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RESEARCH ARTICLE

A PROSPECTIVE STUDY OF FUNCTIONAL OUTCOME OF INTERNAL FIXATION OF FIBULA IN ADDITION TO TIBIA IN DISTAL BOTH BONE LEG FRACTURE

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ABSTRACT

Introduction: Tibial diaphyseal fracture is one of the most common long bone fracture seen and distal 1/3rd accounts for about 20-30% of them There are high chance of malunions, delayed union, ankle stiffness due to prolonged immobilization ,valgus or varus deformity of tibia. The most common injury associated with tibial diaphyseal injury is that of same side fibular fracture Injury to fibula may occur in about 80% of these patients and fibula fracture occurs either at the same level or at a different level and sometimes segmental too In distal both bone leg fractures , there is disruption of the tibiofibular syndesmosis and interrosseus membrane. A study on fixation of fibula is done to find out the effect on reduction of the tibia fracture and restoration of stability. Thus it becomes important to study the outcome of fixation of fibula along with tibia fixation. ***Materials and Methods:*** Data will be collected from patients fulfilling the inclusion criteria, attending either OPD or inpatient of Chigateri General Hospital and Bapuji Hospital attached to JJM Medical college, Davanagere. The study will include patients with distal both bone fracture of leg seen as both out-patient and in-patient fulfilling the inclusion criteria. The patients are assessed both clinically and radiologically. Other associated injuries are noted. The patients undergoing fixation of fibula by closed reduction and TENS nailing or rush nailing in addition to tibia fixed with intramedullary interlocking nail or distal tibial plating. And are reviewed post operatively, at 6wks, 3 months, and 6 months radiologically and 1 year clinically. ***Results:*** This study consist of 30 cases of distal both bone leg fractures with fibula by closed reduction and TENS nailing or rush nailing in addition to tibia fixed with intramedullary interlocking nail or distal tibial plating..For 17 (56.7%) recovery was excellent, for 9 (30%) recovery was god, and for 4 (13.3%) recovery was fair.19 patients(63.33%) had 0-degree of deformity and 2 (6.7%) had 1 degree varus deformity.5(16.7%) had 1 degrees valgus , 4(13.3%) had 2-degree valgus deformity. ***Conclusion:*** Treatment of distal third both bone leg fractures by fixation of fibula by closed tens/rush nailing followed by tibia, nailing/plating is useful in anatomical reduction of tibia & reduced malalignment of tibia with good ankle functions. Further Randomized control studies are needed to assess the long term functional outcome in these patients.

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INTRODUCTION

Fracture of the distal tibia accounts for 7 to 9% of lower extremity fractures, and the fibula is fractured in about 85% of these cases (1-3). The fracture of the distal tibia can be due to a low energy mechanism like rotational strain or a high energy mechanism like road traffic accidents or fall from heights (4). The management is decided based on amount of swelling, blisters, and open wounds in distal tibia and fibula fracture. The closed distal tibia and fibula fracture without excessive swelling, blistering, may be treated with dual plating with a locking plate through MIPPO in the tibia fracture and plating for the fibula fracture through the posterolateral approach.

But there is a high rate of superficial wound infection, implant exposure , wound dehiscence, , and delayed or non- union in patients treated with dual plating in these fractures (5-7). Rush nail/TENS nail is a better alternative for fibular fixation. It requires a smaller incision and less soft tissue dissection (8-9). And provides better mechanical stability in osteoporotic bone and has the potential to reduce the complications (10). Anatomical reduction and fixation of the fibula fracture can be performed in advance to facilitate reduction of the tibia fracture and restoration of the lower-extremity alignment. The fibula fracture fixation can be carried out using K-wires, reconstruction plates or dynamic compression plates (11). However, plate fixation of the fibula fractures may result in severe trauma and obtaining anatomical reduction for the comminuted fractures is difficult and further affects the reduction and fixation of the tibia fracture.

Treatment of long bone fractures in children involves the use of elastic nails (12), but rarely applied to the adult fractures. Titanium elastic nail (TEN) fixation was originally meant as an ideal treatment method for femoral fractures, but are now used for other long bone fractures in children, as itrepresents a compromise between conservative and surgical therapeutic approaches with satisfactory results and minimal complications (13). Titanium elastic nail (TEN) may be used to minimize soft tissue injury in patients with soft tissue compromise, while maintaining fibular length and stability while decreasing the need for bulky hardware. Early weight bearing may be done due to increased stability ofthe construct and range of motion is also better at the ankle (14).

Intramedullary nailing is a reliable technique. Flexible intramedullary nail provides stability without compromising soft tissue healing for fibula fractures (14). Rush nails provide a more rigid fixation due to its composition and are also used in fixation of distal third fibula fractures. Implants range from screws and rod-like spikes to modern, bespoke IM fibular nails. Intramedullary fixation may potentially reduce wound complications and symptomatic metalwork and improve recovery times. The biomechanical advantages of IM over traditional plate fixation have been extensively described. Nails are load-sharing implants, whereas plates are load bearing implants. There is usually less stress shielding, reduced risk of peri-implant fractures, and the injured limb can be loaded earlier. IM devices can be inserted through minimal dissection. The use of intramedullary (IM) devices has expanded in recent years to include the distal fibula, in tandem with the move towards minimally invasive surgical approaches in other areas of orthopaedic surgery. In view of this, the present study was undertaken.

