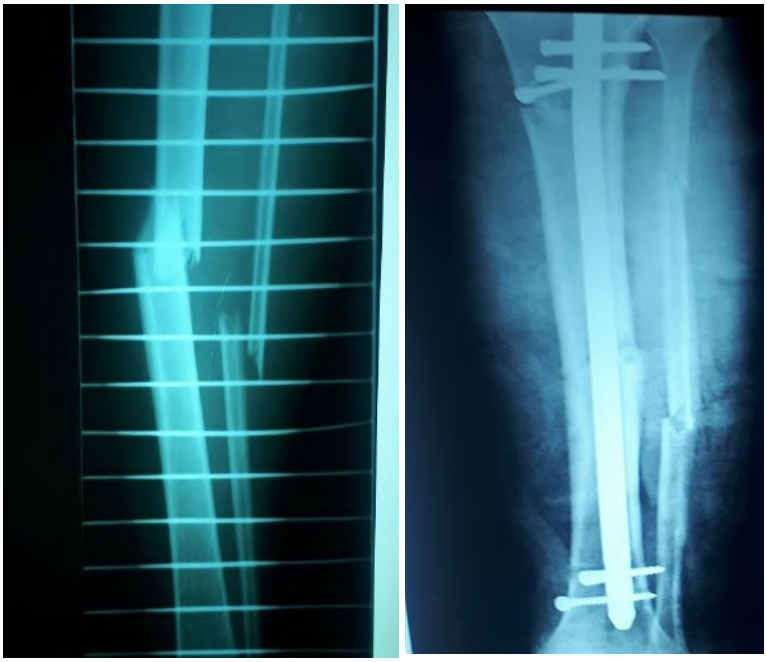
Among the 40 patients in Alfa group, 70 % were less than 45 and 30 % more than 45 years old, and in Beta group, 85% were less than 45 and 15 % more than 45 years old. According to sex differentiation, in Alfa group, 87, 5% were males and 12, 5% females, and in Beta group, 90% were male and 10 % female. According to the causes of accident, in Alfa group , 67,5% were reported to be due to Road traffic accidents(RTA), 22,5% due to falling trauma , 5 % due to war wound and 5 % due to other trauma while in Beta group , 57,5% were due to RTA , 27,5% due to falling trauma, 10% due to war wound and 5 % due to other trauma .According to types of fracture in Alfa group , 40% were reported due to closed oblique , 30% due to closed transverse , 15 % due to closed segmental , 5% due to open Gustilio 1 , 5% due to closed butterfly , 2,5% due to closed comminuted and 2,5% due to open Gustilio 2, while in Beta group , 60% were due to closed transverse , 25% due to closed oblique, 5 % due to open Gustilio 1 , 5% due to open Gustilio 2 , 2,5% due to closed segmental and 2,5% due to closed butterfly .According to method of facture reduction during IM nail insertion , in Alfa group , 57,5% were reduced closely (without opening the fracture site or closed reduction) and 42,5% reduced openly (exposing the fracture site or open reduction), while in Beta group , 62,5% were reduced closely and 37,5% openly. According to chance of union and redisplacement (rotatory or axially) rate during a 3 month follow up after surgery which has been documented by x ray films, in Alfa group, union rate was 97, 5% and delayed or nonunion 2, 5% . Redisplacement was not documented in 3 month follow up, while in Beta group, union rate was 95% and delayed or nonunion 5%. No redisplacement reports documented in follow up periods.

A **B**

A=(2 days after IM nailing with 4 interlocking screws)
B= (3 months post op state , good union)

A **B**

A =(case of gunshot IM nailed after 2 months of ex fix , but not healed well as shown In B)



A B

A= (male , 42 yrs old patient with mid shaft tibia fracture , caused by RTA)
B = (3 month post opertation , with good union)

6. CONCLUSION:

In summary, as a result of this research, we have found that:

- The chance of union in Alfa group was better than Beta, but redisplacement (rotatory & axially) in both group was the same in 3 months of follow up after operation.
- Most occurrence of the tibia mid shaft fractures and IM nail insertion were in patients less than 45 years that percentages in Beta group was more than Alfa. (Beta > Alfa)

- Most occurrence of tibia mid shaft fractures and IM nails operation in both groups were performed more usually in males than females.
- In both group of patients, the most common causative accidents for tibia mid shaft fractures were RTA (Alfa > Beta), falling trauma (Beta > Alfa), war wounds (Beta > Alfa) and other trauma (Alfa=Beta) respectively.
- In Alfa group, the most common types of tibia mid shaft fractures were closed oblique, transverse, segmental, butterfly, open Gustilio 1 & 2 and closed communited respectively, while in Beta group, the most common types of fractures were closed transverse, oblique, open Gustilio 1&2 and closed butterfly respectively.

7. Recommendations:

Based on the results of the research, following points are recommended:

- Patients with tibia mid shaft fractures in whom if IM nails are inserted, the IM nails should be interlocked by two screws at either end of the nail.
- Chance of union is better in closed IM nailing than open technique.
- Appropriate size and quality of nail should be selected before insertion.

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