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A study on the management of tibial diaphyseal fractures with interlocking nail – State of the art.

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Abstract: Objective: Tibial diaphyseal fractures are the commonest Orthopaedic injuries for which many methods of treatment are in vogue. Our study is a descriptive analysis of Osteosynthesis of tibial fracture with interlocking nail and its outcome. Setting: Orthopaedics Department of a tertiary care teaching hospital in South India. Design: A 2 year prospective, longitudinal, hospital based observational study and its outcome. Participants: 25 Patients (22 Male & 3 Female) aged 18 to 70 years, excluding individuals with open Tibial fractures grade III. Results: Out of 25 participated, the overall functional results were excellent in 56%, good in 32%, fair in 8% & outcome is poor in 4% of the cases. Conclusions: Fixation of the tibial diaphyseal fractures with interlocking nail is a effective technique & treatment of choice.
Keywords: Diaphyseal fractures, Interlocking Nail, Dynamisation.

I. Introduction

In the modern world with increase in speed and number of fast moving vehicles there is a great increase in number and severity of fractures. The goal of fracture treatment is to obtain union of the fracture in the most compatible anatomical position, which allows maximal and full restoration of the function of the extremity (Rockwood and Greens fractures in adults. 2010).

Tibia is one of the most commonly fractured long bone of the body. The management of open tibia fractures remains controversial despite increase in its incidence. Identifying an optimal management modality is of utmost benefit to the patients (Esan et al. 2014). Intramedullary nailing is commonly used for treating fractures of the shaft of tibia. Objective of the study is the prospective analysis of interlocking nail in the management of fracture of tibia.

II. Materials & Methods

Present study is carried out during 01/03/2013 to 28/02/2015 at Guntur medical college, Guntur. A two-year prospective longitudinal hospital based observational study and its outcome which included a total of 25 cases involving both sex. A written informed consent was obtained from the cases which were included in the study group. Cases diagnosed as fracture of tibial diaphysis and stabilized with tibial interlocking nailing in the age group of 18 to 70 years formed the study group. A detailed history was obtained regarding the mode of injury to assess the velocity of trauma and mechanism of injury, the time of accident and if any primary treatment was received. Past history of any medical illness was noted to evaluate the patient's risk for potential complications. General, local examinations, routine investigations were done and abnormalities if any were noted. Initial treatment and pre-operative planning was done. Tibial interlocking nail were used for 25 fresh tibial fractures and no non-unions. Of the 25 tibial fractures 18 were closed tibial fracture and 7 were open fractures. 6 closed fractures were displaced and lost reduction during non-operative plasters cast treatment and was taken up for closed nailing. Of the 7 open fractures 5 were Grade I, 2 were Grade II. Follow up was done for a period varying from 3 months to 18 months.

III. Operative Procedure

Most of the cases were administered spinal and epidural anaesthesia. Few cases were operated under general anaesthesia because of co existing morbidities. Under strict aseptic conditions, patient is placed in supine position on radiolucent table, facilitating view under image intensifier.

Through patellar tendon splitting approach, entry point is made with bone awl just medial to the lateral tibial spine in frontal plane. A non cannulated reamer is passed 5 – 8cm into metaphysis to establish contact with the medullary canal. Then a guide wire is inserted through the entry point into the proximal fragment. On lateral view, guide wire was nearly parallel with the anterior tibial crest. After reduction, which is carried out by closed manipulation, the guide wire is passed across the fracture into the distal fragment upto the subchondral bone.

The position of guide wire is checked under C – arm in both AP & Lateral views. Tibia is reamed serially with reamers in increments of 1mm diameter. A nail of appropriate diameter and length is mounted on a jig and is passed over the guide wire into the medullary canal.

The final position of nail was checked under C-arm and guide wire was removed. Rotational alignment was checked and interlocking was done with self tapping screws of appropriate length. Distal interlocking was done with freehand technique and proximal interlocking was done through holes in the jig. Surgical wound is closed in layers and antiseptic dressing applied.

