



## STUDY OF FUNCTIONAL OUTCOME OF SURGICAL MANAGEMENT OF PROXIMAL THIRD FRACTURES OF SHAFT TIBIA USING HIGH BEND TIBIA NAIL

### Orthopaedics

|                                     |                                                                                                              |
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### ABSTRACT

**Background:** Tibia, being anatomically placed subcutaneously throughout its length, is very prone to fractures. Incidence of extra-articular proximal tibia fractures accounts for 5-11% of all tibia shaft fractures. Hence this study is done to emphasise the importance of functional outcome of high bend tibia nailing in management of extra-articular proximal third tibia fractures based on Knee Society Score and Radiological fracture union. **Method:** Our study is a prospective study conducted at Department of Orthopaedics at Tertiary Healthcare Centre between February 2021 to July 2022. Total 40 patients were included in present study as per inclusion and exclusion criteria. **Results:** Functional outcome was assessed by knee society score at the interval of one and half month, three months, six months and 1 year interval. At the end of our study maximum of the patients had excellent outcome on knee society score, with minimal to no radiological malalignment, with radiological signs of union seen at 18 to 20 weeks. With knee range of motion ranging from 0 to 125 degree in maximum patients. With absence of anterior beaking or palpable step and absence of knee pain. **Conclusion:** High bend tibia nail can be considered a better surgical option as it offers advantages in terms of range of motion, hospital stay, full weight-bearing time and union time, infection rate.

### KEYWORDS

Tibial fractures, High bend tibia nail, knee society score, extra-articular proximal

### INTRODUCTION

Tibial fractures are one of the most commonly occurring fractures due to its superficial location. It is frequently fractured long bone in the body with an annual incidence of tibial shaft fractures is 26 per 1,00,000 individuals<sup>(1)</sup> of which Extra-articular proximal tibial fractures account for 5-10 % of all tibial shaft fractures<sup>(2,3)</sup> and typically are caused by a high-energy mechanism. Treatment of these fractures is of utter importance. The treatment options for the tibial fractures are conservative management, open reduction with plate fixation, external fixator devices and recently the intramedullary interlocking nailing. Each treatment has its own advantages and disadvantages.

Interlocking nailing of tibial fractures are most desirable because these are load sharing devices in compared to load bearing plate implants. Biological fixation of the fracture is possible in the method of nailing without opening the fracture site, further it is possible to spare the extra osseous blood supply and we can avoid extensive soft tissue dissection.

The AO/Orthopaedic Trauma Association (OTA) system is the most widely used system for classifying proximal tibial fractures. Type A fractures are extra-articular, type B fractures are partially articular, and type C fractures are articular with a metaphyseal component. Both IM nails and plates are appropriate for treating type A and simple intra-articular type C1 fracture patterns.

Conservative management of proximal tibia fractures has resulted in malunion, non-union, rotational deformity, or stiffness of adjacent joints,<sup>(4,5)</sup> delayed weight bearing, prolonged immobilization time, turning the tendency of patient toward surgical management. The available treatment options for proximal tibia fractures are external fixators, plate internal fixation and intramedullary nailing.<sup>(6)</sup>

Intramedullary nailing is the standard treatment for most patients with fractures of the tibial shaft. In recent years, closed reduction with minimally invasive plating and locked intramedullary nailing have both become widely used treatment modalities for proximal tibia extraarticular fractures.<sup>(7,8)</sup>

The Tibial Nail System (TNS)<sup>(9)</sup> is an intramedullary nailing system indicated for fractures in the tibial shaft as well as for metaphyseal and certain intra-articular fractures like the Pilon fracture. End cap blocks

the most proximal screw creating an angular stable construct. The tibia nail gives stable fixation and early mobilization which further result in early restoration of function without use of plaster. The rate of union in proximal tibia fractures is more due to osteosynthesis initiated by high bend tibia nail by interfragmentary compression due to its intramedullary support.<sup>(10)</sup>

Hence this study is done to emphasise the importance of functional outcome of high bend tibia nailing in management of extra-articular proximal third tibia fractures based on Knee Society Score and Radiological fracture union.<sup>(11)</sup>

### MATERIAL AND METHODS

Our study is a prospective study conducted at Department of Orthopaedics at Tertiary Healthcare Centre between February 2021 to July 2022. Total 40 patients were included in present study as per inclusion and exclusion criteria.

