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Comparison of Results of Conservative and Operative (Interlocking Nail) Treatment of Closed Isolated Diaphyseal Tibial Fracture in Adult

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Abstract: *The aim of this prospective study is to compare the result of treatment in two groups , one group closed intramedullary nailing after reaming with the other group closed reduction followed by plaster casting in the patient having isolated closed diaphyseal tibial fracture in adult.*

Materials & Methods*: All patients with an isolated closed unilateral fracture of the tibial diaphysis, , were evaluated for inclusion in the present study. Inclusion criteria were displaced closed fractures. The fractures of type A and B, according to the AO-classification system, were considered suitable for the study Patients who agreed to participate in the study were randomized using the technique of stratified randomization by minimization. This method ensures that the treatment groups are similar as regards the percentage of patient factors that are considered of major prognostic importance. The aim is to balance the marginal treatment totals for each level of each patient factor. Patients in each stratum were randomly allocated for treatment by reamed intramedullary nailing or plaster cast . 17 patients were randomized to have reamed intramedullary nail (group I), and 17 patients were randomized to have a plaster cast (group II). All fractures were unilateral. 19 involved the right leg. 4 patients were injured by falling accidents. Traffic accidents caused the injuries in 26 patients, 11 of them were pedestrians, 2 was an automobile driver, and 13 was a motorcycle driver. 2 patients were injured in sporting accidents and 2 others were injured at work.*

Results: *The mean time to radiographic union was nineteen weeks for the 17 patients who had been managed with a cast compared with thirteen weeks for the 17 patients who had been managed with nailing ($p < 0.05$). A non-union occurred in two patients who had been managed with a cast and in one patient who had nailing. Two patients who had a non-union after management with a cast had intact fibula. These differences were significant ($p < 0.05$, chi-square test).*

For the matched pairs of patients, the mean time to union was nineteen weeks after management with a cast and thirteen weeks after management with nailing ($p < 0.05$) (Table 3The differences between the two groups were significant ($p < 0.05$).

I. Introduction

Fractures of tibial shaft are among the most common long bone injuries presenting for treatment. The tibia is often involved in high-energy trauma; its relative lack of soft-tissue covering often leads to severe complications and major disabilities. The management of such fractures remains controversial. Closed isolated tibial shaft fractures conventionally have been treated conservatively with closed manipulative reduction and a cast, while surgical management has been reserved for cases in which an adequate closed manipulative reduction could not be obtained or maintained. During the last two decades, excellent results have been reported by a number of investigators after treatment with both closed intramedullary nailing [1-12] and conservative management [13- 15]. In the literature, the results after different types of treatment have often focused on time-to-union and complications. Few studies have included questions about general function [12]. The combination of general function, quality of life and morbidity during fracture healing has not been studied in a prospective study. We therefore conduct this prospective study to compare treatment with closed intramedullary nailing with those of closed reduction and a cast in patient having isolated closed Diaphyseal tibial fractures, emphasizing the patient's general function and morbidity.

II. Aims And Objectives

The aim of this prospective study is to compare the result of treatment in two groups , one group closed intramedullary nailing after reaming with the other group closed reduction followed by plaster casting in the patient having isolated closed diaphyseal tibial fracture in adult –

(1) in terms of time of union,
(2) comparative assessment of the functional recovery between and rehabilitation period of two groups.
(3) comparative assessment of the radiological outcome after fixation with the cast treatment and closed interlocking nail.

III. Materials And Methods

All patients with an isolated closed unilateral fracture of the tibial diaphysis, occurring between November 2011 and October 2012, were evaluated for inclusion in the present study. Inclusion criteria were displaced closed fractures. The fractures of type A and B, according to the AO-classification system, were considered suitable for the study (Müller et al. 1990) [16]. The following exclusion criteria were used: 1) patients who had other major injuries which could influence the final functional result, 2) Patients with cardiopulmunary, rheumatological, neurological, or metabolic disease, 3) patients with previous injuries which influenced their general function, 4) patients with fractures within 5 cm distal to the tibial tuberosity or 7 cm proximal to the ankle joint, 5) open fractures and 6) those with open growth plates. 34 patients (26 men) having a mean age of 38 (17– 78) years fulfilled the criteria and entered the study. The patients gave their informed written consent before inclusion in the study, which was approved by the hospital's ethics committee. Patients who agreed to participate in the study were randomized using the technique of stratified randomization by minimization (Pocock 1983) [17]. This method ensures that the treatment groups are similar as regards the percentage of patient factors that are considered of major prognostic importance. The aim is to balance the marginal treatment totals for each level of each patient factor. Using a computer minimization program, each patient was allocated according to high-energy, soft tissue injury (closed), age (under or over 50 years), smoking (yes or no), alcoholism (yes or no), and occupation (sedentary, mobile, heavy, unemployed). Fractures caused by traffic accident or a fall from a height of at least 3 meters were classified as high-energy trauma (Önnerfält 1978) [18]. Patients in each stratum were randomly allocated for treatment by reamed intramedullary nailing or plaster cast . 17 patients were randomized to have reamed intramedullary nail (group I), and 17 patients were randomized to have a plaster cast (group II). All fractures were unilateral. 19 involved the right leg. 4 patients were injured by falling accidents. Traffic accidents caused the injuries in 26 patients, 11 of them were pedestrians, 2 was an automobile driver, and 13 was a motorcycle driver. 2 patients were injured in sporting accidents and 2 others were injured at work. The severity of the closed injuries was classified according to Oestern and Tscherne (1984)[19] (Table 1). 8 fractures were caused by low energy trauma, while 26 fractures were caused by high-energy trauma (Table 1).

