OUTCOME OF THE INTERLOCKING NAILING IN OPEN FRACTURE TIBIA.... TYPE I TO TYPE III(A)

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ABSTRACT

BACKGROUND: Tibia is one of the most commonly fractured long bone. Common causes of the injury are road side accidents, falls from heights, fire arm injuries, blasts and direct hits. Being exposed part of the body it is more commonly injured in the Traffic accidents. Open Fractures with the wound of the Tibia are not rare. In case of the open fractures the priority for treatment is mainly the management of the wound and then the fracture itself. There are three types of the open fractures according to the Gustilo and Anderson i.e. Type I, II and III (a, b & c) according to the conditions of the wounds. Close fractures and open fractures of type I, II & III, up to type III Acan be treated surgically with internal fixation.

OBJECTIVE: To determine outcome of interlocking nail in type I, II and IIIAOpen Fractures of the tibia shaft.

MATERIAL AND METHODS: This descriptive study was conducted in Orthopedic Department Saidu Teaching Hospital Swat from October 2013 to September 2015 in 69 Patients. Patients of both gender with adult age with open type I,II and IIIA Tibia shaft fracture were included. Patients less than 15 years with open physes, patients with type III B and III C, patients with anatomical deformities and elderly patients above 60 years with comorbidities were excluded. Outcome of the procedure was measured in terms of postoperative infection, improvement in Range of motion (ROM) and fracture healing time. Statistical analysis was performed to identify factors influencing results.

RESULTS: In majority of the patients (60.87%) the mode of injury was Road traffic accident in more than 90% of the patients the functional outcome of the procedure was excellent. There were 4 complications with 2 patients had post operative infection and 2 delayed union and there was no mortality in the series.

CONCLUSION: Interlocking nail is a very effective procedure for the treatment of open tibia type I,II and IIIA fractures. It is effective irrespective of the age of the patient and mode of injury.

KEY WORDS: *Interlocking Nail, Open Tibia Type I,II and IIIAfractures, Outcome.*

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INTRODUCTION:

High speed lifestyles with motor vehicles, motorcycles and the growing popularity of extreme sports contribute to the increasing occurrence of tibia shaft fractures. Tibia is currently the most commonly fractured long bone in the body,[1] being subcutaneous throughout its length and due to poor blood supply, fractures of tibia which usually are open, result in loss of skin cover, infection and non-union[2].

During the initial assessment, the patient needs carefully evaluation for open wounds at the fractured site, neurovascular insufficiency and the elevated compartmental pressure. Abnormality in any of these areas constitutes a surgical emergency. The most common complications that occur with Tibia fractures are compartment syndrome, neurovascular injury, chronic osteomyelitis, malunion, non-union, deformity, and joint stiffness[3].

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Extra-articular proximal tibia fractures are often the results of high energy trauma with displacement and comminution. Operative management of these fractures is warranted to optimize patient outcome[4]. Most tibia fractures can be treated non operatively with good results but fracture stability must be considered[5,6].

Over the last several years, orthopedic surgeons have begun utilizing minimal invasive techniques or close reduction maneuvers in order to preserve fracture hematomas, avoid soft tissue trauma and periosteal stripping of the fracture fragments[7].

Historically there has been much debate as to what constitutes the best method of treatment of these fractures. This led Nicolli in 1964 to publish his after quoted observation 'Fractures of tibia shaft are important for two reasons, the first is that they are common, the second that they are controversial and any thing that is both common and controversial must be important". Since then much clinical knowledge has been gained but some of the controversies remain[8].

Long term outcome for tibia shaft fractures generally are good, but are associated with

increase in osteoarthritis of unclear etiology in the knee and ankle joint. It has been observed that reamed intramedullary nailing with interlocking screw fixation is an excellent mean to control rotation and limb shortening[9].

Intramedullary fixation of tibia shaft fractures has become the treatment of choice for those fractures requiring operative treatment. Clinical outcome of fracture treatment by intramedullary nailing have been well studied in both closed and open fractures[11].

Intramedullary nailing enables the surgeon to stabilize tibia with a minimally invasive technique, which depending on fracture pattern, may allow early weight bearing and yield high union rates [12].

Unreamed interlocking tibia nailing can be safely used for type I and type II open injuries even with delayed presentation[13]. However immediate external fixation followed by early closed interlocking nailing is a safe and effective treatment for open fractures of shaft of tibia [14].

In comminuted fractures locked intramedullary nailing is more suitable method because it does not disturb the periosteal circulation of small bone fragments [10,11,15].

Intramedullary nailing with locking screws has become the treatment of choice for most tibia shaft fractures. Prevalence of non union and malunion is greatly decreased when compared with the other methods of fixation. Patients are also able to return to low impact activities much sooner than with the other treatments [7].

