INTRODUCTION

With the advent of modern civilization the life of people have become more comfortable. The distances have shortened and the time has expanded. But along with these its inevitable evils have also followed it. Increasing mechanisation at home, farm, road or place of work and increasing vehicular traffic has lead to an increase in various types of accidents involving death and disability of an enormous magnitude.

Fracture of the tibia is one of the commonest fracture of lower extremity which by virtue of its location and position offer many problems in its treatment. As one third of its surface is subcutaneous through most of its length, open fracture are common in the tibia than any other major long bone. Furthermore the blood supply to the tibia is more precarious than that of bones enclosed by thick muscles. The presence of hinge joints at the knee and ankle allows no adjustment for rotatory deformity after fracture and thus special care is necessary during reduction to correct such deformity. Delayed union, non-union and infection are frequent complications after fractures of tibial shaft.

From the days of Sushruta (1000 B.C.) a number of methods of the treatment of fractures of tibial shaft have been devised till date. On one hand there is a view that these fractures should primarily be treated with conservative methods. On the other hand, there are surgical techniques
for fixation by plates, intramedullary nails and highly mechanical external fixator. In the words of Sir John Charnley (1961) "we have still a long way to go before the best method of treating a fracture of the shaft of the tibia can be stated with finality".

Several large series of tibial shaft fractures have been studied during the past. The studies of Demail et al (1961), Anderson and Hutchins (1961), Weissman et al (1966), Hoogland and States (1967), Sarmento (1970) and many others concluded the recommendation of closed treatment. Miceli (1964) in the study of 674 cases found that union without deformity and good functional results occurred in 95 percent of cases treated conservatively.

The immobilization of limb from toe to groin plaster of paris cast is most commonly used conservative method. In stable fractures it is a satisfactory method but in unstable ones it is very difficult to maintain the reduced position only by plaster cast resulting into malunion, delayed union or non union. Patients require prolonged immobilization in this conventional method which leads to joint stiffness, muscles wasting, osteoporosis, thromboembolic phenomenon and above all psychic disturbances.

External fixation devices have enjoyed long periods of enthusiastic use. They afford certain advantages owing to more rigid fixation, early mobilization protective care for wound without disturbing the fracture alignment or fixation and thus causing least joint stiffness, edema
muscle atrophy and osteoporosis. The highly mechanized metallic fixation devices have some disadvantages: being costly and difficult in assembling the fixator by the uninitiated surgeon.

Open reduction and internal fixation, although results in good anatomical reduction and rigid immobilisation avoiding a few of the complications of conventional closed method, yet carries a definite risk of anaesthesia, infection and delayed union. This method cannot be applied routinely in high risk patients.

Open reduction and internal fixation disturbs the normal healing process by periosteal stripping and draining of the fracture haematoma. Moreover, supporters of internal fixation have not proved a decreased incidence of non-union as a result of operative treatment.

Ellis of Great Britain has summed up the problem as follows "However attractive the possibilities of operative treatment may seem, operation still entails the conversion of a closed fracture into an open one, and the consequent risk must be weighed against the theoretical advantages". According to Mour (1968) "I make this appeal, keep the closed fracture closed".

The introduction of strong clover leaf nail combined with principle of reaming out the medullary canal (Kuntscher, 1958) and the development of image intensifier have renewed interest in closed nailing. Lotzen (1962) Kuntscher (1958) and Schler (1965) have reported encouraging results with such technique.
Still this method is not in common use and is practised only in big centres because of certain limitations such as a specialised traction device and image intensifier. There are certain advantages of the above said procedure such as:

1. It inflicts minimal surgical trauma.
2. Fracture haematoma is least interfered with.
3. Cancellous bone from within the medullary canal is driven into fracture haematoma thus conferring it with considerably more osteogenic potential.
4. Periosteal blood supply is not disturbed.
5. Infection is low or practically ruled out.

Since the technique used at various centres in developed countries entails the use of expensive apparatus and sophisticated instruments, this is not always available in a developing country as ours. We propose to simplify the technique of closed nailing in fresh simple fractures of shaft of tibia.

AIMS OF CLOSED NAILING

1. To decrease the rate of infection.
2. To decrease the time of hospitalisation and period of disability.
3. Early rehabilitation and good range of joint movements.
4. To decrease the rate of non-union, delayed union and malunion.
REVIEW OF LITERATURE

The treatment of fractures of tibial shaft has become one of the most controversial subject in orthopaedic surgery. In the past years many methods of treating fractures of tibial shaft have been presented and there have also been many analyses of the end results of such treatment.

