



EVALUATION OF THE RESULTS OF CLOSED INTERLOCKING INTRAMEDULLARY NAILING IN MANAGEMENT OF TIBIAL DIAPHYSEAL FRACTURES - A PROSPECTIVE STUDY

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ABSTRACT **Background And Objectives:** The tibia is the large long bone of the body and one of the principle load bearing bones in lower extremity, fractures can cause prolong morbidity and extensive disability unless the management is appropriate.

Various methods are now available for management of diaphyseal fractures of tibia. Each method has its own advantages, disadvantages and limitations also. The type of fracture, location, degree of comminution, age, and patient's socio-economic demands are the other factors which influence the method of management.

The difficulties that arises in the treatment of tibial diaphyseal fractures include –

1. A high incidence of open and infected fractures as the antero-medial surface of tibia is subcutaneous.
2. A tendency of displacement of fragments when initial swelling due to fracture subsides.
3. Functional disabilities if alignment and rotational position of fracture fragments is not perfect. Tibia is guarded by the presence of hinge joint at knee and ankle (modified/atypical hinge joint) which allows no adjustment for rotation/deformity, as the knee and ankle joint normally moves in the same parallel axis.
4. Delayed union and non union as a result of severity of fracture, poor blood supply and sometimes distraction of bone fragments seen in complex fractures.
5. Limitations of joint movements at the knee, ankle and foot usually caused by associated joint, soft tissue and vascular injury.

6. **OBJECTIVE** is to study and evaluate the results of closed interlocking intramedullary nailing in management of tibial diaphyseal fractures.

Results: In total 30 patients were assessed at the end of 16 weeks follow up, most of the patients showed excellent results 24 patients, 4 patients falls under good category, 2 patients showed fair results and none of patient showed poor results.

KEYWORDS : Diaphyseal tibia fracture; closed intramedullary nailing; Closed reduction; Early post-operative mobilization; Weight bearing

INTRODUCTION

Complex trauma cases caused by road traffic accidents are increasing progressively. Tibia is most commonly affected long bone in vehicular accidents (high energy/high velocity trauma) and annual incidence of tibial diaphyseal fractures is 2 per 1000 individuals. Due to subcutaneous location of tibia, severe bone and soft tissue injury is frequent and there is high incidence of open fractures compared with other long bones. The blood supply to tibia is more precarious than other long bones. Early mobilization prevented the fracture disease and enhanced union.

The history of intramedullary nailing for the treatment of long bone fractures and non union is long. Advances in method, principles and design appears to parallel advances in anaesthetic and aseptic techniques, allowing for routine operative care of fractures to emerge.

Fischer also believed that reaming in combination with a large diameter nail would enhance the stability of fractures by increasing the contact area. And also stated that the intramedullary vascular supply was obliterated through this technique, periosteum and surrounding tissues would promote adequate bone formation for healing. Re-emergence of closed nailing has led to many of today's current techniques, unreamed nailing became reserved for open fractures. In addition very proximal and distal tibia and femur fractures, once thought to be unsuitable for nailing, were benefitting with intramedullary fixation. **Non slotted designs** provided greater torsional rigidity.

Himanshu G. Kulkarni and others (2015) done a study of 100 cases named "a study of reamed and unreamed intramedullary interlocking nailing in compound fractures of shaft of tibia" and concluded that there are no advantages/disadvantages to favour either reamed or unreamed nailing over each other.

MATERIAL AND METHODS

Study Design:

Patients presenting with diaphyseal fractures of tibia attending the department of orthopaedics at our institute were subjected to this study. The approval of ethical committee and informed consent from all the patients regarding participation in this study was taken.

Type Of Study: Prospective study

Sample Size:

The study includes 30 patients with tibial diaphyseal fractures attending the hospital within the duration of JANUARY 2022 to NOVEMBER 2023 managed by closed interlocking intramedullary nailing.

AO/ASIF CLASSIFICATION OF TIBIAL SHAFT FRACTURES (**Johner R, Wruhs O**⁷⁴ classified the fractures according to AO/ASIF classification.

Case Selection:

All the patients of 18 years or above age, of either sex having closed or Gustilo-Anderson type 1 open fracture of diaphysis of tibia, were chosen for interlocking intramedullary nailing



MANAGEMENT OF INJURY

Associated limb, chest, abdomen and head injury was ruled out or taken care appropriately.

The wound over the fracture site was cleaned and dressed and a groin to toe pop slab was applied. After pre anaesthetic check up fitness the patient was planned for surgery at the earliest. A prophylactic broad spectrum intravenous antibiotic was given to the patients an hour before the operation. Pre-operative informed consent was taken for operative procedure and anaesthesia.

Operative Procedure:

Closed interlocking intramedullary nailing was done without opening the fracture site, with reaming the medullary canal.