Table 1: Distribution by gender, smoker, age, and details of soft-tissue damage in the treatment groups

Treatment group	n	Gender (Male)	Smoker	Age Mean (range)	Trauma type		Soft-tissue damage [19]	
					High	Low	C0	C1
Group I (nail)	17	14	5	32 (20-45)	12	5	8	9
Group II (Cast)	17	12	5	31 (21-48)	14	3	7	10

The type of fracture was classified according to the AO system (Figure 1) (Table 2). Seven fractures involved the proximal third of the tibia, 21 the middle third, and 6 the distal third. 29 patients had an associated fibula fracture, 8 at the same level as the tibia fracture and 21 at a different one (Table 2).

Table 2: Distribution of the fractures according to the AO-classification system and fracture localization

Treatment group	AO-classification						Location of tibia fractures			Fibula[a]		
	A1	A2	A3	B1	B2	B3	Proximal	Middle	Distal	1	2	3
Group I (nail)	4	6	3	2	1	1	4	11	2	2	11	4
Group II (Cast)	3	7	2	3	1	1	3	10	4	3	10	4

[a] 1 intact, 2 fractured at a level different from the tibia fracture, and 3 fractured at the same level as the tibia fracture, according to AO-classification. The median time of delay to operation was 5 days for group I and no days for group II. Gender, smoking habits, age, type of trauma, severity of soft-tissue damage, and degrees of comminution of the fractures were similar in the 2 groups. Closed tibial nailing was performed with the patient lying supine. A calcaneal pin was used if traction was required. We used a longitudinal mid patellar incision and

approach to the proximal tibial cortex 1–1.5 cm below the joint line, just beneath the patellar tendon. The nail diameter was 8 mm in 6 patients, 9 mm in 8 and 10 mm in 3. In all patients, the nail was inserted after reaming. Static locking was performed in all patients. Active movement and partial weight bearing encouraged soon after the operation. Weight bearing was allowed after six weeks, depending upon progression of healing and associated injuries.

Technique:

Interlocking Tibial Nailing:

During the pre operative period, all patient received antibiotics prophylactically (1.5 gram of Cefaruoxime preoperatively and 1.5 gram eight, sixteen, and twenty four hours postoperatively. Patients who are allergic to Cefaruoxime receive Vancomycin (500 mg preoperatively and 500 mg twelve and twenty four hours postoperatively). If there were associated open injuries distant from the fracture of the tibial shaft, prophylaxis was extended to three days postoperatively, and if the patient had a grade III A injury an Aminoglycoside was added.

Nailing was made to perform within 5 days after the injury; the limb was splinted in the interim.

Under Spinal Anaesthesia, all nailing procedure were performed with radiolucent standard operating table with patient supine the knee hanging down at side of the table.

After appropriate preparation of skin and draping, a midline incision was made over the patellar tendon. A large curved bone awl tip is used to open the proximal tibial cortex anteriorly at a point 1- 1.5 cm below the joint line, proximal to the tibial tubercle. at the level of fibular head – confirm the position on anteroposterior, lateral fluoroscopic view.

Direct the awl nearly perpendicular to the shaft when it first penetrates the cortex, but gradually bring it down to a position more parallel to the shaft as it is inserted more deeply to prevent violation of posterior cortex. An olive pointed guide-wire passed through the entry portal into the medullary canal, and pass it across the fracture site into the tibia under the fluoroscopic guidance.

Reaming was then carried out throughout the entire extent of the medullary canal in knee ninety degree flexion, overreamed to one milimeter more than the diameter of the nail. The appropriate length of the nails that were to be inserted after reaming was determined with use of guide-rod substraction method. Insertion of nail with insertion device was controlled under image intensification. Distal locking was done with freehand technique after perfect circle obtained by fluroscopy. Proximal locking was done with the jig attached to nail insertion device. On O.T. table whole construct was evaluated under fluoroscopy in AP & LAT view for proper fixation and aligment.

Post-operative early range of motion exercise of knee and ankle was encouraged. In the absence of injuries of the contralateral lower extremity, patients who were able to walk with a walker or crutches did so, without weight bearing .Patients were discharged on 3rd Post Operative day.

On 14th day stich off done at Follow-up clinic. Attempts were made to evaluate the patients clinically and radiographically, every four weeks until the fracture united and at 12 months.

Patients in group II were treated with a long leg plaster for the first 4–6 weeks. Thereafter, the cast was changed to a patellar tendon-bearing cast until the fracture was stable enough for treatment with a functional brace. Displaced fracture was defined as more than 5° of angulations in any direction, noticeable malrotation, shortening more than 5 mm, or displacement of more than half of the width of the tibia, on the radiograph. All operations were done under antibiotic prophylaxis. All fractures were assessed clinically and radiographically, every 4 weeks until fracture union and at 12 months.

Plaster Cast

(a) If the Tibial Diaphyseal fracture is minimally displaced or undisplaced without much swelling of swoft tissue :

The patient is in supine position with an assistant holding the toes with one hand and supporting the calf with the other hand. Keep the limb much above the table. Apply generous layer of cotton as an even layer of rolled wadding measuring about half an inch in thickness extending beyond the metatarsal head to upper third Thigh. Apply Plaster in two stage technique – apply below knee plaster, mould and then complete the plaster upto the thigh. Plaster is applied smoothly taking a tuck with each turn, smoothing each layer firmly onto the one beneath. The limb is placed in Neutral position, with knee flexed at 10 and foot in plantigrade position. Check the position of limb is done by doing X-RAY of leg with ankle & knee joint in AP – LAT view.