#### inclusion criteria:

- All patients (Male and female) between 18-55 years of age with fresh tibia fractures radiologically diagnosed as Proximal 3rd metaphyseal tibial fractures.
- All Grade 1 and Grade 2 Extra-articular fractures of proximal tibia (AO 41 A2 / A3) according to Gustilo Andersons classification.
- Patients with knee flexion more than 90 degrees.
- Patient who gives written informed consent.

#### Exclusion Criteria:

- All patients with age less than 18 years and age >55yrs.
- Open fractures of Gustilo Anderson Grade III injuries
- Patients with intra-articular fractures
- Patients unfit for surgery
- Pathological fractures
- Patient not giving informed written consent.

#### Mode Of Injury:

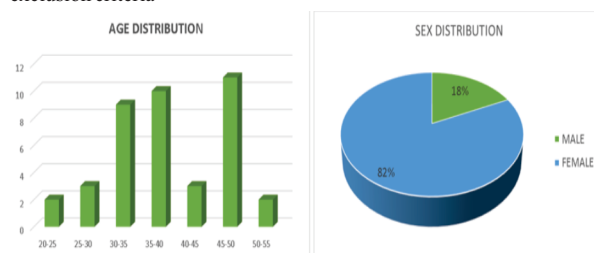
Out of the total number, 36 patients sustained High energy trauma and 4 had a history of fall by slipping from standing height.

#### Time Of Surgery:

The average period from day of injury to surgery was 5 days with a range between 2 to 12 days.

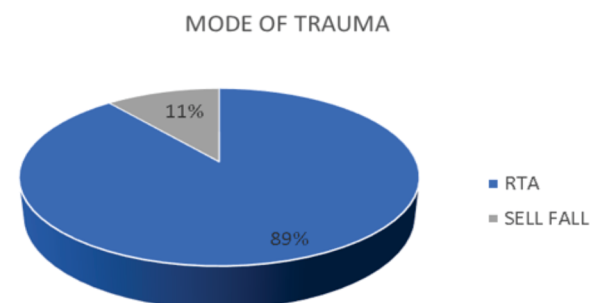
## RESULTS

This a prospective study conducted at Department of Orthopaedics at Tertiary Healthcare Centre between February 2021 to July 2022. Total 40 patients were included in present study as per inclusion and exclusion criteria



On the basis of age, elderly population in the age group of 45 to 50 years age are more susceptible to fractures, due to their lifestyle.

Young adults also tend to have higher susceptibility of this kind of fractures mostly due to high velocity trauma. Male gender has higher propensity for fractures of around 80% Females tend to osteoporotic fractures which highly affect the area around the hip joint. With less chances for proximal tibia fractures, which usually occur due to self-fall from standing height with direct impact or due to twisting injury.



High velocity traumas are the main cause of fractures like road traffic accidents, gunshot injury, crush injury. Which are then followed by low velocity traumas like twisting injury, self-fall etc.