Postoperative Protocol

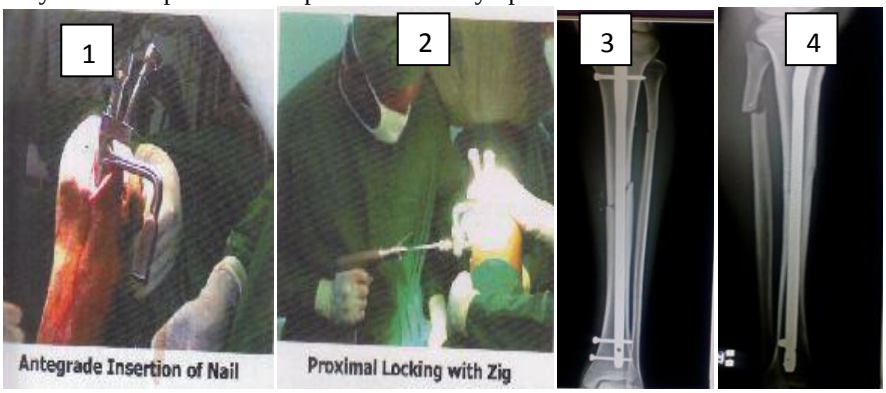
Intravenous antibiotics were given for 3 to 5 days. First dressing was done on 2nd postoperative day and subsequent ones on 6th & 10th day. Sutures were removed on 12th day.

Mobilisation Protocol

Early active non weight bearing movements of knee and ankle were encouraged 2 to 3 days after surgery. Partial weight bearing was allowed only after 6 – 8 weeks of surgery depending on fracture healing status.

Follow-up Protocol

Cases were followed up clinically (wound healing, pain, swelling, deformity, Limb Length Discrepancy, knee and ankle range of movements and weight bearing) and radiologically (union status, malalignment and implant failure). If required dynamisation was done at 8 – 12 weeks when insufficient callus was seen at fracture site. Cases were followed up every 6 weeks postoperatively till consolidation of fracture and thereafter every 3 months provided the patients were asymptomatic.



1& 2 – Procedure with the Zig & Primary Locking

3 & 4 – Post OP X ray images– AP / Lateral Views

Table.1. General information of cases with tibial fracture

(Total Number – 25)

Variables		Number (%)
Gender	Male	22 (88)
	Female	3 (12)
Age group (yrs)	10-20	01 (04)
	21-40	13 (52)
	41-60	10 (40)
	61-70	01 (04)
Side	Left	16 (64)
	Right	09 (36)
Cause	Non unions	0
	Road traffic accidents	17 (68)
	Accidental fall from height	04 (16)
	Fall of weights	03 (12)
	Assault	01 (04)

Table.2. Type, cause and level of fractures

(Total Number – 25)

Variables		Number (%)
Type	Closed	18 (72)
	Open	07 (28)
	GradeI	05 (20)
	Grade II	02 (08)
	GradeIII	—
Level of fracture	Upper third	03 (12)
	Middle third	13 (52)
	Middle third – lower third junction	03 (12)
	Lower third	05 (20)
	Segmental	01 (04)

Table.3. Nail length and diameter

Total Number- 25

Variables		Number (%)
Length (cm)	30	03 (12)
	32	10 (40)
	34	09 (36)
	36	03 (12)
Diameter (mm)	8	08 (32)
	9	14 (56)
	10	03 (12)

Table.4. Non weight and full weight bearing mobilization

(Total number- 25)

Variables	Duration (weeks)	Number (%)
Non weight bearing	Within 1 week	7 (28)
	8 days to 3 weeks	18 (72)
	After 3 weeks	0
Full weight bearing	12 – 16 Weeks	16 (64)
	17 – 20 Weeks	7 (28)
	After 20 Weeks	2 (8)

Table.5. Follow-up

Duration (months)	Number (%)
3 – 8	15 (60)
9 – 12	04 (16)
13 – 18	06 (24)