MATERIALS AND METHODS

Source of the data: Data will be collected from patients fulfilling the inclusion criteria, attending either OPD or inpatient of Chigateri General Hospital and Bapuji Hospital attached to JJM Medical college, Davangere

Method of collection of data: The study will include patients with distal both bone fracture of leg seen as both out-patient and in-patient fulfilling the inclusion criteria. The patients are assessed both clinically and radiologically. Other associated injuries are noted.

The patients undergoing fixation of fibula by closed reduction and TENS nailing or rush nailing in addition to tibia fixed with intramedullary interlocking nail or distal tibial plating. And are reviewed post operatively, at 6wks, 3 months, and 6 months & 1 year clinically and with x-rays. This is a prospective study during the academic year from December 2020 to December 2022.

Sample Size and design: The proposed study will be a prospective study and will include 30 patients who satisfy the inclusion and exclusion criteria. Informed consent will be taken from all the patients. The patients will be assessed by clinical and radiologically

Inclusion criteria

- Closed distal both bone fractures
- Compound type I fractures
- Age more than 18 years
- Both sexes.

Exclusion criteria

- Age less than 18 years
- Compound type III a , III b, III c fractures.
- Intraarticular fractures.
- Patient not fit for surgery due to comorbid conditions.
- Patient not willing for surgery.

OPERATIVE PROCEDURE

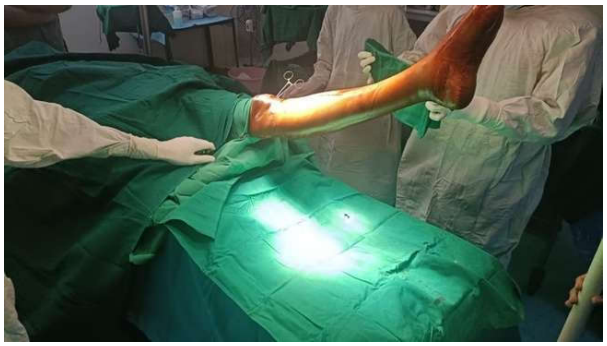
FIBULA MEDULLARY FIXATION

Fracture fibula was addressed first.

Occasionally, the associated fibula fracture is axially and rotationally stable, as demonstrated by a transverse or short oblique fracture pattern with minimal comminution. In these situations, medullary fixation is a reasonable option and can be achieved with less surgical dissection than plate fixation.65 Fractures within 5 to 7 cm from the tip of the lateral malleolus can be stabilized with a long medullary 3.5-mm screw. Segmental fractures or those above 7 cm from the tip of the lateral malleolus can be stabilized with commercially available titanium rods or guide rods from humeral, femoral, or tibial medullary nailing sets. Regardless of the device, the radiographs should be closely examined to determine the presence and diameter of the medullary canal of the fibula. Occasionally, the fibular medullary canal is stenotic or nonexistent and cannot accept a longitudinally oriented medullary implant.

PROCEDURE FOR NAILING

- After induction of spinal anaesthesia , prepare and drape the affected leg.

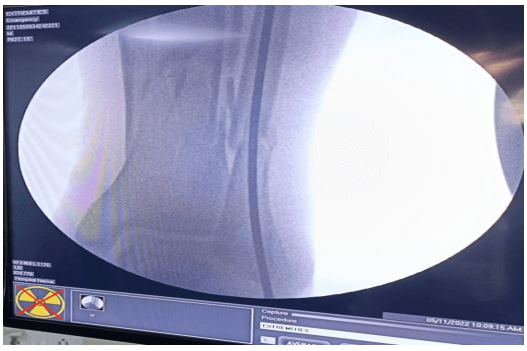


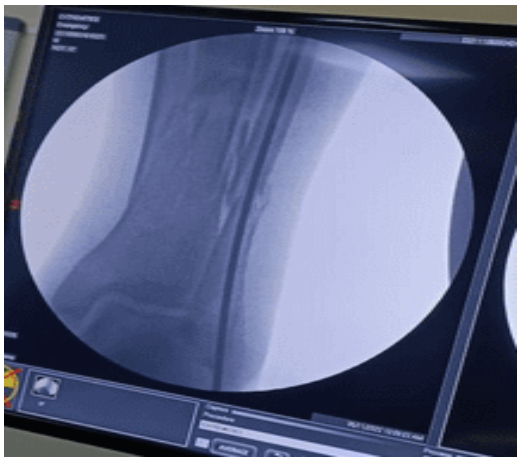
- With the use of fluoroscopy, mark on the skin the fracture site, and the starting points for nail entry. The starting point for nail entry hole is at the tip ofthe lateral malleoli

- Fluoroscopically, the tip of the lateral malleolus is identified
- A 2-cm longitudinal incision is made from the tip of the lateral malleolus and directed distally
- The tip of the lateral malleolus is identified by blunt dissection. Using a trocar, an entry hole is created in the tip of the lateral malleolus in the direction of the fibular canal.
- A long 2.5-mm drill bit is then inserted into the entry hole and directed into the medullary canal of the fibula using biplanar fluoroscopy. Since the starting point is not collinear with the medullary canal, the drill bit is required to bend as it becomes centered within the endosteal surface
- Placing the drill on oscillate and slowly advancing the drill bit will help facilitate this. Care should be taken to avoid breakage of the drill bit within the canal

- The nails come with a bevelled blunt tip. Bend the very tip of the nail to 45 degrees to facilitate passage along the opposite cortex and aid in fracture reduction.
- Contour the entire length of the nail to a gentle curve such that the apex will rest at or near the fracture site after reduction. The depth of the curve should be approximately three times the diameter of the canal to achieve the optimal balance between ease of insertion and stability.