Functional outcome was assessed by knee society score at the interval of one and half month, three months, six months and 1 year interval. At the end of our study maximum of the patients had excellent outcome on knee society score, with minimal to no radiological malalignment, with radiological signs of union seen at 18 to 20 weeks. With knee range of motion ranging from 0 to 125 degree in maximum patients. With absence of anterior beaking or palpable step and absence of knee pain.

| KSS RESULTS | 1.5 MNTH | 3 MNTH | 6 MNTH | 12 MNTH |
|-------------|----------|--------|--------|---------|
| EXCELLENT   | 0        | 0      | 9      | 35      |
| GOOD        | 0        | 0      | 12     | 5       |
| FAIR        | 0        | 1      | 17     | 0       |
| POOR        | 40       | 39     | 2      | 0       |

## DISCUSSION

Proximal third shaft tibia fractures are a result of combination of multiple forces namely, axial, loading and valgus stress. Most of these fractures occur due to high energy trauma like road traffic accidents and fall from height in young males but injuries due to low energy trauma like fall by slipping are also seen in elderly population. In 1984 Sarmiento et al<sup>(12)</sup> described the criteria for the judgment of fracture union

- Patient should be able to bear weight without pain.
- There should not be any clinically detectable movements across the fracture site.
- There should be visible bridging callus across the fracture on plain radiograph.

In the past, such fractures usually were treated with a cast by Sarmiento, with good intermediate term results in the majority of patients. Fracture union often occurs with some angulation after such treatment, and it has been suggested that this may predispose the patient to osteoarthritis by altering load transmission through the knee and ankle joints. Recently, the use of intramedullary nails as a

treatment for open tibial fractures was advocated.<sup>(14,15)</sup> This minimally invasive technique can be performed without further stripping of the already damaged soft tissue envelope and provides a load sharing device with superior stiffness. Opinions are still divided regarding the appropriate management of the proximal tibial fractures. All the techniques have their merits and demerits.

High bend tibial nail in the management of properly selected proximal tibial fractures has an upper hand over other method.<sup>(15)</sup> The goals of surgical treatment are to achieve osseous union and to restore length, alignment, and rotation of the fractured tibia and functional knee and ankle range of motion.

## Comparison Of Post-operative Functional Outcome In Various Studies

| Study                         | Scoring system     | Excellent results | Good results | Poor results |
|-------------------------------|--------------------|-------------------|--------------|--------------|
| Prashant Patel et al (2016)   | Knee society score | 80%               | 20%          | 0%           |
| Gaurav Kumar et al (2017)     | Klemm Borner       | 80%               | 0%           | 20%          |
| Dr. N Manikandan et al (2020) | Klemm Borner       | 60%               | 20%          | 0%           |
| Our study                     | Knee society score | 87.5%             | 12.5%        | 0%           |

We analysed Functional assessment at the last three follow up using the parameters of postoperative resumption of function and radiological findings.

The mean interval of radiological union in our study was 18.5 weeks while the average time of radiological union was 18.68 weeks in a study conducted by Vidyadhara et al.<sup>(16)</sup> in 2006 and 20.33 weeks in kenganal et al in 2019 study.<sup>(17)</sup>

## Comparison Of Mean Interval Of Radiological Union In Various Studies

| Parameter                                   | Vidyadhara et al(16) 2006 | Kenganal et al(17) 2019 | Our study |
|---------------------------------------------|---------------------------|-------------------------|-----------|
| Mean interval of radiological union (weeks) | 18.68                     | 20.33                   | 18.5      |

The mean interval of radiological union in our study was 18.5 weeks while the average time of radiological union was 18.68 weeks in a study conducted by Vidyadhara et al.<sup>(16)</sup> in 2006 and 20.33 weeks in Kenganal et al<sup>(17)</sup> in 2019 study.

## CONCLUSION

From this study, after evaluation of the score with knee society scoring system and counting the average of all sample size and after getting the p value, it has been concluded that high bend tibia nail can be considered a better surgical option as it offers advantages in terms of range of motion, hospital stay, full weight-bearing time and union time, infection rate. There is significant difference in patient's recovery at 6 weeks and 6 months, thus proving that high bend Tibia Nail has good functional and radiological outcomes in patients of proximal 1/3rd shaft tibial fractures and excellent results at the end of 1 years follow up with minimal anterior knee pain and minimal evidence of complications, due to short operative time and minimal operative field.

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