Anaesthesia:

Spinal, epidural at the discretion of anaesthetist

Position: Supine position

Operative Technique:

(Lottes jo⁶³:1954, 1974, Muller⁶⁴1990) In operation theatre under anaesthesia and all aseptic precautions, cleaning, painting, and draping is done. A tourniquet is applied. Approximate 3 cm long incision given along the medial border of the patellar tendon, between the lower pole of patella and tibial tubercle. We used split patellar tendon approach.

Keeping the knee flexed to 90 degrees, with the help of a **curved awl** the entry portal made to the medullary canal. Fracture is closely reduced and olive tipped guide wire inserted and negotiated into distal fragment under image guidance. After inserting guide wire reaming is done by serial increasing size reamers. The skin protector was used to protect the soft tissue. The interlocking nail is attached to the zig with nail parallel to the bone. With the help of the zig the nail is inserted into the medullary canal. After reduction of the fracture nail is advanced into the distal fragment and half inch above and middle of proximal ankle articular surface.

Distal locking of the nail is done under image guidance by free hand technique, then proximal locking done. An appropriate length of locking bolts is used for locking.

Post Operative Management:

Intravenous antibiotics were continued for 5 days and then oral antibiotics were given for next 5 days if needed. Analgesics were given according to the need of the patient. Post op xray was taken. Initially isometric exercises, active assisted range of motion exercises were initiated on first post operative day. Active knee and ankle mobilization was started as soon as patient became pain free. Non weight bearing crutch walking was begun within one week. Suture removal was done after 10 to 12 days of operation under strict asepsis. Full weight bearing (with both limbs and standing on one limb) was allowed after osseous union seen radiologically (approx 12 weeks postoperatively) or earlier if condition of patient permitted.

Follow Up And Evaluation:

Patient was followed up at 2 weeks, 4 weeks, 8 weeks, 12 weeks, 16 weeks and 20 weeks. Check x ray was taken at every visit and patient was clinically and radiologically assessed for fracture union, functional outcome and complications.

The results were assessed on the basis of **ALHO⁶⁵ AND EKELAND⁶⁶ CRITERIA** (CLINICAL ORTHOPAEDIC 231:205:1988).

Functional assessment of the patient was done as per **EDWARDS⁶⁷ 1965:**

- Resumption of activities of daily living.
- Resumption of occupation.
- Pain free movements and walking.

Squatting and sitting crossed legged.

OBSERVATIONS AND RESULTS

The present study consisted of 30 patients with tibial diaphyseal fractures which were managed by interlocking intramedullary nailing. Maximum numbers of patients in the present study were light workers (46.67%).

Mode Of Injury:

In majority of cases (20, 66.67%) mode of injury was RTA. This was followed by fall from height (08, 26.67%).

Grade Of Fracture:

In the present series 70% patients (21) had closed fracture

Pattern Of Fracture:

In our series 50% fractures (15) were comminuted

Severity Of Injury:

In our series 50% cases (15) having non comminuted fractures and 33.33% cases (10) having minimum comminution.

Full Weight Bearing:

In the present series mean full weight bearing time was 12.27 weeks with standard deviation of 1.34 weeks. 73.33% patients (22) were able to fully weight bear within 12 weeks.

Time Of Fracture Union:

The union of fracture was assessed by standard radiological and clinical criteria (Edwards 1965; Court Brown et al 1990). Due to presence of nail we couldn't stress the fracture site; hence loss of pain on walking was deemed a better clinical indicator of union (Bradford Henley 1989). In the present series mean union time was 17.03 weeks with standard deviation of 1.65 weeks. In 46.67% cases (14) union time was 17-18 weeks and in 33.33% cases (10) union time was 14-16 weeks.

Varus/valgus/rotation Deformity:

In the present series we didn't find any angulation deformity (varus/valgus) in any case. In only one case we found rotation deformity (external rotation) of 2.5°.

Shortening

We found shortening of 1 cm in only one case.

Range Of Knee Motion And Ankle Motion:

In the present series in most our cases flexion at knee was not affected (>120°). In the present series dorsiflexion at ankle joint in 27 cases was normal (>20°). Planter flexion at ankle joint was normal in 29 cases (>30°)

Anterior Knee Pain:

In the present series 7 cases complained of sporadic anterior knee pain.

Infection:

In the present series in one case we found deep infection for which the patient was admitted and intravenous antibiotics were given and eventually the infection was controlled. In 4 cases infection was superficial and was controlled by oral antibiotics.

Dynamization Required And Healing Time

In 2 cases dynamization was required. The dynamization was done at 08 weeks after surgery and union seen at 19 weeks

RESULTS:

In the present series all the patients were followed up for 20 week period and periodically assessed clinically and radiologically. After the end of 20 week follow up most of the patients showed excellent results (24 patients, 80%), 4 patients (13.33%) falls under good category, 2 patients (6.67%) showed fair results and none of patient showed poor results.

Statistical Analysis:**Level Of Fracture And Results:**

In the statistical analysis correlation between level of fracture and results was done. Here p value is 0.650 which is non significant which means there is no significant association between level of fracture and results. This implies interlocking intramedullary nailing is equally effective in treatment of tibial diaphyseal fractures irrespective of level (proximal, middle or distal).