- Under fluoroscopic guidance, slide the nail along the opposite cortex until the fracture is reached.
- Reduce the fracture and advance the nail across the fracture.





- If necessary, rotate the bent tips of the nails after passing the fracture site to effect an anatomic reduction, taking care not to distract the fracture site.
- Anatomic fibular length and rotation is confirmed and the wounds are closed

POSTOPERATIVE CARE (59)

- Patients were kept nil orally 4 to 6 hours post operatively.
- IV fluids / blood transfusions were given as needed.
- Analgesics were given according to the needs of the patient.
- The limb was kept elevated over a pillow

TIBIA FIXATION

Intramedullary interlocking nail

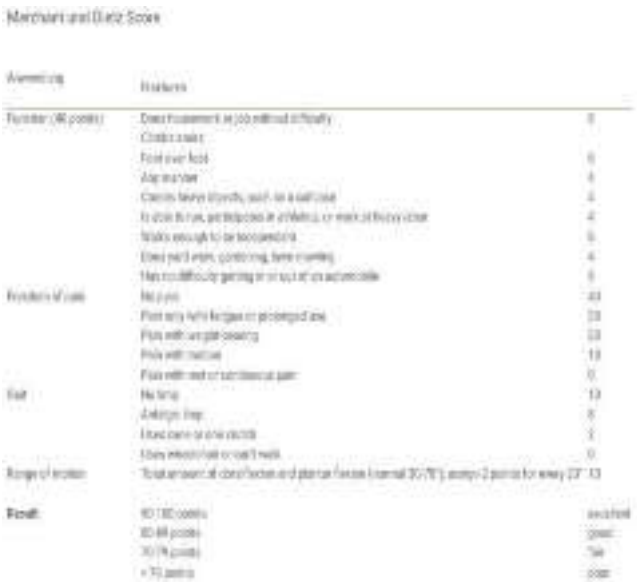
Distal tibia plating: Postoperatively 0Patients were followed upClinically and Radiologically at 6wks, 3 months, and 6 months & 1 year andthen yearly intervals until the fracture healcompletely. Orthopaedic Trauma Association classification was used at the time of admission and fractures were classified according to it. Nature of the injury was also noted. Postoperative radiographs were takento asses the tibial malalignment. The degree of the tibial angulation (varus or valgus), (Antero-posterior), (rotational) and shortening were evaluated radiologically and clinically. At the end of one year, the range of movement (dorsiflexion and plantar flexion) at the ankle was determined. Functional assessment of ankle function is done by "Ankle-Evaluation Rating System" by Merchant &Deitz and "Johner & Wruhs' Criteria" were used for final evaluation

Postoperative Scoring system

Clinical Assessment

Ankle Evaluation and Rating system by Merchant and Deitz: (100 POINTSCALE)

- 10 POINTS : Motion at Ankle
- 40 POINTS :Function
- 40 POINTS :Pain
- 10 POINTS :Gait



Range Of Motion Analysis of Ankle Joint

Radiological Assessment

Degree of Varus/ Valgusangulationat thefracturesite:

Excellent: 0-1 degree
Good: 2 to 5 degree

Fair: 6 to 10 degree
Poor: 10 degree

- Evidence of union at the Fracture site
- Final Analysis and Evaluation is based on **Johner and Wruhs[60],** Criteria and classified as Excellent, Good, Fair and Poor Outcomes

	Excellent	Good	Fair	Poor
Nonunion	None	None	None	Yes
Tibial Deformity (Varus/Valgus)	None	2-5 °	6-10 °	>10 °
Mobility at Ankle (%)	Normal	>75 %	50 – 75%	< 50%
Gait	Normal	Normal	Insignificant limp	Significant limp

RESULTS

Table 1. Age distribution among study subjects

Age Group in Years	frequency	Percentage
21-30	7	23.3
31-40	8	26.7
41-50	9	30.0
51-60	2	6.7
61-70	4	13.3

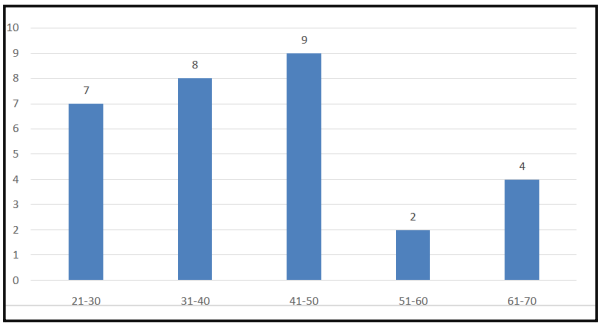


Figure 1. Distribution age among study subjects

Table 2. Sex distribution among study subjects

SEX	FREQUENCY	PERCENTAGE
FEMALE	12	40.0
MALE	18	60.0

Total 30 subjects were included in the study. Majority i.e., 9 (30%) subjects belonged to 41-50 years age group, 8 (26.7%) subjects belonged to 31-40 years age group, 7 ((23.3%) belonged to 21-30 years age group and 4 (13.3%) belonged to 61-70 years age group. Majority i.e., 18 (60%) were males and 12 (40%) were females.