Thereafter, elevation of the leg and regular, careful check up of circulation is essential. Non-weight bearing can be allowed as soon as the patient has mastered cruthes. At 4 -6 wks post injury, the long leg plaster is changed to patellar tendon bearing cast with walking heel allowed for weight bearing and knee flexing. This is retained until union is sound.

(b) Displaced , Stable Tibial Diaphyseal fracture with swelling of soft tissue :

Close reduction followed by long leg Posterior Plaster slab for splintage is done until swelling is reduced.

During reduction in supine position with a sand bag under the buttock, an assistant holds the thigh and keeps the limb much above table while the surgeon applies traction in the leg in the line of the limb done under either spinal anaesthesia or general aesthesia.. Traction will lead to disimpaction of most fractures.

Traction will also lead to reduction of shortening and in most cases reduction of deformity. Any residual angulation following the application of traction may be corrected by using the heel of the hand under the fracture and applying pressure distally with the other. Checking the reduction clinically by trying to palpate the fracture line along the subcutaneous border or in case of transverse fracture confirm that a hitch is present by noting resistance to attempted telescopy. Thereafter, elevation of the leg and regular, careful check of circulation is essential, until the swelling subsided. Check the reduction by doing XRAY of the leg with knee & ankle joint AP-LAT view. After swelling reduced long leg plaster casing done as before. If, the radiography indicate residual angulation, this should be corrected by wedging. All wedging should be done by 3rd day after reduction and the plaster should be left untouched for six to eight weeks. Thereafter, the cast was changed to a patellar tendon bearing cast with walking heel to allow the patient weight bearing and knee flexion until union is sound. Radiological union should be confirmed by clinical examination- if union is judged sound plaster is removed and full unsupported weight bearing commenced.

The matched pairs, consisting of 17 patients who had had nailing and 17 who had been managed with a cast, were assessed at a mean of 12 months.The time to union was compared for the both groups. In addition, all 34 patients were asked when they had returned to work after the injury.

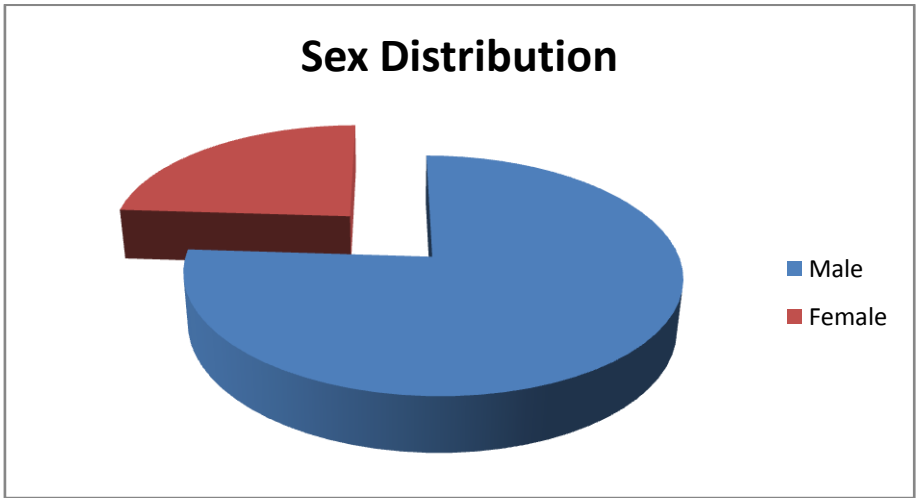
Healing was defined as bridging callus across at least 3 of 4 cortices on the anteroposterior and lateral radiographs (Sharrard 1990) [22], with no pain by stressing the fracture or on walking. Delayed union was diagnosed as consolidation after 20 weeks without further surgical procedures to promote healing. Nonunion was reported when union did not occur unless an intramedullary reaming and fixation with a nail or bone graft was done. Nonunion patients were excluded from the groups when time-to-union was assessed. Malunion was defined as of more than 5° angular deformity (Collins et al. 1990) [6], more than 10° rotational deformity (Johner and Wruhs 1983) [23], or more than 10 mm shortening or lengthening (Collins et al. 1990) [6]. Infection was defined as a purulent discharge from which pathogenic organisms were cultured.

Table No: 3 Age distribution in Group 1 & 2.

Age Group	Group -1 Nail	Group -2 Cast
(20 – 30) Years	8 cases	8 cases
(31 – 45) Years	9 cases	8 cases
Above 45 Years	Nil	1 case

Table 4. Sex distribution in study group.

Sex	**No. of patients**	**Percentage**
Male	26	76%
Female	8	24%
Total	34	100%



Statistics

Statistical analyses were done with use of the paired Student t test to compare differences between the two groups in terms of the time to union, the knee joint mobility, ankle joint mobility, deformityand the time until the patients returned to work. Statistically significant difference was defined as $p < 0.05$.