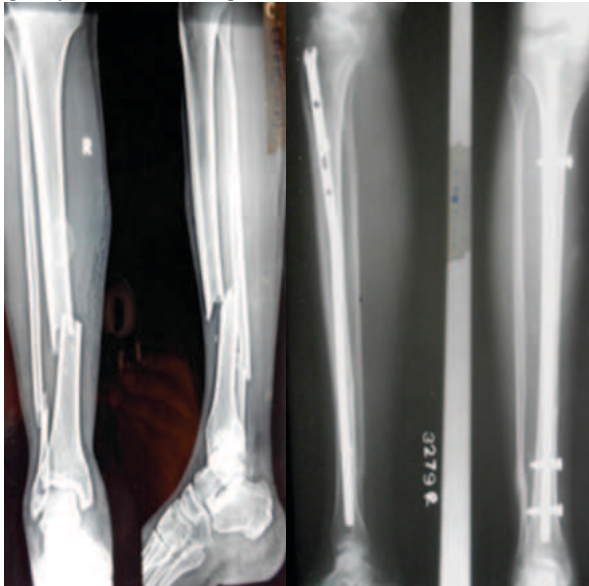
Pattern Of Fracture And Results:

There is no significant association between pattern of fracture and results

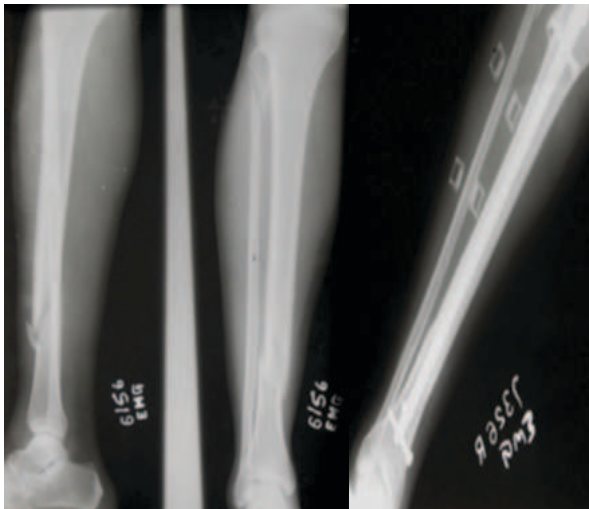
Functional Assessment (as per EDWARDS 1965):

average full weight bearing time was 12.27 weeks (patient able to

weight bear on single limb), patients resumed his daily activities quickly and became self dependant.



Case no 1



Case no 2

DISCUSSION:

Fractures of tibia are the common among the major long bone fractures. Fractures can cause prolong morbidity and extensive disability unless the treatment is appropriate. This method is Closed interlocking intramedullary nailing of tibia without exposing the fracture site, thus avoiding complications of opening the fracture. Close reduction and stable internal fixation achieved by reaming the medullary cavity and inserting a nail of appropriate size, But it may not be applicable to fractures which are more distal or more proximal where the nail has no hold over fracture in the wide medullary cavity. The purpose of this study work was to evaluate the results of closed interlocking intramedullary nailing in management of tibial diaphyseal fractures. Primary medullary nailing by closed method without exposing the fracture site was done in closed, open grade I fractures and early post operative mobilization was done. Most of the authors had used reamed interlocking intramedullary nails. In our study reamed closed interlocking intramedullary nailing was done by putting locking screws proximally and distally in all of the cases.

Healing Time:

Healing was assessed to have occurred when the fractures was clinically stable and did not elicit pain on palpation, manual stress or weight bearing. In our study mean union time was 17.03 weeks with standard deviation of 1.65 weeks

Results At Final Follow Up:

Final evaluation of patients was done for both anatomic and functional

parameters (as per Edwards 1965). In present study early weight bearing was promoted without plaster.

In our series none of our patients had non union or delayed union

SUMMARY AND CONCLUSION

The fracture was usually seen in 2nd 3rd 4th decade of life with the maximum incidence in 21-30 age group.

The most common cause for injury was RTA (road traffic accidents) in maximum number of cases (66.67%) followed by fall from height (26.67%). Mean union time was 17.03 weeks.

In our study we did not found any significant joint stiffness. No significant muscle wasting as all the patients were kept on early post operative joint motion exercises.

Out of 30 cases in which closed interlocking intramedullary nailing was done 24 cases (80%) had excellent results, 4 cases (13.33%) had good results, 2 cases (6.67%) had fair results and no case had poor results. All the patients were able to resume their activities of daily living earliest and resumed their previous occupation. No difficulty found in any case in squatting/sitting cross legged/walking.

All the results are comparable to the results of other studies in the literature as mentioned already. The usefulness of our study lies in the fact that closed interlocking intramedullary nailing as one of the best method of treatment for tibial diaphyseal fractures in all patterns even in severely comminuted fractures, at all levels proximal, middle, distal (except in cases of too proximal or too distal fractures) and in closed/open I fractures.

No conflict of interest

Research committee of college. Approved

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