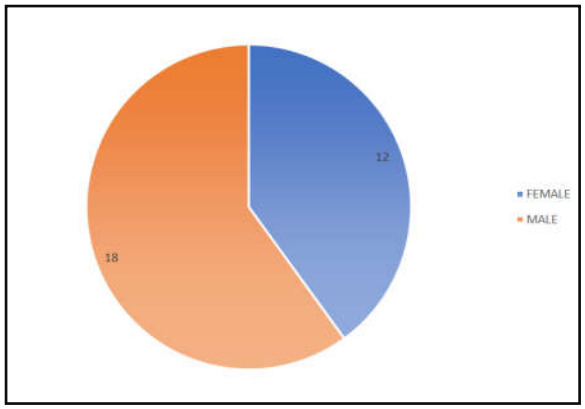


Figure 2. Sex distribution among study subjects

Table 3. Side effected among study subjects

SIDE	FREQUENCY	PERCENTAGE
LEFT	13	43.3
RIGHT	17	56.7

For 17 (56.7%) had right side involved and for 13 (43.3%) subjects had left side involved.

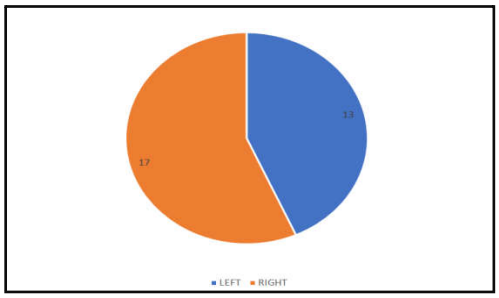


Figure 3. Side effected among study subjects

Table 4. Mode of injury among study subjects

MODE OF INJURY	FREQUENCY	PERCENTAGE
FALL	6	20.0
RTA	24	80.0

For majority i.e., 24 (80%) mode of injury was RTA, and 6 (20%) subjects mode of injury was fall.

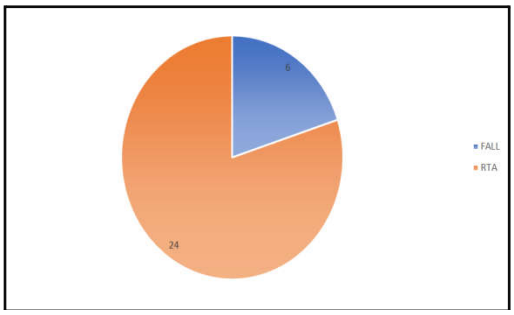


Figure 4. Mode of injury among study subjects

Table 5. Gustilo and anderson's type of fracture among study subjects

FRACTURE	FREQUENCY	PERCENTAGE
CLOSED DISTAL 1/3RD BOTH BONE LEG FRACTURE	26	86.7
GRADE 1 DISTAL 1/3RD BOTH BONE LEG FRACTURE	4	13.3

For 26 (86.7%) site of fracture was closed distal 1/3rd both bone leg fracture and for 4 (13.3%) it was grade 1 distal 1/3rd both bone leg fracture.

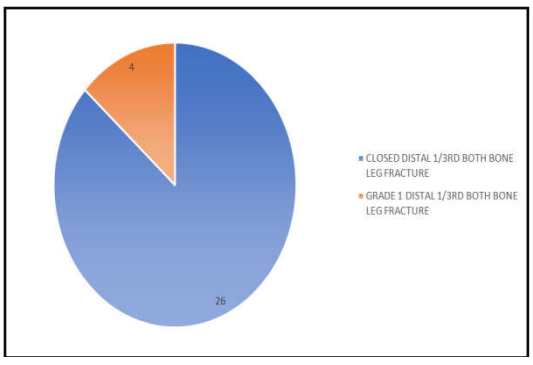


Figure 5. Gustilo and anderson's type of fracture among study subjects

Table 6. Complications among study subjects

COMPLICATIONS	FREQUENCY	PERCENTAGE
ANKLE STIFFNESS	4	13.3
HARDWARE IRRITATION	2	6.7
SUPERFICIAL INFECTION	1	3.3

Among 7 subjects who had complications, majority i.e., 4 (13.3%) had ankle stiffness, 2 (6.7%) had hardware irritation and 1 (3.3%) had superficial infection.

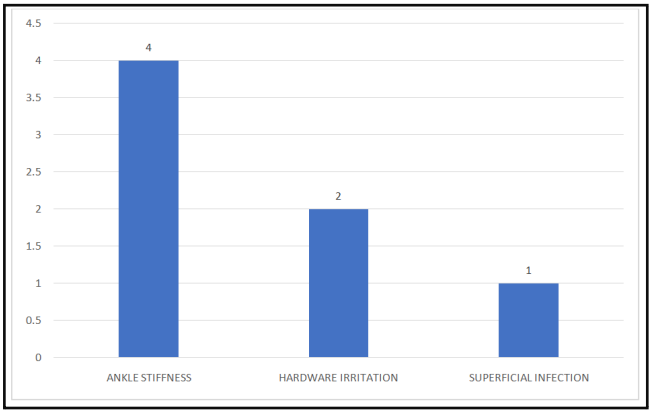


Figure 6. Complications among study subjects

Table 7. Outcome according to johner and wruhs

JOHNER AND WRUHS	FREQUENCY	PERCENTAGE
EXCELLENT	17	56.7
GOOD	4	13.3
FAIR	9	30.0

For 17 (56.7%) recovery was excellent, for 9 (30%) recovery was god, and for 4 (13.3%) recovery was fair.