Sushruta has described the fractures as "Kanda Shang". Various type of fractures and dislocations are described in Sushruta Samhita. In the treatment of the fractures of lower extremities "Kapat-Shayana" (Door bed) or a fracture board consisting of a plank of wood resembling the panel of a door were used. For the fracture of the lower limb after making the patient lie on the bed, the injured limb was immobilised with the help of yrs.

Apart from these references, no clear concept of treatment of fractures particularly of lower limb was available till the middle of 19th century. Hippocrates was the first to study the effect of muscle spasm on fractures which caused shortening and ever firing. Hence splinting the limb to overcome these problems became popular in the middle of 19th century.

Impressive results have been cited to support both open (Linden, 1928 and Velishakis, 1939) and closed methods (Alder, 1962; Edward, 1962; Sadunyo, 1970) of treatment for fracture shaft tibia.
The clinical problem of the tibial fracture is seen by the multiplicity of therapeutic methods which exists (Alder et al., 1962). These methods can be divided as follows:

2. Open/closed reduction and internal fixation with or without A.O. or A.S.I.F. techniques.
3. Closed reduction followed by immobilisation by external fixator.

No method of treatment is applicable to all types of fractures of the tibial shaft which are encountered under various circumstances. Various workers have reported the results of different methods of treatment.

**Conservative Treatment of Fracture, Tibia**

Olszewski, Linden (1936) observed in a study of 52 cases treated by conventional method, the average healing time was 12.3 weeks. The average shortening was one to two cm with five to ten degree of valgus deformity in 30.4 percent and varus deformity in twenty five percent cases.

Griffith (1943) analysed 365 cases of fractures of both bones in the patients treated by closed method of reduction with above knee plaster of paris cast. The mean time for union was 16.5 weeks and eight cases had non-union.
Robert Funstein (1945) reviewed 149 cases of fracture of both bones leg and found average healing time to be 11.2 weeks for clinical union and 30.4 weeks for radiological union. Types of fractures made practically no difference in the rate of healing.

Carpenter (1953) and Jackson (1959) concluded that 95 percent of tibial shaft fractures, whether simple comminuted or compound can be adequately managed by closed reduction with the advantage that such conservative means will avoid serious complications and will enable the fractures to heal in a shorter period than a similar fracture treated by open reduction and internal fixation.

Their conclusion is that initial haematoma around a fracture contains osteogenic properties which help in healing of the fracture. If this haematoma is exposed to external environment by open reduction, not only the union of fracture is delayed but also chances of infection increase.

Stelheim (1960) studied 500 tibial shaft fractures treated by either closed reduction and plaster of paris cast or open reduction and internal fixation. He found that healing time was shortest with conservative method and that the transverse fractures united earlier.

Nicolli (1964) in a survey of 702 cases of which 674 cases of tibial shaft fractures were treated conservatively. He observed the average time of union of fracture was 16 weeks (13 to 20 weeks). Incidence of delayed and
non union in infected cases was 60 percent. Intact fibula showed to hasten the process of healing. Twenty five percent of cases had foot and ankle stiffness. We also stated that internal fixation can be justified on grounds that it reduced the incidence of functionally significant deformity and joint stiffness, it significantly lowered the incidence of delayed and non-union.

Edward (1965) treated 492 fractures with closed reduction and plaster application. The results after one year were analysed as good, fair and poor. Longitudinal fractures showed 85 percent good, 15 percent fair while the transverse fractures showed 95 percent good, five percent poor results. Union time was nine months in closed transverse fractures and fourteen months in open transverse fractures. Complications such as skin necrosis osteomyelitis and mal union were observed in four cases.

Weissman and Harald (1966) treated tibial shaft fracture without internal fixation in 130 cases and found that the average time of union was four months and seventeen days along with average time of hospitalization of seven days. Temporary limitations of movements at knee and ankle was observed in most patients during first few months after plaster was removed. Shortening of leg amounting to 1°, 2°, 1½°, 1° respectively was observed in four cases and one case had varus angulation of 10 degrees. Seven patients had pain over the fracture site for more than seven months.
Sarmiento (1970) treated 135 of fracture shaft tibia by a functional below knee brace and stated that the patient walked with full weight bearing after four weeks of injury. Average healing time was 14.1 weeks in both bone fracture leg and 16.8 weeks when fibula was intact. Average amount of shortening observed was 6.4 mm. No rotation deformity was recognised at follow up but the ultimate degree of rotation of distal fragment was not measured accurately. Several minor pressure sores were encountered in the popliteal fossa.

