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A RETROSPECTIVE STUDY OF CLOSED DIAPHYSEAL TIBIA FRACTURE TREATED BY CLOSED REDUCTION BY INTRAMEDULLARY FLEXIBLE NAIL

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ABSTRACT Intramedullary flexible nail in closed tibia diaphyseal fracture preserves periosteal and endosteal blood supply and fracture hematoma, which increase chance fracture union. There is chance of fracture union. There is minimal risk of infection. It provides dynamically controlled motion.

KEYWORDS : Tibia diaphysis, intramedullary flexible nail, endosteal blood supply, hematoma

INTRODUCTION

With the increasing number of vehicles on roads in India, complex trauma cases caused by road traffic accidents have increased progressively. Being subcutaneous in location, the tibia is the commonest bone to be fractured and seen commonly in orthopaedic practice. Open fractures are more common. The presence of hinge joints at the knee and ankle allows no adjustment for rotatory deformity after a fracture. Delayed union, non-union and infection are relatively frequent complications especially after open fractures of the shaft of tibia. Due to its frequency, topography and mode of injury it has become a major source of temporary disability and morbidity. The major goal in the treatment of fracture tibia is achieving functionally useful and stable extremity. Yet the spectrum of injuries to tibia is so great that no single method of treatment is applicable to all fractures. Management of the fractures of the shaft of the tibia remained a controversial subject despite advances in both non-operative and operative care. Several published series regarding treatment of fractures of the shaft of tibia have shown that closed treatment of fractures can have excellent results. Stability to rotational forces was sometimes found to be insufficient until the interlocking nail was introduced. its improved stability is sufficient to apply to severely comminuted fractures. However, Intramedullary flexible nailing is preferred, which is a semiconservative treatment for tibial shaft fractures based on the belief of "gentle treatment for bone". The Intramedullary flexible nailing usually wide range of applications as a relatively easy procedure involving less impairment and fewer complications than other nailing methods. As a method of fixation Intramedullary flexible's nail provides following features: The technique of insertion being closed, fracture hematoma is preserved with very minimal risk of infection. Insertion without intramedullary reaming does not disrupt endosteal blood supply to the diaphysis, the flexible nails provide dynamic controlled motion, which stimulates periosteal callus formation. Stacking of the canal provides axial stability and the three point fixation produced by each nail affords rotational control. The nails are load sharing implants. The implants are inexpensive, the instrumentation is simple and inventory small. The technique is relatively easy once mastered and provides a consistent swift fixation. The biomechanical principle of the Intramedullary flexible nailing is three point fixation that is symmetrical bracing action of two pre-tensioned elastic nails inserted in metaphysis. The main aim of this biological and minimally invasive technique is to achieve acceptable range of reduction and stabilization of the fracture. The elasticity of nail depends upon the material used, titanium is better than steel in terms of elasticity. The biomechanical properties include (A) Flexural stability (B)Axial stability (C)Translational stability (D) Rotational stability. Among the four Rotational stability is the weakest point of this technique. The intramedullary flexible nails have been inserted into metaphysis after the nail has been prebent . During the intramedullary insertion the nail is inserted in retrograde manner for tibia in relatively straight medullary canal.The biological fixation is not a rigid fixation but still it is relatively stable to resist the angular, translational forces that displaces the fracture. There are ideal prerequistives to give a better stability intramedullary flexible nail. The Nails should be prebend that the apex should be located at the fracture site. Diameter of nail should be minimum 40% of internal diameter of medullary canal. Both the nails to be inserted should be of same diameter. Both the nails should be prebent to same extent Nails inserted should have maximal cortical contact at fracture site at opposite directions.

MATERIALS AND METHODS

Under spinal anaesthesia, positioning and draping of the patient done in supine position radiolucent table. Then using image intensifier fracture is reduced and alignment checked in AP and lateral views. The prebending of nail is necessary because good contact of nail with the inner side of cortex is absolutely essential to achieve three point fixation. The nail should be bent in a bow shape with apex of bend should be at the fracture site. usually, it is bent up to 30 degrees. Two locations for inserting Intramedullary flexible nails are selected from a total of four locations on the medial and lateral sides of the tibial tuberosity and on the medial and lateral sides of the distal end of the tibia. These Intramedullary flexible nails are inserted so as to create load shearing by themselves. First, the appropriate length of nail is measured by the distance between a point 2 cm proximal to the tibial tuberosity and the medial malleolus on the intact leg. Then two oblique skin incisions 2 cm long were made one on each side of the tibial tuberosity. The cortex of the tibia was perforated with an awl and the nails inserted one at a time. The prebent nails are inserted through the entry points using an inserter. The nail passed into the medullary canal with nail tip right angle to the shaft of bone. Then rotate the nail 180 degree and nail tip aligned with axis of canal under the guidance of image intensifier . This helps in preventing excessive crossing over at the fracture site producing corkscrew effect. Fracture is reduced using traction and manipulation. Then nail is driven across fracture site about 2cm proximally and rotated. Movement of proximal fragment noted in image intensifier and nail advanced. The second nail is inserted in same manner. The first nail is not advanced fully until the second nail crosses the fracture site because if advanced that shifts the fragments and makes difficult to pass the second nail. The ideal intramedullary flexible nail to tibial canal diameter ratio to optimize tibial shaft fracture healing is between 0.8 and 0.9. The fracture reduction is checked and any deformity is corrected by manipulating the nail. Varus /Valgus alignment also corrected by rotating the nail in direction of deformation through 180 degrees. The intramedullary flexible nail eye should 1 cm left outside.