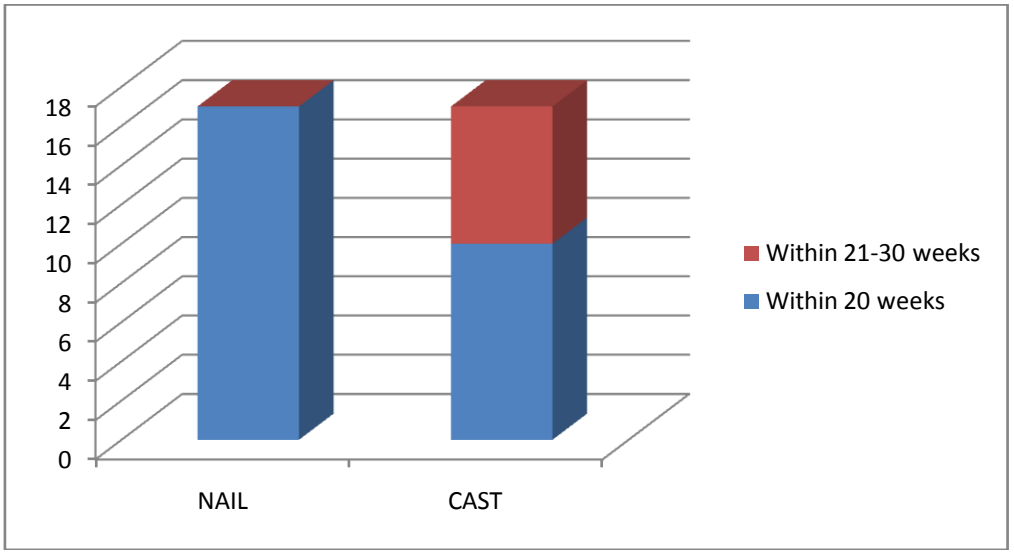
IV. Results

The mean time to radiographic union was nineteen weeks for the 17 patients who had been managed with a cast compared with thirteen weeks for the 17 patients who had been managed with nailing ($p < 0.05$). A non-union occurred in two patients who had been managed with a cast and in one patient who had nailing. Two patients who had a non-union after management with a cast had intact fibula. Three patients who had been managed with a cast had shortening of more than 1.5 centimeters. No patient had shortening of more than 1.5 centimeters after intramedullary nailing. Two patients had varus or valgus malalignment of more than 10 degrees, and two had 10 degrees of recurvatum after management with a cast. No patient had varus, valgus, or sagittal malalignment after intramedullary nailing. These differences were significant ($p < 0.05$, chi-square test). No patient in either group had rotational deformity of more than 10 degrees or a compartment syndrome. No patient who had intramedullary nailing had hardware failure. Elective removal of nail is done in Six of the 17 patients more than eighteen months after the injury, usually because of pain in the knee.

For the matched pairs of patients, the mean time to union was nineteen weeks after management with a cast and thirteen weeks after management with nailing ($p < 0.05$) (Table 3The differences between the two groups were significant ($p < 0.05$).

Table 5: Time of union & Average time of union in Group 1 & 2.

Time of union	Group 1 (Nail)	Group 2 (Cast)
Within 20week	17 cases	10 cases
Within (21 – 30) week	NIL	7cases
Above 30 week	NIL	NIL
AVERAGE UNION TIME	19 WEEKS	13 WEEKS



There were five smokers in each matched-pair group. The mean time to radiological union was twenty-two weeks (range, sixteen to thirty-two weeks) for the smokers who had nailing compared with twenty-five weeks (range, twenty to fourty-two weeks) for the smokers who had been managed with a cast. With the numbers available for study, we could not detect a significant difference between the two groups ($p > 0.05$). The 17 patients who had had nailing returned to work significantly sooner than did the 17 who had been managed with a cast (mean, four compared with 6.5 months; $p < 0.05$)

Table No. 5: Shortening in Length in Group 1 & 2

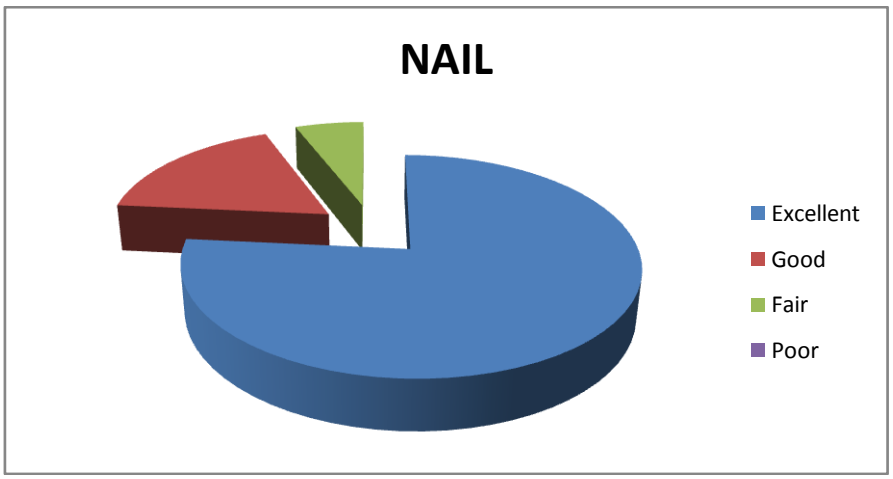
Shortening in Length in cm	Group I Nail	Group 2 Plaster
< 1cm.	2 cases (11%)	6 cases (35.3%)
>1 cm	1 case (5.9%)	Nil
> 1.5cm	Nil	3 cases (17%)
No shortening	14 cases (82.4%)	8 cases (47.1%)
Total number =	17 cases	17 cases