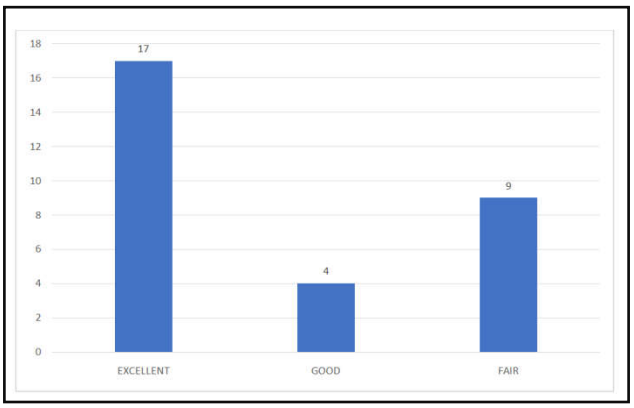


Figure 7. Outcome according to johner and wruhs

Table 8. Type of fracture among study subjects

TYPE OF FRACTURE (AO OTA CLASSSIFICATION)		
TYPE	FREQUENCY	PERCENT
A1	4	13.3
A2	4	13.3
A3	4	13.3
B1	3	10.0
B2	5	16.7
B3	2	6.7
C1	4	13.3
C2	2	6.7
C3	2	6.7

4 (13.3%) had A1 type of fracture, 4 (13.3%) had A2 type, 4 (13.3%) had A3, 3 (10%) had B1, 5 (16.7%) had B2, 4 (13.3%) had C1 type, 2 (6.7%) had C2 type and 2 (6.7%) had C3 type of fracture. Majority i.e.,19 patients (63.33%) had 0-degree of deformity and 2 (6.7%) had 1˚degree varus deformity.5(16.7%) had 1 degrees valgus , 4(13.3%) had 2-degree valgus deformity.

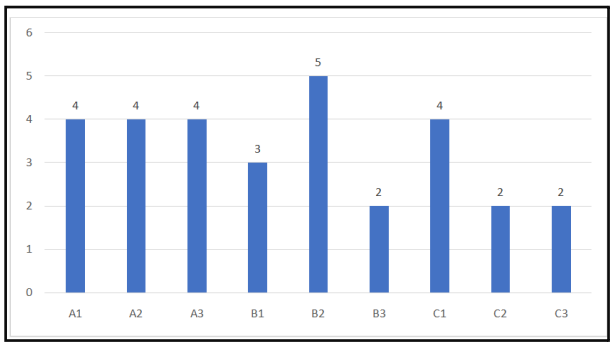


Figure 8. Type of fracture among study subjects

Table 9. Radiological varus/valgus deformity among study subjects

DEFORMITY<DEGREES>		FREQUENCY	PERCENTAGE
VARUS	1	2	6.7
VALGUS	1	5	16.7
	2	4	13.3

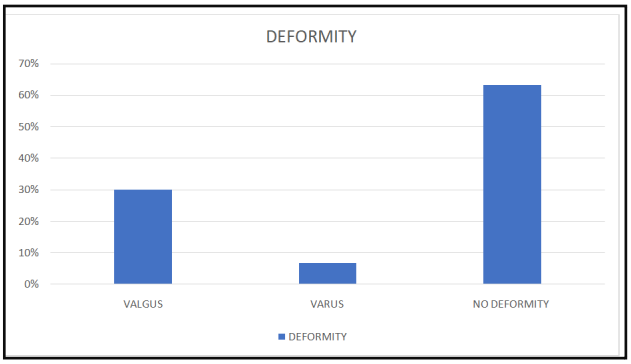


Figure 9. Radiological varus/valgus deformity among study subejcts

Table 10. Type of tibia fixation among study subjects

TIBIA FIXATION	FREQUENCY	PERCENT
IMIL	17	56.7
PLATE	13	43.3

Among 30 subjects, majority i.e., 17 (56.7%) had undergone tibia fixation by using IMIL and 13 (43.3%) had undergone tibia fixation by using plate.

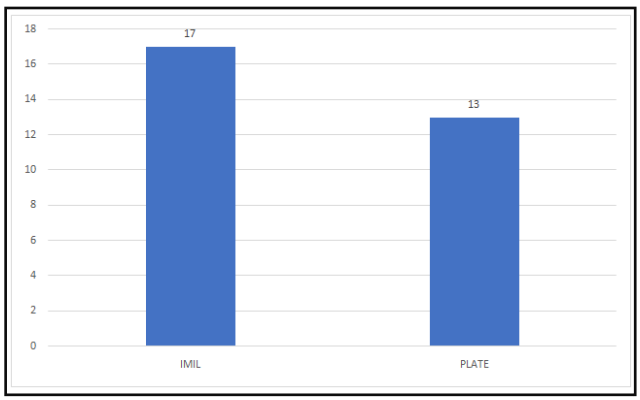


Figure 10. Type of tibia fixation among study subjects

Table 11. Type of fibula fixation among study subjects

FIBULA FIXATION	FREQUENCY	PERCENTAGE
RUSH	13	43.3
TENS	17	56.7

Among 30 subjects, for 17 (56.7%) TENS was used for fibula fixation and for 13 (43.3%) subjects, RUSH was used for fibula fixation.

