



Tibial Shaft Fracture Using Intramedullary Interlocking Nailing Technique in Patients Coming with Tibial Shaft Fracture

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Abstract: Background: Tibia being a large bone in humans anatomically is always prone to fracture in cases of trauma owing to its capacity to bear load the recovery can be complicated easily by instability, delayed recovery, and long illness. Tibial shaft fractures are often the result of high-energy injuries in younger peoples. Intramedullary nailing is one widely used form of fixation with excellent results. **Objective:** To assess the functionality in tibial shaft fracture using intramedullary interlocking nailing technique in patients coming with tibial shaft fracture. **Methodology:** A prospective observational study was conducted in the Department of ortho & Spine surgery, National Institute of Traumatology & Orthopaedic Rehabilitation (NITOR), Dhaka, Bangladesh over a period of one year between June 2018 to July 2020. A total of 59 participants were evaluated who met the inclusion criterion for the study of which data for 56 were available for analysis as 3 patients didn't completed the follow up. They were included only after satisfying the laid down inclusion criterion while after performing routine procedures they were given the treatment of intramedullary interlocking nailing if indicated. Data collected on excel sheets were analyzed using SPSS for tests of association and measures of central tendency. **Results:** 56 participants were there who were offered the treatment of intramedullary nailing with interlocking nailing majority of them were males from BPL. Most of the injury was of type A from Motor vehicle accidents involving proximal shaft. John Wruh's criterion was used to assess the functional outcomes with 47% having excellent results. Only 3 (5%) of the patients had poor results. **Conclusion:** Interlocking Intramedullary nailing for tibial shaft fractures is an excellent method of surgical management. Intramedullary nailing decreases the occurrence of complications such as infection thus by decreasing the time to recover in patients receiving such injuries.

Keywords: Tibial Shaft Fractures, Younger People, Injuries, Treatment.

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INTRODUCTION

Tibia has been raising concerns for the world's orthopedists. With the growing amount of industrialization urbanization and road vehicles in Bangladesh, complex cases of injury caused by road car accidents have increased dynamically. Tibia being a large bone in humans anatomically is always

prone to fracture in cases of trauma owing to its capacity to bear load the recovery can be complicated easily by instability, delayed recovery, and long illness. Males are more commonly affected than females, with a male rate of about 41 for every lakh per year and a female rate of about 12 for every 1 lakh peryear [1]. Tibial shaft fractures are often

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the result of high-energy injuries in younger people, and patients must be assessed according to Advanced Trauma Life Support (ATLS) guidelines for traumatic complications. The affected lower limb must be properly inspected. It is important to record and log injuries to the underlying skin and soft tissues, such as fracture blisters, skin abrasions, burns, ecchymosis or skin tenting. It is important to recognize open fractures and to initiate an effective tetanus update and antibiotics immediately upon initial presentation. Recent research has shown that the prevalence of associated compartment syndrome can be as high as 11.5 percent in diaphysis tibial fractures. Tibial surface is 33% is subcutaneous making it more prone to develop open fracture along the majority of its length when compared to other large bones [2, 3]. Younger people in general tend to be more predisposed to develop the compartment syndrome. Tibial shaft fractures (fractures in the bone in the long middle portion of the tibia or shin bone) are often caused by high-energy injuries, such as collisions with motor vehicles. Fractures of the tibial shaft that are identified as 4 cm distal to the tibial tuberosity and 4 cm proximal to the ankle are treated with interlocking techniques [4]. Intramedullary nailing is one widely used form of fixation with excellent results. This is done by inserting a metal rod often from the upper side of the tibia into the medulla (inner cavity) of the tibial shaft. The rod is held in both ends by screws [5, 6]. Traditionally, either by splitting the patellar tendon (transtendinous approach) or alternatively by dissecting just adjacent to the patellar tendon (paratendinous approach), the starting point for intramedullary nailing of tibial shaft fractures was developed through an infrapatellar approach.

METHODOLOGY

A prospective observational study was conducted in the Department of Ortho & Spine Surgery, National Institute of Traumatology & Orthopaedic Rehabilitation (NITOR), Dhaka, Bangladesh over a period of one year between June 2018 to July 2020. A total of 59 participants were evaluated who met the inclusion criterion for the study of which data for 56 were available for analysis as 3 patients didn't completed the follow up.

Inclusion Criterion

- All consenting patients who had fracture tibial shaft open or closed, were of age group 18-60 who were readily available for follow up for one year.

Exclusion Criterion

- All participants who had compound or

comminuted fracture and age not within age criterion, malunion, aseptic nonunion, pathological fracture, medically unfit patients.