**TREATMENT OF Tibial Fracture BY PLATES AND SCREWS**

Tibial shaft fractures treated by plate and screws have been used by various workers (Egger, 1948; White, 1953; Reynolds, 1954 and Burwell, 1971).

Wade and Campbell (1958) reported discouraging results with the use of plates as compared to other forms of surgery. According to them endosteum appeared to assume the sole responsibility for binding the fracture site, but fixed distraction and absence of foreign material made the use of plates hazardous.

Edwards (1965) stated that tibial fractures treated by open reduction and plate fixation both in closed and open fracture resulted in high rate of infection.

Muller et al (1965) treated tibial shaft fracture by compression plates. He reported encouraging results with dynamic compression plates and reported 95 percent results as good whereas only six percent complication
rate was found in closed group treated fracture of tibia.

Berkin and Marshall (1972) used three sided plate fixation for fractures of tibia. Two plates which were slotted fenestrated and gutter shaped were placed such that its linear margin would be in contact of bone on two sides and an Egger's slotted plate placed along the third side. This assembly did not result into angulation.

Ninety two tibial fractures were treated with above method. The overall results were very good in 73 cases, 11 were good and nine were satisfactory. There were six post operative wound infection. Delayed union occurred in 11 patients.

Lindon and Larson (1979) in a randomized trial of 100 transplaced fractures treated conservatively or by A.O. plating found that complications in the A.O. group were more common. Their stay in the hospital was more, delayed union more frequent, but A.O. group healed faster with average time of 12 weeks as compared to the conservative group where healing time was 17 weeks whereas open fractures healed faster when treated conservatively.

Screw fixation was sometimes favoured for spiral or oblique fractures but while, Reddy and Kerly (1983) ecart and Marleau (1954) and Charalab (1961) claimed that this method is uncertain, since number of fractures redisplaced despite plaster immobilisation and there were more chances of non union.
TREATMENT OF TIBIAL FRACTURE BY EXTERNAL FIXATOR

Although open method offered exact opposition of fragments yet they bring potential danger of infection and delayed or non union. External fixation refers to a method of immobilisation of fracture with two or more pins attached to a rigid external metal frame or incorporated in plaster.

The first external fixation for the treatment of fractures was described by Malgaigne (1831). Parkhill (1897) described the use of two half pins above and two half pins below the fracture in long bone, externally joined by an indigenous clamp for fracture reduction and immobilisation.

Racel Hoffmann of Switzerland (1938) developed a four plaster double frame external fixation device. He presented a series of articles describing his method of external fixation from 1938 to 1954.

Karstrom and Olnerud (1975) treated 28 severe, open tibial fractures with stable external frame fixation by the vidal Adney double frame method. The average time of limb kept in the frame was 4.9 months and then a P.T.P. cast was used. The mean time until full weight bearing without external support was 7.9 months.

Edward (1979) reported the study of 44 open tibial fractures. Seventy three percent of cases had bone loss or major comminution. After initial debridement double frame Hoffmann apparatus was applied and fracture reduced. Initial union was evident at four months, complete at thirteen
months. Thirty percent of cases developed pin tract infection which cleared off after removal of pins.

Traditional half frames are safe and provide excellent wound access but are not rigid enough to hold unstable fractures to deal with heavy limbs, or to permit early weight bearing (Schmidt and Porosnak, 1983). They reported loss of reduction in 15 percent of their cases.

Bilateral frames rarely allow displacement but malunion occurred in up to 39 percent of cases (Keirnal, 1982). Refracture in eight percent (Lawyer and Laffman, 1980) and pin tract infection in thirty percent (Edward et al, 1979).

Transfixation of ankle and foot dorsiflexion more distally may lead to permanent ankle stiffness. Emerson and Grabias (1989) followed up tibial fractures immobilized with bilateral frames and found that the most frequent complaint was ankle and foot stiffness. Apart from neurovascular injuries and permanent joint stiffness pin tract infection have been the most serious limiting factor in the use of traditional unilateral or bilateral frames.