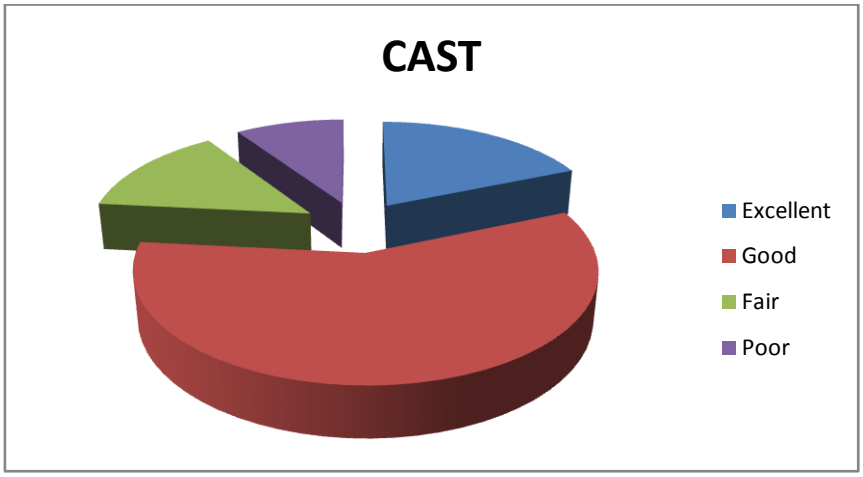
JOHNER & WRUHS criteria for comparative assessment of final result after Tibial shaft fracture either with closed reduction followed by plaster casting or Tibial interlocking nail based on functional, radiological, clinical & subjective Outcome. (clnical orthop 178:12 l983)

	Excellent	Good	Fair	Poor
Non-Union	X	X	X	Present
N-V disturbances	X	Minimal	Moderate	Severe
Deformity :				
Varus / Valgus	Normal	(2-5) degree	(6-10) degree	>10 degree
Anteversion / Recarvatum	(0-5) degree	(6-10) degree	(11-20) degree	>20 degree
Rotation	(0-5) degree	(6-10) degree	(11-20) degree	>20 degree
Shortening	(0-5) mm	(6-10)mm	(11-20)mm	>20mm
Mobility				
Knee joint	Normal	80%	>75%	<75%
Ankle joint	Normal	75%	>50%	<50%
Pain	No	Occasional	Moderate	Severe
Gait	Normal	Normal	Insignificant Limp	Significant Limp
Strenous Activity	Possible	Limited	Severely Limited	Impossible

Table 6 Results in Group 1 & 2.

Result	Group I Nail	Group2 Cast
Excellent	13 cases (76.5%)	4 cases (23.5%)
Good	3 cases (17.6%)	8 cases (72.7%)
Fair	1 case (5.9%)	3 cases (17.6%)
Poor	Nil	2 cases (11.8%)
	17 cases	17 cases





Pie Diagram showing comparison of result between in Group 1 & 2.

V. Discussion

Isolated closed tibial shaft fractures conventionally have been treated with closed manipulative reduction and an above-the knee POP cast, followed by conversion to a patellar tendon-bearing cast or a functional cast-brace at about one month [14-15]. Sarmiento et al. in a study of 1000 closed fractures of the tibial shaft reported that conservative management with use of a prefabricated functional below-the-knee cast-brace was effective [14-15]. However, those authors had strict criteria for using the cast-brace. An intact fibula was a relative contraindication to functional cast-brace because of increased risk of developing angular deformity. Fractures with more than 1-2 cm of initial shortening also are a relative contraindication to functional cast-bracing because the initial 1-2 cm amount of shortening indicates the final amount of shortening after healing. In addition, an inability to bear weight while wearing the patellar-tendon brace or the fracture-brace is predictive of a longer time to union. Sarmiento et al. had thirty years of experience with the treatment of tibial shaft fractures with a functional cast-brace, and to our knoweldge, the results of their study were excellent — the best reported in the literature. However, their results have not been reproduced by other researchers [5, 10].

Interestingly, in an earlier study by Sarmiento et al., eighty-five (28 per cent) of 306 patients with closed tibial shaft fractures treated with functional cast-bracing had angular deformity of more than 5 degrees [14]. Bostman reported that closed manipulative reduction is difficult to obtain or maintain when there is initial displacement of more than 50 percent of the width of the tibia, especially with spiral fractures of tibial shaft in the distal third [3]. There have been few studies in the literature comparing the results of closed conservative treatment with those of closed intramedullary nailing of fractures of the tibial shaft. Hooper et al. [8] performed a prospective, comparative randomized study of 62 patients who had a closed tibial shaft fractures with at least 50% displacement or at least 10 degrees of angular deformity in any plane. Thirty-three patients (Group A) were managed with closed manipulative reduction, followed by an above-the-knee POP cast for four weeks, followed by use of a patellar tendon-bearing cast until union. Full weight-bearing was encouraged. Twenty nine patients (Group B) had closed intramedullary nailing of the fracture. The mean time to union was 18.3 weeks for Group A compared with 15.7 weeks for Group B ($p < 0.05$), and the mean time until the patients returned to work was twenty-three weeks for Group A and 13.5 weeks for Group B ($p < 0.01$); both of these differences were statistically significant. There was significantly more angular deformity in Group A, with nine patients having varus or valgus angulation of more than 5 degrees and no patient in Group B having an angular deformity ($p < 0.01$). Shortening of 1-2 cm occurred in six patients in Group A and in one patient in Group B ($p < 0.01$). No infections were noted in either group. Bone et al. [12] performed a retrospective study of ninety-nine patients who had a closed, isolated, unilateral, displaced tibial shaft fractures was performed to ascertain the result of the type of treatment on the functional and clinical outcome. Forty-seven patients were managed with closed intramedullary nailing with reaming, and fifty-two were managed with closed reduction and a cast. The two groups were comparable in terms of the ages of the patients, the locations and degrees of displacement of the fractures, and the number of patients with smoking history. The time to union was significantly quicker in the patients who had been managed with closed intramedullary nailing than in those who had been managed with a closed reduction and cast (mean, eighteen compared with twenty-six weeks; $p = 0.02$). A non-union occurred in one patient (2 per cent) who had been managed with nailing and in five patients (10 per cent) who had been managed with a cast. There were no post-opertive infections in either group. Elective Removal of the interlocking nail was performed in twenty-six patients. Twenty-five patients who had been managed with intramedullary nailing and twenty-five who had been managed with a POP cast were followed for a mean duration of 4.4 years.