The aims and objectives of the study were to see the union time of fracture, post operative complications like infection, compartment syndrome, fat embolism, Non union, Malunion, Delayed union in type I, II, and IIIA open fractures of tibia shaft treated by intramedullary interlocking nailing.

MATERIAL AND METHODS

This Descriptive study was conducted in patients with type I, II, IIIA open tibia fractures in Department of Orthopedic Surgery, Saidu Teaching hospital Swat, Pakistan. The duration of this study was two years from October 2013 to September 2015. Total of 69 patients of either gender with age range from 15 to 60 years with open tibia shaft fracture were treated with interlocking nail. The study was conducted in strict adherence with established guidelines for treatment of subjects, and written informed consent was obtained from each patient. Preoperative planning after initial management of the patient with ATLS protocols which included laboratory investigations for anesthesia fitness and careful study of the x-rays, considering intraoperative reduction techniques and choice of implants, was done. The wounds were examined and classified according to Gustilo's classification. The affected limb was washed before starting the surgery in the operation theatre. A preoperative dose of broad spectrum antibiotic 2nd generation cephalosporin was given. The operation site was shaved in the side room of operation theatre. Under anesthesia (general or spinal) patient was put on traction table.

After application of pneumatic tourniquet, the affected limb was washed thoroughly and scrubbed with pyodine. Draping was done and the patient was covered with sheets leaving the affected limb exposed from knee to ankle joint.

Knee was flexed to 90 degree and a 3-5 cm skin incision was made over the tibial tuberosity. Ligamentum patellae was split longitudinally, and retracted by the assistant with the help of retractors. The area above the tibial tuberosity was exposed, and awl was introduced to make the port of entry. The fracture site was reduced under image intensifier by the assistant and a ball tipped guide pin was passed across the fracture site.

In some old cases a small incision was given to remove the soft tissue, to reduce the fracture site and for passing the guide pin in the distal fragment. Keeping the leg in flexion, flexible reamers were used over the guide pin, starting from the smallest size and progressed to 0.5 mm increments up to reamer size 0.5 mm more than chosen nail, to prepare the medullary canal. After the completion of the reaming, the nail of desired size was introduced and the guide pin was removed.

Once accurate restorations of length, alignment and rotation have been achieved proximal interlocking screw was applied with the help of jig, depth gauge was used for the proper size screw. The distal screw is passed under image intensifier. Skin stitched and dressing done.

During the postoperative period the patient's

attendant and nursing staff was advised directed/instructed to keep the leg of the patient elevated. Intravenous antibiotic cover was given for 2 days and then continued on oral antibiotic for 2 weeks.

All these patients were followed up in the OPD postoperatively and after discharge from the ward they were advised for regular follow up visits after two weeks, six weeks, and 12 weeks, sixth month, 12 months and 18 months.

Rehabilitation was started on the second postoperative day with quadriceps strengthening exercises and continuous passive motion of the knee and ankle joints. After discharge, the patients were encouraged to perform straight leg-raising exercise and active flexion of their knees and ankles, from tolerable range of motion followed by gradual increase of range similar to unaffected limb. After two weeks stitches were removed. In every follow up visit x rays were done to assess bone healing and callus formation. Union Scale Score, a numerical score was used to assess the progress of union (Table 1). Patients were mobilized partial weight bearing on sixth week and full weight bearing on 12 weeks.

Table 1 : Union Scale Score

FEATURES	SCORE			
	0	1	2	3
Mobility	Frank mobility in both planes	Restricted mobility in both planes	Minimum mobility in one plane	No mobility at all

Final clinical outcomes were evaluated using Knee Society clinical rating scores11, where excellent means 85-100; good, 70-84; fair, 60-69; and poor < 60.

Complications were recorded as union or soft tissue related, including infection. The analysis was conducted using SPSS version17. The Data was collected and entered in proforma, especially designed for this study. All required information was recorded in that proforma.

Table 02

Tendemess	Present	Absent		
Radiological Features	No callous formation	Minimum ensheathing callus	Good ensheathing callus or internal callus with bridging of at least two cortex	Good internal callus with bridging of all four cortex

DATA ANALYSIS PLAN

All the studied variables that are; demographic features, type of fracture, mechanism of injury, presentation of patients after injury, type of anesthesia, tourniquet used, pain at fracture site, radiological union signs, weight bearing, range of motions, knee pain, infection, removal of implant, any residual deformity, were analyzed for descriptive statistics that is frequency and percentages. All these were presented in tables, graphs, and figures. The quantitative data like age, time of union, hospital stay were calculated for mean, ± standard deviation. Male to female ratio was calculated for sex distribution. Data was analyzed for descriptive statistics by using computer program SPSS for windows version 17. Due to the nature of the study design (Descriptive study) no statistical test was applied to the categorical data.



RESULTS

In this study majority of patients 48 (69.56%) were male and 21 (30.44%) were female. Male to female ratio was 2.28 : 1.