Clayson et al (1979) treated 103 open tibial shaft fractures, 56 with cast immobilisation, 28 with internal fixation and seven with external fixation. Average time of healing was 19.5, 19 and 28 weeks respectively. Deep infection developed more in cases with internal fixation (11 percent) than in cases treated
The favourable effect of pressure at fracture site was first described by Sir Hugo Owen Thomas of Liverpool and later by Sir Robert Jones, who used to expose and hammer the fracture site in cases of non-union to achieve union.

TREATMENT OF TIBIAL FRACTURE BY WALKING CAST

The technique of walking cast was first developed by Krause (1891) and later by Dellingar and Budapest (1893). They used to apply the unpaddeed plaster to treat fracture of leg, so that weight might be transmitted from tuberosity of tibia to bottom of plaster.

Eggar (1969) demonstrated the effect of contact compression factor on the osteogenesis in surgical fractures. He described two forces acting at the fracture sites, the internal force exerted by the mass of the muscle especially in the voluntary contraction and external contact compression exerted by gravity and weight bearing.

He concluded that:

1. Presence of contact compression factor stimulates the osteogenesis.

2. Excessive compression fails to stimulate osteogenesis.

Dahne (1961) treated fractured tibia by immobilisation in a near skin tight cast with knee held in full extension and with immediate weight bearing. The average time of healing and return to work for all 367 patients was five months. In 96 percent of the patients the time for healing and mobilisation was between four and six
two to four months.

Brown and Urban (1969) presented a series of 60 cases of fracture shaft tibia. After reduction a long leg cast was applied and early weight bearing was permitted. He reported 100 percent union with average period of nineteen weeks. The overall shortening was nine months, angulation was less than ten degrees.

Gamble et al (1972) treated 100 fractures of tibia by early weight bearing in long leg cast and evaluated the result close to Brown and Urban (1974). Brown concluded that the closed reduction and early weight bearing in long leg cast often concedes minor complication in favour of a predictably high union rate with no major complications and can be used for all types of tibial shaft fractures.

The advantage of ambulation were explained as the alternating contraction and relaxation of muscles of leg with improve circulation in the extremity and at fracture site. Venous return was enhanced, oedema was minimal and muscle tone maintained. All of which facilitated the mobilisation of the knee and ankle when the cast was removed.

A below knee cast moulded in a manner resembling that of the patellar tendon bearing prosthesis stabilises the proximal fragment of tibial fracture. Weight bearing pressures are transmitted from the ground to the proximal end of the tibia virtually by passing the fracture site and suspending the fracture bone. The triangular moulding of the
proximal fragment prevents rotation and ever riding of fragments. The indentation over the patellar tendon and the femoral condyles, appear to enhance the rotational stability.

Dunn et al (1973) in his study of 45 closed tibial shaft fractures, treated by PTB cast reported average healing time of 14.1 weeks. Non union occurred in two cases.

Sharma et al (1979) studied 268 fractures of tibia treated in below knee cast following toe to groin conventional treatment. The average time for union was 15 weeks. The fractures with intact fibula healed earlier than fractures of both bone leg.

This method of closed reduction and early weight bearing by either above knee or below knee cast is suitable for stable fractures or transverse fractures. Fractures that are oblique or comminuted and are unstable if subjected to above treatment may angulate or shorten unless some additional fixation is used.

To prevent loss of reduction and to avoid angulation or shortening Behler advocated pin and plaster treatment as early as 1929. 239 fractures were treated by Collevoid and Behler by pins incorporated in plaster. The results obtained were good. Andersen et al (1944) reported their experience with a method of closed treatment of fractures of tibia and fibula. They used stainless pin through the tibia and closed reduction followed by plaster
application. They found certain advantages of this method over closed reduction in cases of unstable fractures of both bones of leg. In only 2.1 percent union was delayed and in 1.9 percent no union developed out of 125 fractures of the tibia and fibula treated by the above method.

Birouet and Joseph (1970) treated 75 fresh displaced fractures of tibia by percutaneous multiple pin fixation, short leg cast and immediate weight bearing reviewed 100 percent healing with an average period of healing between 16 to 20 weeks. They used four pins; two in proximal and two in distal fragments but segmental and comminuted fractures needed five or six pins. The mean time for healing was eighteen and half weeks. Oblique fractures healed slowly. There were no instances of nonunion or delayed union. Secondary, inflammatory reaction in about two pins occurred. Preserved knee motion was associated with early restored ankle and foot motion.