Karladani et al. [24], in a randomized prospective comparative study of 53 patients with isolated, unilateral, closed or grade 1 open, displaced fractures of the tibial shaft, 27 patients (group I) were randomized to treatment with an intramedullary nail and 26 patients (group II) to treatment with a plaster cast. 12 fractures in the latter group were considered stable enough for treatment with only a cast (group IIa), while 14 fractures in group II showed redisplacement during reduction under anesthesia or at 1 week follow-up. Therefore, these fractures were stabilized with cerclage or screws (group IIb), which was a prerequisite for continuing cast treatment. The mean time-to-union was 19 weeks for group I, and 25 weeks for group II. 6 patients in group I and 16 in group II had delayed union. The Nottingham Health Profile index scores on physical mobility, social isolation, work ability, and sexual life were significantly better in group I than in group II at 3 months after injury.

Delayed union, malunion, and restricted range of motion at the ankle joint were common complications when these fractures were treated with a cast.

The results obtained by Hooper et al., Bone et al. and Karladani et al. were very similar to those in our current study. According to Sarmiento et al.[15], poor result by conservative treatment with POP cast in several study may be due to poor patient selection for example conservative treatment with a cast-brace for a fracture for which such treatment is relatively contarindicated — for example, a tibial shaft fracture with an intact fibula or one associated with more than two centimeters of initial shortening as seen on the initial radiograph. Thus, the study may be biased selectively towards the group managed with intramedullary nailing.

Puno et al. reported markedly improved ankle evaluation score for the group that had been treated with intramedullary nailing. Thus, Their study established a direct relationship between the extent of residual deformity of the limb and the clinical result for the ankle but not that for the knee [10]. The responses to the SF-36 survey in our current study showed significant differences, in the patients' bodily pain perceptions, mental health, social functioning, vitality, general health, and physical role functioning, between the group that had been managed with a POP cast and the group that had had intramedullary nailing. Our study had several limitations. The time to union was significantly prolonged after treatment with a POP cast, but this could have been influenced by the surgeon not encouraging the patients to bear weight fully as early as they could have. Two patients who had been managed conservatively had a nonunion. One of those two patients who had a nonunion had an intact fibula,which could have contributed to the non-union.

The major strength of our study is its prospective design.

In conclusion, we recognize that, when the proper indications for intramedullary nailing or use of a POP cast are present, the choice of treatment of a islolated, closed tibial shaft fracture should be made by the informed patient. The results of our study showed that closed intramedullary nailing may yield better clinical and functional outcome than use of a POP cast for many patients who have a displaced closed tibial shaft fracture

VI. Conclusion

We summarize the main points of the study – 34 cases were selected in whom 17 cases were treated with closed reduction and plaster cast and Rest 17 cases were treated with closed reduction followed by reaming then intramedullary nailing.

34 patient with isolated, closed, diaphyseal , tibial fracture were followed up for a period 12 month.

Fracture were classified according to AO classification and soft tissue injury classified according to The Tscherne and Gotzen classification .

More than half of the cases were found below the age of the 35 years and in males.

8 cases were caused by low energy trauma, while 26 fracture were caused by high energy trauma.

Seven fractures involved proximal third of the tibia, 21 fractures the middle third and 6 the distal Third. 29 patients had an associated fibula fracture.

The Median time of delay of operation was 5 days for Nailing group and for plaster group for (0-5) days.

For Tibial intramedullary nailing was done through mid-patellar incision.

Complicaion include - superficial infection, deep infection, delayed union, non-union, stiffness of proximal and distal joints, deformity or malignment.

Partial weight bearing was allowed depending on the stability of fracture from 6 weeks after operation when x-ray shows partial callus. In conservative cases patient were allowed to walk after 6 weeks with Patellar tendon bearing casing with walking heal after 6 weeks.

Full weight bearing was allowed when the x-ray showed consolidation of bridging callus.

All fracture treated by intramedullary nailing united within 20 weeks whereas treated by plaster cast united 10 cases. Only 7 cases treated by plaster cast united within 30 weeks.

Average time of union for plaster group was 19 weeks and for nail group was 14 weeks.

Only 1 case in nail group complicated with superficial skin infection and only 1 case complicated with deep infection .

Deformity like shortening in length of limb in plaster group < 1 cm in 6 cases, > 1.5 cm in 3cases and no shortening rest case, whereas in nail group < 1 cm in 2 cases and >1 cm in 1 cases.
Two patient had varus or valgus malalignment of more trhan 10 degreesss and one recurvatum after managent with a cast.

The final result of two groups were compared according to Johner & Wruhs Criteria based on Functional, Radiological, Clinical & subjective outcome. (clinical orthop 178 :12 1983).