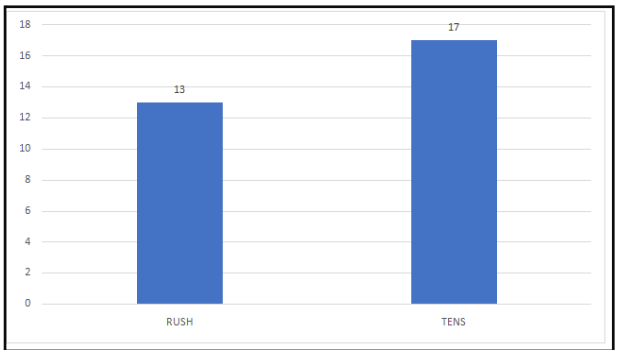


Figure 11. Type of fibula fixation among study subjects

Table 12. Mean variables among study subjects

VARIABLE	Minimum	Maximum	Mean	SD
AGE	24	70	41.87	13.080
TIME OF UNION	12	16	14.20	1.215
AERS(100)	80	100	95.73	5.650
LEFS(80)	62	78	71.23	4.297

Mean age in the study was 41.87+13.080, mean time of union was 14.20+1.215, mean AERS was 95.73+5.650, mean valgus degree was 0.45+0.736 and mean LEFS was 71.23+4.297.

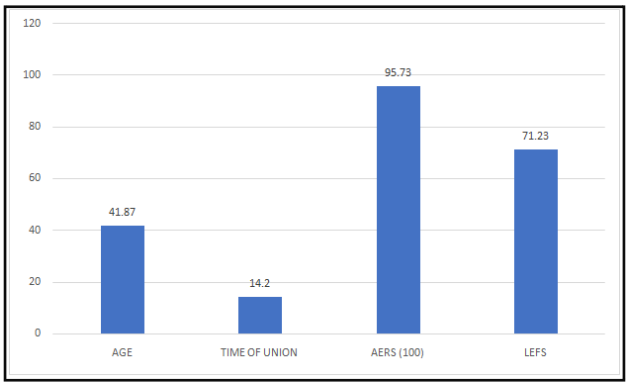


Figure 12. Mean variables among study subjects

Table 13. Association Between Tibia Fixation And Mean Variables

TIBIA FIXATION		TIME OF UNION OF TIBIA	AERS(100	LEFS
IMIL	MEAN	14.12	97.18	71.24
	SD	1.111	3.877	3.833
PLATE	MEAN	14.31	93.85	71.23
	SD	1.377	7.093	5.003
P VALUE		0.679	0.111	0.998

Mean time of union was 14.12±1.111 in IMIL type of tibia fixation and in plate type it was 1431+1.377 without any significant difference between the two. Mean AERS was97.18±3.877 in IMIL type which was similar to plate type 93.85±7.093. Mean LEFS was 71.24±3.833 in IMIL type which was similar to pate type in which it was 71.23±5.003. Mean time of union was 14.62±1.261 in RUSH type of fibula fixation and in plate TENS it was 13.88+1.111 without any significant difference between the two. Mean AERS was94.46±6.790 in RUSH type which was similar to TENS type 96.71±4.579. Mean LEFS was 70.62±4.011 in IMIL type which was similar to TENS type in which it was 71.71±4.566. Ankle stiffness was present in 3 (23.1%) subjects in RUSH type fibula fixation and in 1 (5.9%) subjects in TENS type fibula fixation. Hardware irritation was present in 1 (7.7%) RUSH type fibula fixation and in 1 (5.9%) in TENS type fibula fixation.

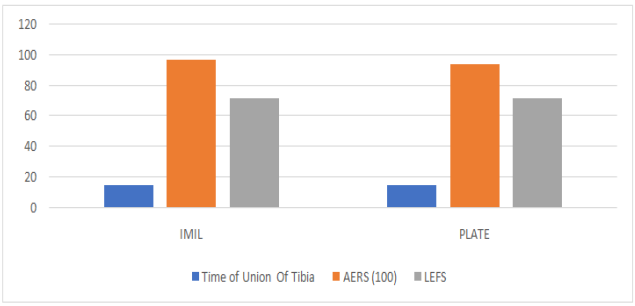


Figure 13. Association between tibia fixation and mean variables

Table 14. Association Between Fibula Fixation And Mean Variables

FIBULA FIXATION		TIME OF UNION	AERS(100)	LEFS
RUSH (13)	MEAN	14.62	94.46	70.62
	SD	1.261	6.790	4.011
TENS (17)	MEAN	13.88	96.71	71.71
	SD	1.111	4.579	4.566
P VALUE		0.102	0.289	0.501

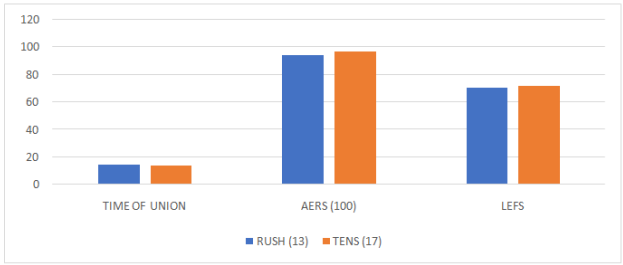


Figure 14. Association between fibula fixation and mean variables

Table 15. Association between fibula fixation and complications

FIBULA FIXATION		COMPLICATIONS			P VALUE
		ANKLE STIFFNESS	HARDWARE IRRITATION	SUPERFICIAL INFECTION	
RUSH	Count	3	1	1	0.326
	%	23.1%	7.7%	7.7%	
TENS	Count	1	1	0	
	%	5.9%	5.9%	0.0%	

Superficial infection was present in 1 (7.7%) RUSH type tibia fixation and in none in TENS type fibula fixation.