COMPLICATION

LIMB LENGTH DISCREPANCY Fragments with overriding causing shortening of limb . Fractures in proximal third and communited fractures bine loss.

ROTATIONAL DEFORMITY Rotational deformity is measured by comparing with the opposite side. Deformity of more than 5 degree is significant. Deformity should be corrected below 5 degrees with the corrective casting.

NONUNION & DELAYED UNION Bone grafting was used for the non-unions and fibular osteotomy for the delayed union

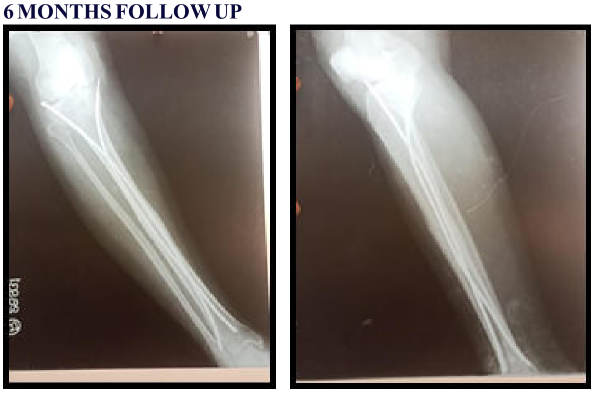
MALUNION Varus, valgus or anterior-posterior deformity of more than 5 degree was visualized on anterior posterior or lateral views or when there was a shortening of more than 1 cm.

KNEE AND ANKLE STIFFNESS Managed by physiotherapy.
INFECTION Mostly seen in compound grade 3 tibia fracture

PRE OP

POST OP

6 MONTHS FOLLOW UP



DISCUSSION

There are several methods for treatment of fracture of shaft of tibia. Some people apply a groin-to-toe cast after closed reduction till clinical union occurs. This will lead to joint stiffness, muscle atrophy, osteoporosis, prolonged recumbency, and loss of working days. The popularly applied patellar tendon bearing cast (Sarmiento Tibial Plaster) and early weight bearing may not control alignment in all cases. Besides, there is chance of loss of reduction during treatment. Further, not all cases can be reduced to an acceptable position by closed methods. Sarmiento type patellar tendon bearing functional brace result an average shortening of 6.4mm, an average angulation of 8 degrees and an average union lime of 5.7 months. Recent trend is use of AO compression osteosynthesis. This has the advantage of perfect anatomic reduction and early movement of the affected limb, but needs expertise. Complications following treatment with the AO - compression methods have been explained as due to insufficient experience. Open reduction and internal fixation is not recommended for high energy compound fractures with gross soft tissue injury, comminution and as there are chances of spreading infection. In our study, the anatomical location of the fracture was in the mid shaft of tibia in 55 (55%) patients, followed by distal-shaft in 23(23.00%) of the cases. The middle-third fractures are common because of anatomical features of more rigidity of the bone and is subcutaneous nature make it more vulnerable to the injuring force Final assessment in our series was done at 6 months using the Johner and Wruh's criteria, taking into account the objective and subjective symptoms of gait, pain, deformity, range of motion of knee, ankle and subtalar joints, shortening, neurovascular disturbances, ability to do strenuous activities, radiological union and presence or absence of non-union. Functional outcome was graded into excellent,good, fair and poor. In our series, 81.00% (81 patients) have got excellent, 14.00% (14patients) have good, 4.00% (4 patients) have fair, poor 1%(1patients)functional outcome.

CONCLUSION

The advantages observed are maintaining limb alignment and lesser number of serious complication, and a better range of motion of adjacent joints are obtained. It reduces hospital stay of patients and can return early to work, thus minimizes psychological trauma and financial burden. Intramedullary flexible nailing has easy learning curve. Intramedullary flexible nail can be good alternative for treatment of diaphyseal fractures of tibia in selected indications as it is an effective modality which allows early ambulation and weight bearing, and decreased dependency. Infection is controlled effectively in compound fractures. Intramedullary flexible nail is technically less demanding and it can be performed by junior doctors without any observation and can be done in tertiary health care centres. Intramedullary flexible nail the cost of implant is cheaper and affordable by poor people. In intramedullary flexible nail ,ther is no use of power instrument, so heat necrosis is not seen and it is less tissue damaging. Satisfactory results achieved in terms of union and functional recovery. It is cost effective and done by simple technique that can be mastered easily. Intramedullary flexible nailing is an excellent semi conservative treatment of tibial shaft fractures, maintaining adequate elasticity and micro mobility at the fracture site, which facilitate union when used in properly selected indications.

ANATOMICAL LOCATION OF FEACTURE	NUMBER OF PATIENT	EXCELLENT	GOOD	FAIR	POOR
PROXIMAL SHAFT	22(22%)	16(16%)	4(4%)	2(2%)	-
MIDSHAFT	55(55%)	54(54%)	1(1%)	-	-
DISTAL SHAFT	23(23%)	11(11%)	9(9%)	2(2%)	1(1%)

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