



FUNCTIONAL OUTCOME OF DISTAL TIBIA META-DIAPHYSEAL AND METAPHYSEAL FRACTURE IN ADULTS TREATED WITH DISTAL TIP LOCKING NAIL.

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ABSTRACT **Objective :** The aim of our study is to evaluate the functional outcome using Johner and Wruh's criteria of distal one third meta-diaphyseal and metaphyseal fracture in adults treated with distal tip locking intramedullary nail. **Material and methods:** Patients belonging to age group between 18 to 60 years with distal tibia meta-diaphyseal and metaphyseal fractures which do not have any wounds or have open wounds with Gustilo Anderson type 1 or 2 and came to a tertiary centre, Dr. D. Y. Patil Hospital and Research Institute Kolhapur, Maharashtra from January 2020 to December 2020 were included in the study. After initial evaluation and investigation patients were posted for surgery. All patients were treated with distal tip locking intramedullary nail under spinal anaesthesia. After discharge patients were followed up at an interval of 2 weeks, 4 weeks, 3 months and 6 months and evaluated using Johner and Wruh's criteria and radiological union. **Results:** In our study - 80% patients had an excellent, 12.5% patients had a good, 5% patients had a fair and 2.5% patients had a poor functional according to Johner and Wruh's criteria. The average time of union was 14 weeks and 5 days. 2 patients had anterior knee pain (5%), 1 patient had wound infection (2.5%). **Conclusion:** Distal tibia metaphyseal and meta-diaphyseal fractures treated with tip locking intramedullary nailing has shown excellent and good outcome according to Johner and Wruh's criteria, thus can be recommended for wider use as it is a reliable method of treatment for such fractures.

KEYWORDS : Johner and Wruh's criteria, distal tibia meta- diaphyseal and metaphyseal fracture, intramedullary nailing

INTRODUCTION:

Hoaglund and States classified fractures of tibia as being caused by either high-energy or low-energy trauma [1]. Fracture from high energy group usually resulted from road traffic accidents and crush injuries. More common causes of low energy tibia fracture are fall from a standing height and sporting injuries, [1,2]. Distal end tibial metaphyseal and meta-diaphyses fractures are usually caused by direct bending or High energy axial compression forces, low energy rotational forces [3-5]. These type of fractures represent less than 7% of all tibia fractures and less than 10% of all lower extremity fractures [3]. Injuries associated with tibia fractures include compartment syndrome because of limited soft tissue envelope and common soft tissue injuries, ankle injuries can be associated with tibia fractures including fractures of the medial, lateral, posterior malleolus, floating knee injuries, rotational deformities [2]. Different modalities of fracture treatment are available like- plates and screw fixation, external fixation, intramedullary nailing, of which locked intramedullary nailing is the preferred treatment [9] because it will preserve the soft tissue cover of the bone and fracture site and allow early mobilization of the joints [7,9,11,12]. Distal interlocking screw options [9] in tip locking nails in contrast to standard intramedullary interlocking nails gives. The ability to lock the nail more distally, provides control of alignment, length and rotation in unstable fractures and Permits stabilization of fractures located 3 to 4 cm proximal to the ankle joint [10]. This is the reason we should study the results of tip locking intramedullary nailing in distal metaphyseal and meta-diaphyses fractures, and assess the functional outcome using the Johner and Wruh's criteria as well as the radiological outcome.

MATERIALS AND METHODS:

This study is a prospective case series study in which we reviewed the outcome of forty patients who sustained distal tibial metaphyseal and meta-diaphyses fractures, treated with tip locking intramedullary interlocking nailing in our institute from January 2020 to January 2021. All cases who came to the institute who were meeting the criteria mentioned below were included in the study with simple random sampling of these cases. Patients with distal end tibia metaphyseal and meta-diaphyses fractures with closed or Gustilo Anderson type 1 and 2 open wounds were included in the study. All these patients were treated tip locking intramedullary interlocking nailing with distal most locking option. Any distal third fibula fractures associated with distal

tibial metaphyseal and dia-metaphyseal fractures were fixated using plate. Primary and secondary survey was done on all patients and the neurovascular status of the limb and systemic evaluation was done on all patients. Anteroposterior and lateral radiographs of the limb was taken and above knee slab given after the fracture was identified. All fractures were classified according to AO classification. All open fractures were classified according to Gustilo and Anderson classification. All routine investigations were done for all patients and operated as early as possible after the patient was fit for surgery.

Operative Procedure:

Spinal anaesthesia was used in all the patients. The patient was placed supine on the table with the leg hanging position with C-arm in place. Rotational alignment was achieved by aligning with the anterior superior iliac spine, patella and second ray of the foot in a straight line. Patella tendon splitting approach was used for all patients. Using a curved awl, the medullary canal was opened and under C-arm guidance, the guide wire was advanced into the distal fragment, centering both in the anteroposterior and lateral views. The guide wire was introduced 0.5 to 1 cm proximal to the ankle joint. The entire tibia was reamed using cannulated reamers over the guide wire and nail 1 mm smaller than the final reamer was selected. Two distal locking screws were inserted either with the help of jig or using a free hand technique with the help of image intensifier. Two proximal locking screws were inserted into the proximal locking holes. If the tibia fracture was associated with distal third fibula fracture, it was fixed using a plate. The fibula fracture was fixed with one third tubular plate and cortical screws. Post-operatively, mobilization of the knee and ankle and non-weight-bearing ambulation was advised with crutches or walker from the first day after surgery. Sutures were removed on the fourteenth day of surgery. X-ray of the involved leg was taken post operatively. Patients were allowed partial weight bearing after 6 weeks and full weight bearing depending on the fracture union and patient compliance. Patients were initially followed up every one month for three months, then every three months for one year. Data was collected by verbal communication, clinical examination and radiographic features. None of the patients required any secondary procedures. Final assessment was done at 6 months as per Johner and Wruh's criteria with modification to Indian lifestyles [13], taking into account of the following objective and subjective symptoms of gait, pain, deformity, range of motion of knee and ankle joints, shortening,

neurovascular injury and presence or absence of non-union/infection. Functional outcome was graded into excellent, good, fair and poor.