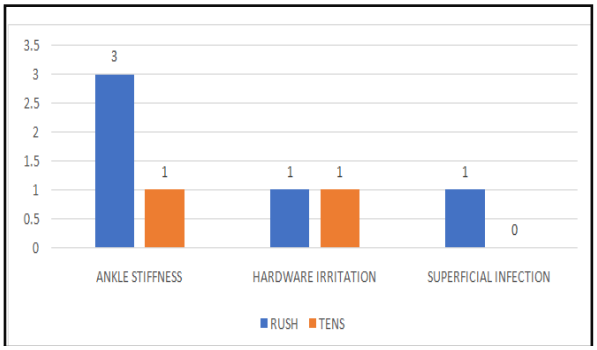


Figure 15. Association between fibula fixation and complications

Figure 15. Association between fibula fixation and complications

COMPLICATIONS

Ankle stiffness was present in 3 (23.1%) subjects in RUSH type fibula fixation and in 1 (5.9%) subjects in TENS type fibula fixation

for which physiotherapy was done for ankle range of motion.. Hardware irritation was present in 1 (7.7%) RUSH type fibula fixation and in 1 (5.9%) in TENS type fibula fixation. Superficial infection was present in 1 (7.7%) RUSH type fibula fixation and in none in TENS type fibula fixation for which regular dressings and extended course of antibiotics were given. J.M. Flynn *et al*.[81] reported 4 (1.7%) cases of superficial infection at the site of nail insertion out of 234 fractures treated with titanium elastic nails. Intramedullary fibula fracture fixation provides relative stability and allows for fracture healing while maintaining proper fibular alignment. This technique using intramedullary fibula fixation, is beneficial in patients with potential soft tissue compromise in the lateral and posterolateral aspects. This technique limits dissection, therefore, also limiting hematoma formation[89]. Barry and Paterson *et al*.[90] refer to using a single Rush nail for creating stability with three-point fixation on the inner aspect of the cortex.

Mild pain was present in 3 (23.1%) subjects who underwent plate type tibia fixation and none in IMIL type, whereas no pain was present in 17 (100%) subjects who underwent IMIL type and in 10 (76.9%) subjects who underwent plate type tibia fixation. Mild pain was present in 32 (15.4%) subjects who underwent RUSH type fibula fixation and in 1 (5.9%) subject who underwent TENS type fibula fixation whereas no pain was present in 11 (84.6%) subjects who underwent RUSH type and in 16 (94.1%) subjects who underwent TENS type fibula fixation. J.M. Flynn *et al*.[81] reported 38 (16.2%) cases of pain at site of nail insertion out of 234 fractures treated with titanium elastic nails.

DISCUSSION

The incidence of combined tibia and fibula fracture in adults is relatively high in clinical practice. High-energy trauma is the most common cause of this kind of fracture. The present study was undertaken to assess the functional outcome of internal fixation of fibula in addition to tibia in distal both bone leg fracture. Total 30 subjects were included in the study. Majority i.e., 9 (30%) subjects belonged to 41-50 years age group, 8 (26.7%) subjects belonged to 31-40 years age group, 7 ((23.3%) belonged to 21-30 years age group and 4 (13.3%) belonged to 61-70 years age group. In a study by Gupta *et al*.[80] majority i.e., 46.66% 350-50 years age group which was consistent with the present study. Majority i.e., 18 (60%) were males and 12 (40%) were females. This was similar to a study by Gupta *et al*.[80] in which male predominance was seen (18 males and 12 females). For 17 (56.7%) had right side involved and for 13 (43.3%) subjects had left side involved. For majority i.e., 24 (80%) mode of injury was RTA, and 6 (20%) subjects mode of injury was fall. This was similar to a study by Gupta *et al*.[80] in which 73.33% of the injuries were due to RTA and to a study by Flynn *et al*.[81] in which it was 58.1%. For 26 (86.7%) site of fracture was closed distal 1/3rd both bone leg fracture and for 4 (13.3%) it was grade 1 distal 1/3rd both bone leg fracture. Among 7 subjects who had complications, majority i.e., 4 (13.3%) had ankle stiffness, 2 (6.7%) had hardware irritation and 1 (3.3%) had superficial infection. In a study by Gupta *et al*.[80] superficial infection was seen in 3 patients which was more compared to this study and none had ankle stiffness. Borg *et al*.[82] postop infection developed in 14.3% of patients which was more compared to this study and delayed/non-union in 19% patients which was not seen in this study. 4 (13.3%) had A1 type of fracture, 4 (13.3%) had A2 type, 4 (13.3%) had A3, 3 (10%) had B1, 5 (16.7%) had B2, 4 (13.3%) had C1 type, 2 (6.7%) had C2 type and 2 (6.7%) had C3 type of fracture. In a study by Gupta *et al*.[80] most of them were type A (46.67%), followed by type B (36.67%) and type C fractures (16.7%) which was consistent with this study.