Usual Procedures followed-In the emergency, the patient was received and his vital parameters were registered & monitored. Related injuries to the limbs, chest, abdomen and head were removed. An intravenous line was developed, tetanus prophylaxis and I/V cephalosporin antibiotics were given, fluid substitution began and pressure bandage managed hemorrhage from the wound. The wound was washed and dressed over the fracture site, and a groin was added to the toe slab by simply aligning the bone. Other wounds, if any, were properly taken care of. The patient was transferred to the orthopedic ward after he had settled from the acute injury. Detailed history, documenting the degree and severity of the injury, degree and form of trauma to the tissues, and detailed examination of the affected extremity were taken upon admission to the ward. Skiagrams in order to describe the fracture were analysed in depth. Details of the Implants - A full collection of 28-38 cm long IL-nails available in diameters of 7, 8, 9 and 10 mm. An osteotome, a hammer and an elevator periosteum. A diamond tip bone awl and a nail with a V. Hexagonal tipped screw driver, tourniquets, Image intensifier television (IITV), Versatile Reamer, guide wire, an aluminium tissue protector, a nail extractor, Hand / Power drill and drill bits of 3.2 mm, Depth gauge, bone tap and 4.5 mm cortical screw collection. A specially constructed IL-nail was used for the purpose in all cases. IL-nail is a hollow, metallic modified clover-leaf nail having a D-shaped platform at its proximal end (head) and a proximal locking hole. It has proximal bent of 20° in antero-posterior direction to compensate for the proximal Herzog's curve within the medullary canal. The nail has a slot along its whole length on the posterior direction which facilitates unreamed nail insertion. About 2.5cm above the tip of the nail, the anteroposterior direction is a distal locking grip.

Measuring from the tibial tuberosity to the base of the medial malleolus on the unaffected foot, the required length of the nail is picked. The nail diameter is measured on the X-ray or by reaming, depending on the extent of the medullary canal. A fret operations were done at all times, the limb was held elevated and vigorous toe movements were encouraged. Excessive swelling, pain and distal circulation were controlled by the patient. After 5 days of surgery, the first dressing was carried out. When the suture line is clean, suture removal was performed under complete asepsis after 10 to 12 days. The compression bandage was removed and a

crepe bandage from the knee to the ankle was added to the GT slab. Immediately after dressing, aggressive mobilization of the knee and ankle begins. As per the symptoms present suitable advice was given to patients for weight bearing and weight training. Monthly evaluation of patients was done; apart from their wellbeing functional parameter was evaluated using John Wruh's Criterion.

Operations Procedure

All cases of fracture shaft tibia were operated on within seven days of the injury. In the orthopedic procedure theatre, both cases were carried out. Near intramedullary nailing was conducted without opening and with or without reaming of the fracture site. The standard procedure for operating such cases were done with all aseptic precautions and as described.

Data Analysis

Data was collected using MS Office Excel Sheets as per the different variables of quantitative

and qualitative types. The data collected was thus analyzed using SPSS software. Analysis was done using standard measures of central tendency like Mean, Standard Deviation while tests for association were used like Chi square test etc. p value of <.05 was considered as statistically significant.

RESULTS

Our study had 56 participants with more males (n=41, 73.21%) while females were less. More of the participants were from rural background (n=36, 64.29%), majority were Hindus and from below poverty line (Table 1). While on the trauma front we saw that more participants suffered the injury due to motor vehicle accidents (n=43, 76.78%) and only 23% were from fall from height of high statistical significance. There was more closed fractures than open ones involving the right side (Table 2) Most commonly involved was the distal segment (n=41, 72.7%) while most were of type A ,83.93% and of statistical significance.

Table 1: A brief description of various socioeconomic indicators of the study participants (N=56)

	Gender				Total	%	p value
	Male	%	Female	%			
Age in years Mean age 33.25							
18-25	10	17.86	2	3.57	12	21.43	>.05
25-35	10	17.86	3	5.36	13	23.22	
35-55	15	26.79	7	12.5	22	39.29	
>55	6	10.71	3	5.36	9	16.07	
Residence							
Urban	15	26.79	5	8.93	20	35.72	>.05
Rural	26	46.43	10	17.86	36	64.29	
Religion							
Muslim	30	53.57	10	17.86	40	71.43	>.05
Hindu	7	12.5	3	5.36	10	17.86	
Others	4	7.14	2	3.57	6	10.71	
SES							
APL	17	30.36	5	8.93	22	39.29	>.05
BPL	24	42.86	10	17.86	34	60.72	
Total	41	73.21	15	26.79	56	100.0	

Table 2: Trauma details, and other types of fracture, their association with Gender (N=56)

Trauma details	Gender				Total	%	p value
	Male	%	Female	%			
Side Involved							
Right	21	37.5	8	14.29	29	51.79	>.05
Left	20	35.71	7	12.5	27	48.21	
Fracture Details							
Open	16	28.57	6	10.71	22	39.28	>.05
Closed	25	44.64	9	16.07	34	60.71	
Trauma mode							
MVA	30	53.57	13	23.21	43	76.78	>.05
Fall from Height	11	19.64	2	3.57	13	23.21	
Fracture Type							
Mid shaft	12	21.43	3	5.36	15	26.79	>.05
Proximal Segment	7	12.5	3	5.36	10	17.86	
Distal Segment	22	39.29	9	16.07	31	55.36	
AO Type Fracture							
Type A	33	58.93	14	25.0	47	83.93	>.05
Type B	8	14.29	1	1.79	9	16.07	

The union time in our study took 30.0 weeks with SD of 10 days, considered when callus

formation appeared on three or four cortices on the AP and lateral X-rays.