Trivedi and Patel (1970) used the method of insertion of stainless pins and incorporating them in a below knee total contact cast in 60 cases of fracture tibia and compared the results with above knee casts. The results showed that the average duration of plaster immobilization was about same in both the series i.e. 4.3 months in below knee method and 4.5 months in above knee method. The occurrence of delayed union and failure rate were slightly lower in former method. The only complication was pin tract infection and loosening of the pin. Early
Martí and Ring (1983) did closed medullary nailing of 61 fractures of the femoral shaft using the A.O. method in 59 patients. More than 50 percent of patient progressed to full weight bearing by the end of eight week. Knee flexion was full in 30 percent. There was no instance of non union and residual clinical deformity. Union of the fractures was radiologically confirmed in all cases. Some callus was seen as early as in the third week in one of the patients.

Chapman and Davis (1980) gave a report of three cases of closed intramedullary bone grafting with nailing of fresh segmental fractures of the femoral diaphysis treated late. Keeping the patient on skeletal traction until the wound had healed and there was no evidence of infection. It was then that the fractures were stabilised. They found that abundant callus about both femoral fracture site was evident by fourth week. The limb lengths were equal and there was loss to 45 degrees of knee flexion at the knee joint. Tractio was continued for six weeks even after the surgery.

King and Rush (1981) treated 112 traumatic fracture shaft femur by closed intramedullary nailing. These were sixty patients who began partial or full weight bearing within two weeks and thirty two within four weeks. Knee flexion to ninety degree was achieved by twelve patients within three weeks, by forty one patients within six weeks, and by thirty six patients within twelve weeks.
There was no non-union in this series. Radiological union was present in all fractures at six months and there was no death.

Leighton et al (1983) undertook a retrospective study of open versus closed intramedullary nailing of femoral shaft fractures. In the group of 65 patients treated by closed method had three failure of treatment and six major complications. Major complications included three malunion, one permanent peroneal nerve palsy and two intramedullary infections. Other group of 65 patients treated by open method had three minor and three major complications in form of deep vein thrombosis and shortening of up to three cm. Satisfactory results in closed nailing were up to 92 percent while in open nailing up to 97 percent.

Stewart and Phillips (1985) treated 23 patients of fracture shaft femur with closed medullary fluted rod. They found that the average time to walk with support was four days. Most of the patients were discharged from the hospital by fourteen days. Average time to walk without support was four weeks. Average time to return to work was fourteen weeks and the average time for the union of fracture was fifteen weeks.

Wilson et al (1987) treated fourteen patients of fracture shaft femur by closed interlocking medullary nail. They stated that average time of patient's stay in the hospital was 27 days. Partial weight bearing was
allowed within first three week of surgery and full weight bearing was achieved within eight weeks. Radiological evidence of healing was evident on an average of 13 weeks and return to work in most cases was within 14 weeks.

Lambotte (1913); Grooves (1918) and Rush and Rush (1937) used some form of nail for intramedullary fixation of tibial fractures. Kuntscher (1958) used the improved nail and his method gained popularity. Introduction of strong intramedullary nail combined with the principle of reaming out the medullary canal and the development of image intensifier have recovered interest in closed nailing. Lottes (1952) and Böhler (1965) reported encouraging results with such technique. Anderson (1971), Selhain (1966), Watson Jones (1983) have not favoured its use and observed that there was no real merit in the attempt to secure fixation of fractures by intramedullary nailing.

Lottes (1952) evaluated the results of 176 fractures of the tibial shaft treated by nailing, plating and plaster immobilisation. The average healing time was six months, 11.6 months and 9.4 months respectively. Incidence of non union was 33.7 percent with plating, 10 percent with conservative treatment and none with nailing. As regards the deformity, there was varus or valgus angulation of three degrees or more in 19.6 percent cases of conservative treatment, 5.7 percent in closed nailing and 4.3 percent in plate fixation. For the three
percent and 4.3 percent of the cases in that order.

Lottes (1954) reported 200 cases of tibial shaft fractures treated by the closed intramedullary nailing. He used Lottes nail. It was necessary to expose the fracture site in only three out of 200 cases all in fresh fractures, because of failure to obtain reduction by closed method. In fresh fractures of tibia with intact fibula, the fibula was osteotomized after the nailing had been completed to allow impaction and weight bearing.

Aldar et al (1962) reported that osteomyelitis developed in twenty percent cases of open fracture treated by medullary nailing and only in 2.3 percent of similar fractures treated without internal fixation. They also stated that Kuntscher nailing cannot be used in comminuted fractures and also in patients below fourteen years of age, because of fear of epiphyseal damage.