Excellent result found in 13 cases in nail group & 4 cases in cast group. Good result found in 3 cases in nail group & 8 cases in cast group. Fair result found in 1 case in nail group & 3 cases in cast group. Poor result found only in cast group 2 cases.

In conclusion, we recognize that, when the proper indications for intramedullary nailing or use of a POP cast are present, the choice of treatment of a islolated, closed tibial shaft fracture should be made by the informed patient. The results of our study showed that closed intramedullary nailing may yield better clinical and functional outcome than use of a POP cast for many patients who have a displaced closed tibial shaft fracture.

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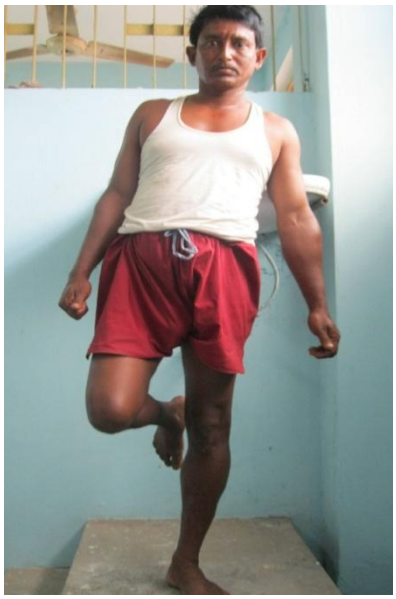
Gr 1 (nail)	Age(Years)	Sex (M/F)	Smoker (Y/N)	Trauma Type (High/Low)	Soft tissue Damage (C0/C1)	AO classification	Location of tibia fracture	Location of Fibula fracture	Time to union (weeks)	Varus/ Valgus	Anteversion / Recurvatum	Rotation	Shortening	Knee joint mobility	Ankle joint mobility	Pain
1	32	M	N	High	C1	A3	Middle	2	11	Nil	Nil	Nil	Nil	100%	98%	No
2	25	M	Y	High	C1	A2	Middle	2	12	Nil	Nil	Nil	Nil	95%	98%	No
3	27	F	N	Low	C0	A2	Middle	3	10	Nil	Nil	Nil	Nil	100%	100%	No
4	39	M	Y	High	C1	A3	Proximal	2	12	Nil	Nil	Nil	Nil	95%	98%	No
5	42	M	N	High	C0	A2	Middle	2	10	Nil	Nil	Nil	Nil	99%	100%	No
6	45	M	Y	High	C1	A2	Distal	1	16	Varus <5	Nil	Nil	Nil	91%	90%	No
7	21	M	N	High	C1	B1	Middle	2	14	Valgus <4	Nil	Nil	< 1cm	80%	88%	Occasional
8	29	M	N	High	C1	A3	Proximal	2	11	Nil	Nil	Nil	Nil	80%	90%	No
9	36	M	N	Low	C0	A1	Middle	2	12		Nil	Nil	Nil	100%	96%	No
10	45	M	Y	Low	C0	A1	Middle	3	14	Nil	Nil	Nil	Nil	100%	100%	No
11	23	F	N	Low	C0	A1	Distal	2	14	Nil	Nil	Nil	Nil	79%	74%	Occasional
12	20	M	N	High	C1	B3	Proximal	3	19	< 4 Varus	Nil	Nil	>1cm	70%	80%	Occasional
13	31	M	N	High	C0	A2	Middle	2	11	Nil	Nil	Nil	Nil	91%	95%	No
14	35	F	N	Low	C0	A1	Middle	2	10	Nil	Nil	Nil	Nil	100%	100%	No
15	33	M	Y	High	C1	B2	Middle	1	18	Nil	Nil	Nil	Nil	79%	80%	Occasional
16	30	M	N	High	C0	A2	Proximal	3	14	Nil	Nil	Nil	Nil	75%	82%	Occasional
17	24	M	N	High	C1	B1	Middle	2	16		Nil	External <5	< 1cm	80%	90%	No