Table 3: A brief description about the Johner and Wruh criterion and Trauma types and AO type Fracture (N=56)

	John Wruh Criterion										p value
	Excellent	%	Good	%	Fair	%	Poor	%	Total	%	
Trauma type											
MVA	19	33.93	10	17.86	11	19.64	3	5.36	43	76.79	>.05
Fall from Height	8	14.29	4	7.14	1	1.79	0	0.0	13	23.21	
AO Type Fracture											
Type A	24	42.86	11	19.64	9	16.07	3	5.36	47	83.93	>.05
Type B	3	5.36	3	5.36	3	5.36	0	0.0	9	16.07	
Total	27	48.21	14	25.0	12	21.43	3	5.36	56	100.0	

In our study we found that Trauma type and AO fracture types were related to the functional results which were categorized using Johner and Wruh Criterion. Both the types of fracture and reasons for trauma were found to be statistically significant (Table 3). We saw excellent results in

48.21% patients while 25.0% were having good results based on Johner and Wruh criterion after the intramedullary interlocking nails as the treatment for shaft tibia fracture. Only 3(5.36%) had poor outcomes.



Fig 1: Pre-operative and Post-operative Skia gram with treatment from intramedullary nail.

DISCUSSION

Using this conventional form, the knee is positioned in a flexed or hyper flexed position over the radiolucent triangle. While the starting point is set, the radiolucent triangle acts as a system to place the leg in a flexed position. During the reduction man oeuvre and nail insertion, the radiolucent triangle can also aid in applying traction [7, 8]. The intramedullary nailing beneath imaging system fulfils the goal to secure minimal tissue damage resulting in better and faster unions of fracture. The application of intramedullary nails with either reaming to match the maximum diameter nail to protect the tibia better or without reaming in compound cases is an accessible and commonly used surgical technique of intramedullary nailing to avoid the spread of infection [9]. Reamed nailing has been used with better results in terms of post implant infection. Reamed nailing facilitates the inserting of a greater diameter of the nail and increases the stability of the fracture, as the torsional stability is proportional to the fourth power of the radius of the nails being used. Our study had more males while coming from rural areas with BP status. Studies done in Bangladeshi set ups for hospitalized patients usually have similar picture (12) Other studies too have had more results from MVA when compared to fall from height or other reasons [10]. The criterion for evaluating the effectiveness of functionality was picked to be evaluated using John Wruh's criterion owing to its ease of use and all round accountability of various components of the recovery associated with such fractures including nonunion, neurovascular disorder, deformity, varus or valgus deformity, anteversion-recurvation, rotation, shortening, mobility of knee and ankle, pain, gait changes, and the strenuous activity [10-15]. Other studies too have evaluated intramedullary nailing for shaft tibia fracture with excellent results as the

majority of clinical outcome. In their studies to the union was achieved after close to 30 weeks while most of the occurrences were Type a fractures. While regarding the percentage of closed fractures which was in our study on the lesser side but similar studies done by Finkemeier, Karaarslan A *et al*, found a higher percentage of closed fractures had been healed at 4 months after reamed nail insertion compared to unreamed insertion ($p = 0.040$), but there was no difference at 6 and 12 months [16, 17]. While in other study length of fracture union averaged 28 weeks in closed fractures and 39 weeks in open fractures. In our study it was close to 30 weeks .The results after using the intramedullary nail with interlocking in our study had majority with excellent to good results. Similar findings have been reported and form the basis of recommending this technique in cases of fracture shaft tibia. We had only mild problems in the form of knee stiffness that involved physiotherapy, which gradually improved with time. Infection was seen in 3 cases.

CONCLUSION

The above study tried to document the findings after patients recover from treatment of intramedullary nail in case of fracture shaft tibia. Interlocking Intramedullary nailing for tibial shaft fractures is an excellent method of surgical management. Intramedullary nailing decreases the occurrence of complications such as infection (5 percent in our study). Primary nailing provides better support to the stabilizing muscle groups thus by helping early soft tissue healing enabling the patients to move early and reducing the length of stay in Hospital. In future more such studies should be planned to have a more rich data base and document the various modalities intricately linked to the fracture shaft tibia and intramedullary nailing techniques.

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