Johner and Wruh's criteria with modification (13-15)

Criteria	Excellent	Good	Fair	Poor
Nonunion/infection	None	None	None	Yes
Neurovascular injury	None	Minimum	Moderate	Severe
Valgus/Varus	None	2°-5°	6°-10°	>10°
Anterior /posterior	0°-5°	6°-10°	11°-20°	>20°
Shortening	0-5mm	6-10mm	11-20mm	>20mm

Observation And Result:

This study includes 40 patients having distal tibia meta-diaphyses and metaphyseal fractures surgically treated with distal tip locking intramedullary nail from January 2020 to Jamnagar 2021 in our institute. Follow up of each patient was taken for 6 months. In this study these type of fractures were more common in 30-50 year age group. Minimum age of the patient was 18 and maximum was 65 years. Average age of the patients was 42.8 years. Right tibia was affected in 62.5% of all patients and left tibia in 37.5% of all patients. 33 fractures were simple closed fractures (82.5%) and 7 were open fractures (17.5%). The most common cause of fracture was road traffic accident which accounted for 57.9% of fractures. Majority of the associated fibula fractures occurred at distal third (37.5%). Fixation of fibula was done in all patients with associated fibula fractures. Union was defined as the presence of bridging callus on two radiographic views and the ability of the patients to bear full weight on the injured extremity. Time of union ranged from 12 to 20 weeks with an average of 14 weeks and 5 days. In our study shortening was noted in only one patient of 10 mm. The wound infection rate was 5% in our stud, due to open injuries. Anterior knee pain was seen in 3 patients (7.5%). In our study 80 % patients had a excellent functional outcome, 12.5% had good functional outcome, while 5% had fair and 2.5% had poor functional outcome according to Johner and Wruh's criteria.

Age Distribution-1

Age	Average
Male	40.9130434782609%
Female	45.3529411764706%
Total	42.8

Sex Distribution

Sex	No.	Frequency
Male	23	57.5%
Female	17	42.5%

Side Distribution

Side	No.	Frequency
Right	25	62.5%
Left	15	37.5%

Time Of Union

	Average
Time of union	14w 5d 14h 24m

Association With Fibula Fracture

Fibula fracture	Cases	Frequency
YES	10	25%
NO	30	75%

Johner And Wruh Criteria

	Number	Frequency
Excellent	32	80%
Good	5	12.5%
Fair	2	5%
Poor	1	2.5%

	Our study	Rajendran et al.(19)	Elinger et al. (10)	Nora et al. (8)
Age group	42.8	41.6	46.2	30
Male predominance	57.5%	63.2%	64%	67%
Open fractures	17.5%	18.4%	22%	38.8%
Time of union	14.7	16.7	15.7	23.5
Union rate	100%	100%	97.6%	100%
Excellent outcome	80%	78.9%	90%	84%
Infection	5%	5.3%	3.9%	6.6%

DISCUSSION:

In a diaphyseal fracture of tibia treated with nail, nail provides a near automatic alignment as long as nail is of proper size and is effective in maintaining stability. In distal tibia meta-diaphyseal and diaphyseal fractures, nailing with distal tip locking nails provide the necessary stability to the distal fracture fragment and maintain the alignment with the proximal fragment. Some authors, suggest 3-4 cm of intact bone beyond the fracture [16,17] but bonnevalle et al [18] proposes nailing proposes nailing distal fragments of 2-6cm of cancellous bone above subchondral bone. We have used Johner and Wruh's criteria for the functional outcome of such fractures, which has become widely accepted.

Risk factors for defect in reduction include, metaphyseal enlargement. In our study forty patients were admitted to the institute with distal tibia meta-diaphyseal and diaphyseal fractures. Majority of these patients were in the age group of 30-50 years of age with an average of 42.8 years. All patients with associated distal third fibula fractures were surgically fixed (37.5%). Final functional and radiological assessment was done at 6 months of age Functional outcome was graded into excellent, good, fair and poor. In our series, 80% (32 patients) had excellent, 12.5% (5 patients) had good and 5% (2 patients) had fair functional outcome and 2.5% (1 patient) had poor functional outcome.

Conflict of interest-

Authors do not have any conflict of interest.

CONCLUSION:

Our observation suggests that the tip locking nail technique helps in early mobilisation of the patient and helps in fracture healing and preserve joint stiffness. The fracture in our study united at an average of 14 weeks and 5 days with 100% union rate. The advantage of tip locking nail is that it provides control of length, alignment, rotation and permits the stabilization at the fracture site located 3-4cm proximal to the ankle joint. This reduces the rate of malunion, loss of alignment and shortening. This type of nailing will also preserve the periosteal blood supply. Our study has found that this method of fracture fixation is a good treatment modality as it gives excellent (80%) and good (12.5) results which are comparable to other studies. This technique of fracture reduction of distal tibia meta-diaphyseal and metaphyseal with distal tip locking nail can be recommended for wider use.

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