Gr 2 (Cast)	Age(Years)	Sex (M/F)	Smoker (Y/N)	Trauma Type (High/Low)	Soft tissue Damage (C0/C1)	AO classsification	Location of tibia fracture	Location of Fibula fracture	Time to union (weeks)	Varus/ Valgus	Anteversion / Recurvatum	Rotation	Shortening	Knee joint mobility	Ankle joint mobility	Pain	Gait	Strenous Activity	Neuro - Vascular Disturbances	Result
1	22	M	Y	High	C1	A2	Middle	2	16	Nil	Nil	Nil	<1 cm	85%	75%	No	Normal	Possible	Nil	Good
2	48	M	N	High	C0	A3	Middle	3	15	Nil	Nil	Nil	Nil	95%	90%	No	Normal	Possible	Nil	Excellent
3	25	M	Y	High	C1	B2	Proximal	2	24	valgus 4	Re - 5	Nil	< 1cm	80%	75%	Occasiona	Normal	Limited	Nil	Good
4	31	F	N	Low	C0	A1	Middle	2	15	Nil	Nil	Nil	Nil	95%	90%	No	Normal	Possible	Nil	Excellent
5	32	M	N	High	C1	A2	Distal	3	20	valgus 4	Nil	Nil	<1cm	80%	75%	Occasiona	Normal	Limited	Nil	Good
6	44	M	N	High	C1	B1	Middle	2	22	Varus 8	Nil	Nil	>1.5 cm	75%	70%	Moderate	InSig Limp	Sever Lim	Nil	Fair
7	29	F	N	Low	C0	A1	Distal	3	20	Valgus 5	Nil	Nil	<1 cm	80%	80%	Occasiona	Normal	Limited	Nil	Good
8	32	M	Y	High	C1	A2	Middle	2	16	Nil	Nil	Nil	Nil	90%	95%	No	Normal	Possible	Nil	Excellent
9	28	M	Y	High	C1	B1	Proximal	1	24	Varus 10	Nil	Nil	Nil	80%	80%	Occasiona	Normal	Limited	Nil	Good
10	30	F	N	High	C0	A2	Middle	2	14	Nil	Nil	>5 External	Nil	80%	75%	Occasiona	Normal	Possible	Nil	Good
11	22	M	N	High	C1	A3	Middle	1	28	Varus>10	Nil	Nil	Nil	70%	45%	Moderate	Signifi Lim	Impossibl	Nil	Poor
12	25	F	N	High	C1	A2	Distal	1	26	Varus >10	Nil	Nil	Nil	68%	45%	Moderate	Signifi Lim	Impossibl	Nil	Poor
13	34	F	N	Low	C0	A1	Middle	2	16		Nil	Nil	Nil	100%	90%	No	Normal	Possible	Nil	Excellent
14	32	M	N	High	C1	B3	Middle	2	24	Valgus >5	Nil	Nil	>1.5 cm	75%	65%	Moderate	InSig Limp	Limited	Nil	Fair
15	33	M	Y	High	C0	A2	Proximal	2	18	Nil	Nil	>5 External	<1 cm	80%	80%	No	Normal	Possible	Nil	Good
16	21	M	N	High	C1	B1	Distal	3	23	Nil	Nil	> 8 External	>1.5 cm	75%	75%	Moderate	InSig Limp	Limited	Nil	Fair
17	35	M	N	High	C0	A2	Middle	2	16	Valgus 6	Nil	Nil	< 1cm	80%	80%	Occasion	Normal	Possible	Nil	Good


Patient in long leg plaster casing

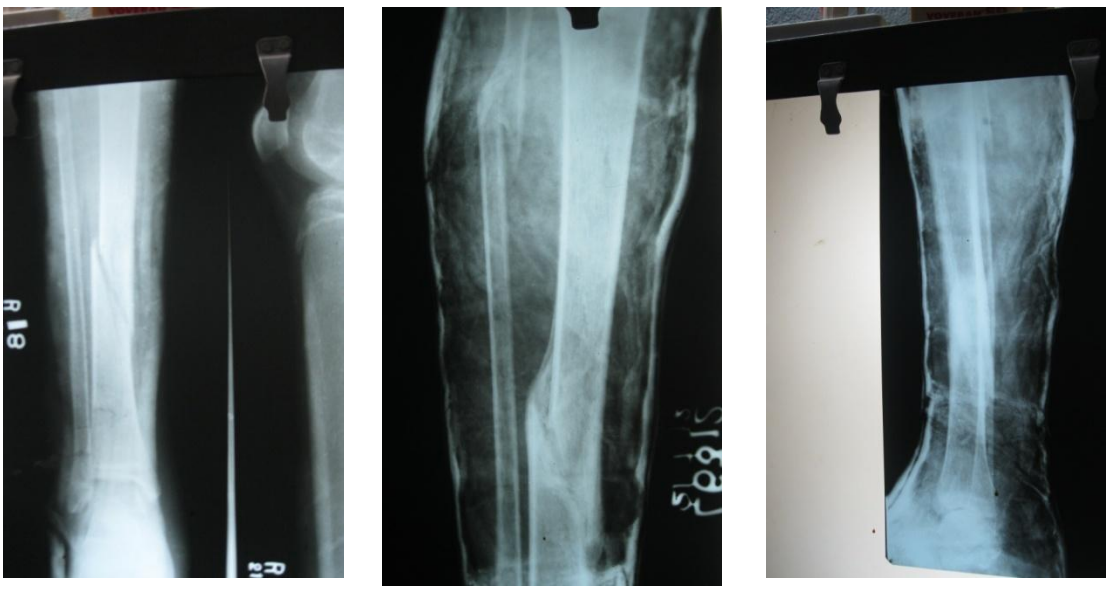
Patient in Patellar tendon bearing plaster with walking heel




Patient 6 months after Interlocking Nail for tibial shaft fracture

Management by Conservative Treatment

Immediate after trauma



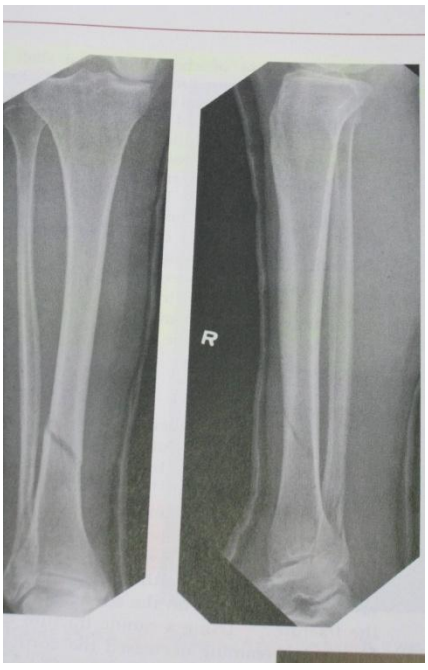
Progressive stages of Healing of fracture in plaster

Management by Tibial Interlocking Nail

Pre operative image

6 month after opeartion

Management by Conservative Treatment



Immediate after plaster

18 weeks after injury