Akins (1962) treated a total of 50 fractures of tibial shaft by closed intramedullary nailing for which no external splint was used and the patient allowed to walk as soon as the wound healed. The average period of absence from work for the patient was eleven weeks. There was no case of sepsis or non union.

Caladius (1964) and Denkwardt (1969) described that the nutrient artery is destroyed and endostema and bone marrow is almost completely removed because of running and nailing and so more chances of delayed or non union. Endosteal callos formation is scarce. There are chances
of fat embolism following reaming of tibia.

Miceli (1964) in his survey of 705 cases of fresh tibial shaft fractures of which 674 were treated conservatively and 31 were treated by primary intramedullary nailing or plating. In his opinion "Internal fixation actually delays union unless it is absolutely rigid and this is never the case with intramedullary nailing". He did agree that practically all fractures can be stabilised and patient can become ambulant in plaster within a desired time but internal fixation can be justified on following grounds that it reduces the incidence of functionally significant deformity and joint stiffness. It significantly lowers the risk of delayed and non union, that the advantages so claimed are great enough to outweigh the additional hazards of surgery, which in a subcutaneous bone like tibia can be disastrous.

Sachau and Maurer (1980) reported 20 cases of two level fractures of tibia treated by blind nailing of which 17 patients had closed fractures. Primary bone union in good position was obtained in 15 cases and aseptic union was found in 0.3 per cent. No case had malunion, union with sepsis or septic nonunion. They concluded that both the fractures upper and lower had the same potential for union. In these cases walking was started with full weight bearing in an average time of three to four months and it decreases the rate of non union and infection as compared with other type of
Hama et al (1971) reported 50 patients with fracture tibia - 28 closed and 22 open treated by intramedullary nailing. Nineteen patients had closed nailing and remaining underwent open nailing. Average time for clinical union was three months. Radiological union was obtained at an average of four months. Average time interval between injury and return to work was 4.3 months. Patients who had developed non union during treatment by other method can obtain union expeditiously after reaming and inserting large size nail.

Olarud and Karlstrom (1972) did secondary intramedullary nailing of tibial fractures. They took thirteen patients who had already been treated with compression plating but due to poor compression achieved they underwent secondary intramedullary nailing after reaming of medullary canal; with regard stability delayed intramedullary nailing has an important advantage namely the endosteal callus which gives nail a firm grip in fracture of lower and upper end of tibia. Out of 13 cases only one had infection which considerably delayed the healing of fracture. The final results were excellent or good in 87 percent of cases.

Smith (1974) compared the results of early and delayed internal fixation in the treatment of fractures shaft of tibia. He observed that average healing time was 26 weeks in cases of early internal fixation and eighteen weeks in delayed internal fixation. He thus confirmed
that in except mild fractures early internal fixation would always increase the time of healing and incidence of complications.

Sharma et al (1978) treated 45 cases of fracture shaft tibia by intramedullary 'V nailing'. Clinical union was evident by ten to fifteen weeks. Complications developed like deep wound infection in 17.2 percent and bending of nail in 7.4 percent. Patient was allowed to walk with the help of crutches after removal of stitches and was allowed to walk with weight bearing after 6 weeks. The hospital stay was from 11 to 20 days.

Greese, Kempf (1982) used interlocking tibial nail which have holes through their proximal and distal ends and are used for fractures of proximal or distal third of tibia, segmental fractures and fractures with significant comminution.

Mayer et al (1983) treated 31 severe fractures of the tibial shaft with multiple intramedullary Enders nail. Forty one fractures united in less than four months and eight within four to eight months. Only two were not united even after eight months.

Lawrence and Kenneth (1986) treated 113 fractures of the tibia by manipulation reduction, realining of medullary canal and fixation of fragments with an intramedullary nail either ASIF/VO or interlocking nail.
Follow up evaluation was performed in 100 fractures.
The average time of union of fracture was 19 weeks. Two
patients had delayed union. Deep sepsis developed in
seven percent and superficial in two percent.

Rao and Shahne (1986) treated 103 tibial shaft
fractures by closed intramedullary V nailing without
image intensifier. Patients were allowed to bear full
weight in patellar tendon bearing cast. By twelve
weeks 91 fractures had united while at 18 weeks only
three had non union. Four patients needed re-operation
for sequestrectomy and delayed union.