IV. Results

Table.1 shows the general information of the cases with tibia fracture. In our series 88% of the cases were male and rest is females. Most of the cases (52%, n=25) aged between 21-60 years and no cases were reported in the age group of 70 and above. Involvement of the left lower limb is more than the right. About 68% of the fractures were due to road traffic accidents and most of the fractures were caused by high-energy trauma. In Table.2 shows the type and level of fracture, closed and open fractures were studied. The soft tissue injuries were classified according to Gustilos Anderson's classification (1976). There were 72% of closed fractures and 28% of compound open fractures grade I & II. The commonest location of the tibial fracture was middle third of the shaft (52%, n=13), followed by lower third (20%, n=5). Table.3 shows the nail length and size. The investigators used AO interlocking nails of diameter 8-10mm and length ranged from 280mm - 400mm. Table.4 shows the non-weight and full weight bearing mobilization. Table.5 shows the follow-up of the cases treated. In the present study, follow-up period of the patients between 3 – 8 months post operatively was 60% of the cases, between 9-12 months was 16% and between 13-18 months was 24%.

V. Discussion

In the present day industrialized society high velocity trauma is on rise. A victim of RTA usually sustains multiple injuries and majority of them are young adults. If mobilization is not done early they are susceptible to develop fracture disease. Hence there is paramount need for a procedure, which offers sound

stability, early mobility and good union. The answer for these desirable results seems to be interlocking nailing system.

The average age of the cases in our study was 30.5 years. Tibial shaft diaphyseal fractures were seen in the younger age group as they are the persons who are physically active and are engaged in various outdoor activities and due to which most of the injuries sustained were high velocity injuries. Arne Ekeland et al. (1988) study series of 45 cases noted the average age of cases to be around 35 years, whereas Court Brown et al. (1990) noted the average age to be 32.4 years of age. Our series with an average age of 30.5 years of age was comparable to the other worker's series, with respect to the average age at which fractures of the tibial diaphysis occur.

In our series males predominates the females. There were 22(88%) cases of males and 3 (12%) cases were females. The incidence of male is higher because of their more outdoor activities. Court browns series (1990) noted the male incidence to be around 81.3, while the female incidence around 18.7%. Hooper et al. (1991) noted male incidence at 82% and females around 19%. Our series of 88% male, the incidence is higher when compared to above workers series; whereas 12% females in our study is lower when compared to workers series.

In our series, we found that majority of the tibial diaphyseal fractures occurred due to road traffic accidents (68%). Motor vehicle accidents seemed to be higher in our series compared to ranganath babu et al. (2012) series, in whose series, the incidence was around 59.25%.

In our series, the anatomical location of the fracture was in the middle-third of the shaft of tibia in 13(52%) cases, followed by the lower third in 5 (20%) cases. This is comparable to Lawrence B. Bone et al. (1986) series, where 53.5% fractures were middle-third of the shaft of tibia. The middle third fractures are common because of anatomical features of more rigidity of the bone and its subcutaneous nature makes it more vulnerable to the injuring force.

In our series investigators used AO interlocking nails of diameter 8-10mm and length ranged from 280mm-400mm.

In 1996 Christie (1996), noted embolic phenomenon during nailing, in our series, however, we have not come across any embolic phenomenon after this surgical procedure. Postoperatively, in our series, no complications like fat embolism, compartment syndrome, and neurological or vascular injury occurred.

The cases were encouraged to perform range of motion exercises for the knee and ankle along with static and strengthening exercises for quadriceps and hamstrings on 3rd postoperative day. The patient was also encouraged non-weight bearing ambulation using axillary crutches or walker as soon as pain subsides. Weight bearing was dictated by the fracture pattern, size of the nail and associated injuries. Full weight bearing mobilization was dependent upon clinical and radiological evidence of fracture healing. Patients with associated injuries were mobilized when permitted by the respective injuries.

VI. Conclusion

Out of 25 (22 male & 3 females) cases with tibia fracture overall functional results were excellent in 56%, good in 32%, fair in 8% result and outcome was poor in 4% of cases. Fixation of tibial diaphyseal fracture with interlocking nail is a effective technique and treatment of choice. Interlocking nail for management of fracture of tibia, acts as internal splint, which stabilizes fracture fragments, maintains alignment, allows early mobilization and promotes sound union.

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