Majority i.e.,19 patients(63.3%) had 0-degree of deformity and 2 (6.7%) had 1˚degree varus deformity.5(16.7%) had 1 degrees valgus , 4(13.3%) had 2-degree valgus deformity. In 9 out of 30patients, there was mild amount of valgus/varus angulation at the fracture site within the acceptable range. In comparison to the previous studies where fibulawas treated conservatively in fractures of distal third of tibia and fibula, the valgus and varus angulationinour study was significantly less. Acceptableangulation being 5degrees.Heinrich SD, *et al*[83] reported 5° of varus angulation in one subject in their study and 11 % of fractures had an average varus or valgus malalignment of 6°.

Among 30 subjects, majority i.e., 17 (56.7%) had undergone tibia fixation by using IMIL and 13 (43.3%) had undergone tibia fixation by using plate. Among 30 subjects, for 17 (56.7%) TENS was used for fibula fixation and for 13 (43.3%) subjects, RUSH was used for fibula fixation. Mean age in the study was 41.87+13.080, mean time of union was 14.20+1.215, mean AERS was 95.73+5.650, mean LEFS was 71.23+4.297.Mean time of union was 14.12±1.111 in IMIL type of tibia fixation and in plate type it was 14.31+1.377 without any significant difference between the two. In a study by Gupta *et al*.[80] mean time of union in IMIL type tibial fixation was 19 weeks with a range of 16-24 weeks which was more compared to this study. Borg *et al*.[82] studied 21 patients with tibial fractures and noted that the average time to union was 5.44 months which was almost similar to this study. Mean AERS was 97.18±3.877 in IMIL type which was similar to plate type 93.85±7.093.. Mean LEFS was 71.24±3.833 in IMIL type which was similar to pate type in which it was 71.23±5.003.Borg *et al*. studied tibial fractures fixed by intramedullary nails and noted that the average time to union was 5.44 months, Bahari *et al*[84] in 42 patients noted union in 22.4 weeks, Redfern *et al*[85] studied noted that the average time to union was 23 weeks, Lau *et al*.[86] noted the average time to union 18.7 weeks which was more compared to this study. Aksoy C, *et al*[87] compared the results of compression plate fixation and intramedulalry nail insertion. Average time to union was 7.7 (4 to 10) months in theplating group and 4 (3 to 7) months for intramedullary nailing. Mean time of union was 14.62±1.261 in RUSH type of fibula fixation and in plate TENS it was 13.88+1.111 without any significant difference between the two. Mean AERS was 94.46±6.790 in RUSH type which was similar to TENS type 96.71±4.579, 0.31±0.602 in TENS type, both were similar. Mean LEFS was 70.62±4.011 in RUSH type which was similar to TENS type in which it was71.71±4.566.

CASE ILLUSTRATION

CASE 1: 55/MALE; TRAUMATIC CLOSED RIGHT DISTAL THIRD BOTH BONE LEG FRACTURE

Pre op xray

Immediate Post-Op

3 Months post-op

6 Months post-op

CLINICAL IMAGES SHOWING RANGE OF MOTION AT 1 YEAR FOLLOW UP

CASE 2: 58/FEMALE; TRAUMATIC CLOSED LEFT DISTAL THIRD BOTH BONE LEG FRACTURE

PRE OP XRAY IMMEDIATE POST OP

3 MONTHS POST-OP

6 MONTHS POST-OP

CLINICAL IMAGES SHOWING RANGE OF MOTION AT 1 YEAR FOLLOW UP

CONCLUSION

- The present study was conducted to assess the functional outcome of internal fixation of fibula in addition to tibia in distal both bone leg fracture.41-50 years age group and males were commonly involved in the both bone leg fractures. Right leg was involved more than the left leg. RTA was the most common mode of injury. For nearly half of the study population, functional outcome was excellent, followed by good and fair outcome in the remaining. Complications observed were superficial infection, ankle stiffness and hardware irritation. Mean time of union was better and complications were lesser in IMIL fixed tibial fractures and in TENS fixed fibular fractures.
- Fixation of fibula in cases of distal third fractures of both bones of leg where tibial fractureis treated by intramedullary interlocking nail /plate offer better outcomes by reducing the incidence of tibial malalignment (varus/valgus) and maintaining thelength
- Fibula fixation prior to fixation of tibia aids in restoring the height of the lateral column and helps in reduction of thetibia anatomically. This may be the reason for less valgus/varus angulation was found in cases where fibulawas fixed.
- Closed fixation of fibula leads to good soft tissue healing.Hence the Functional scores at 1 year showed better results when compared to fixation by plating & conservative management of fibula. Also avoids large skin incision, periosteal stripping,soft tissue damage etc required for plate fixation.
- There was no significance with respect to the time of union of tibia when comparing our results with the previous studieswhere fibular fracture was not fixed.
- According to Criteria by JOHNER and WRUH's, most of the patients(57%) had excellent outcome, (30%)had good,(13 3%) had fair outcomes.
- When compared to previous studies the outcome assessment by this criteria showed a better results in our patients where fibula fixation is carriedout.

In conclusion, treatment of distal third both bone leg fractures by fixation of fibula by closed tens/rush nailing followed by tibia, nailing/plating is useful in anatomical reduction of tibia & reduced malalignment of tibia with good ankle functions. Further Randomized control studies are needed to assess the long term functional outcome in thesepatients.

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