In this study majority of patients 31 (44.93%) were in the age group of 31-40 years. 24 (34.78%) patients in our study were of younger age group 21 to 30 years of age. 14 (20.28%) were in the age group of 41-60 years. Mean age of the patients was 35.48 $\pm$ 9.22 years. Minimum age was 21 years and maximum age was 60 years .

Out of 69 patients of tibia shaft fracture, 42 (60.87%) patients were injured due to road traffic accident, in which 31 (44.92%) due to motorbike accident and 35 (15.95%) due to four wheel accident. 25 (36.23%) sustained fractures due to fall from height and 2 (2.9%) patients had history of assault.

Majority of patient, 51 (73.91%) having tibia shaft fractures, were presented to hospital within 12 hours after injury. 18 (26.09%) patients presented after 12 hours after injury .

In this study, in 42 (72%) of patients general anesthesia was induced, while 17 (28%) patients who were not fit for general anesthesia, spinal anesthesia was given .Tourniquet was used in all patients (100%) having tibia shaft fractures . Majority of patients, 54 (78.26%) in this study had minimum postoperative pain at the fracture site. 11 (11.46%) patients were having mild postoperative pain at fracture site, 2 (2.8%) patients were having moderate postoperative pain and 2 (2.8%) patients were having severe postoperative pain, who were treated by I/V analgesics.

Minimum time of union of fracture of tibia shaft was achieved in 15 (21.73%) patients in 10 weeks; maximum time of union of fracture of tibia shaft was in 54 (78.26%) patients in 24 weeks. On 2nd week radiological signs were nil. After 6 weeks, early callus formation was seen in 19 (27.53%) patients. On 3rd months, in 60 (86.95%) patients callus formation was seen. On 6th months, in 67 (97.1%) patients callus formation was seen (Table No. 2). Dynamization was done in 32(46.37) patients in third month.

Average range of motion (90 degree) of knee was achieved in 21 (30.43%) patients on 2nd week. Average full range of motion was achieved in 37(53.62%) on 1st month. Average range full range of motion was achieved in 58 (84.05%) patients on 3rd month. Average full range of motion was achieved in 62 (89.85%) patients on 6th month.

Average range of motion (30 degree) of ankle was achieved on 2nd week. Average range of motion (45 degree) was achieved on 1st month. Average range of motion (60 degree) was achieved on 3rdmonth. Anterior knee pain was reported in 49(71%) patients on 2nd week.

Knee pain was reported in 40 (57.97%) on 1st month. 32 (46.38%) patients reported knee pain on 3rd month. While 12 (17.39%) patients reported knee pain on 6th month.

On 2nd week of operation 2 (2.9%) patients were developed superficial wound infection, which was successfully treated by intravenous antibiotics.

In patients treated with intramedullary interlocking nailing, residual deformity of less than 5 degree varus was observed in 2 (2.9%) patients. Shortening of less than 1 cm was observed in 5 (7.2%) patients, while valgus deformity was not seen in any patients.



DISCUSSION

In this study majority of patients (73.91%) were presented in the golden time period (0-12 hours) after injury. Only (26.09%) patients were presented after the golden time period (after 12 hours). One of the important aspect of this study was to evaluate the incidence of complications in

the patients treated with interlocking nail in open tibia type I, II and III a fractures. Despite taking all the antiseptic measures, thorough debridement and wash, there were overall 2.9% (2 out of 69) infection rate. All of which were in type III a open tibia fractures which were presented after golden time period. The rate of infection was 10% in the study done by Atul Agrawal. The incidence of infection reported by Gustilo Anderson was 2-16%.

We do not do routine dynamization in our unit. In this study, Dynamization was done in 32 cases. These were those cases in which there were no signs of union at 6-12 weeks.

In our study anterior knee pain was reported in 12 (17.39%) patients after 6 months of surgery. The incidence of anterior knee pain reported by Court-Brown et al was 36%. They suggested for decreasing the incidence of anterior knee pain, the techniques of using a more proximal and a lateral entry point, hyper flexing the knee during the nail insertion and extending the knee during the screw insertion to lessen the irritation of the overlying tendons.

The factors which commonly affect the prognosis of high energy trauma open tibia fractures are the severity of the soft tissue injury, the degree of contamination, the fracture configuration and the extent of contamination. In the presence of severe soft tissue trauma, Open reduction internal fixation with plate and screw can further damage the vascularity of already compromised soft tissues and bone. Therefore, it is extremely important to avoid such operative interventions for preventing sepsis and for promoting the healing of the tibia fractures.

The external fixator is in common use in the recent past. However, it has been associated with high rates of pin tract infections, delayed union, non unions and there is usually a need for a secondary definitive procedure.

CONCLUSION

Intramedullary interlocking nailing is an effective method in treating close & open front type I,II and III(a) tibia fractures. It provides a high rate of union less complications and early return to function.

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