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Fracture of both bones leg have long been considered difficult problem. Most series of reported non-union list the tibia being the most common site of non-union of all diaphyseal fractures. The old aged method of above knee immobilisation in plaster cast has many complications such as:

a. Increase time of hospitalisation, convalescence or both.
b. Stiffness of the joint and decrease range of joint movements.
c. Increase rate of non-union, delayed union and malunion.

The alternative method of open reduction and internal fixation though results in good alignment and fixation of fractured fragment is not free from many disadvantages and complications such as:

1. Vascularisation of fractured area is impaired as periosteum is further damaged and fracture haematoma drains out which may result in deficient nutrition of osteogenic cells and subsequent delayed union and non union.
2. Increased rate of infection.
3. It inflict surgical trauma.

A compromise between open reduction and conventional method of treatment appears to be more logical. Under these circumstances closed method of nailing for the
fractured tibia was proposed. It has certain advantages such as:

a. It inflicts minimal surgical trauma.
b. Fracture haematoma is least interfered with.
c. Convoluted bone from within the medullary canal is driven into fracture haematoma thus conferring it with considerable osteogenic potential.
d. Periosteal blood supply is not further disturbed.
e. Infection is low or practically nil.

This technique of closed nailing is in use at various centers for quite some time particularly after the availability of image intensifier. Our being a poor country the facility of image intensifier is available only at few places. Yet the advantages outlined above form a strong case in favour of close nailing. Therefore we have endeavoured to simplify and perfect the technique of closed intramedullary nailing in simple fresh cases of fractured tibia doing away with the paraphernalia of elaborate arrangements and costly gadgets. Our efforts are mainly directed to devise such a method which may be used extensively without the use of image intensifier and is simple to achieve.

Hence we relied upon the clinical judgement of fracture reduction, positioning of guide wire and ultimately of the nail. In only one case the nail failed to pass in the distal fragment as the fracture stability was misjudged because of intact fibula. It was discovered on X-ray and was corrected in the next sitting.
The maximum number of cases (50 percent) ranged between 18 to 27 years of age and the males (86 percent) outnumbered females (14 percent) which should be due to their more active outdoor life making them more prone to trauma.

Majority of the cases had fracture of the middle third of tibia followed by the fracture at the junction of middle and distal one third and the least number of cases (14 percent) had fracture of the upper third. The low incidence of fracture in the upper third is probably because of more soft tissue covering of bone in upper part than in middle and lower region. Tibia being subcutaneous in most of the length had high incidence of open (Grade I) fractures (50 percent) than any other long bone.

Comminuted (43 percent) and oblique (23 percent) fractures were more commonly seen in our study which may be because of the position of tibia between two hinge joints so that twisting forces make it more vulnerable to the above type of fractures.

Lottes et al (1982) in his series of 216 tibial shaft fractures treated 102 cases by closed nailing and rest by plating or conservative method. They introduced the nail from the prespinal surface of the tibial plateau keeping the leg horizontal. The same position of limb was used by Lottes (1984); Alon (1962); Zachman and Neuner (1966); Hame et al (1971); and Smith (1974). In all our patients the site of introduction of nail was the same as above but we kept the limb acutely flexed to about 130°
while introducing the guide wire and about right angle, suspended by the side of table while achieving reduction and negotiating the guide wire in the distal fragment. The knee was again flexed to about $135^\circ$ making the leg almost vertical and placing the sole over the operation table while the nail was threaded over the guide wire and hammered home.

Lottes et al (1962) used Lottes's triflanged nail without using any guide wire. Ains, Zuckman and Maurer (1969) and Minna et al (1971) used Kuntscher clover leaf nail bent 10 to 20 degree anteriorly near the upper end for easier extraction. In all of our cases we used Kuntscher clover leaf nail. The tip of the guide wire was made blunt so that it may not perforate the posterior cortex of proximal tibial fragment and moreover the soft tissues and vessels after the guide wire had passed through the proximal fragment but had not found its way in the distal one.

Lottes et al (1962), Zuckman and Maurer (1969) and Minna et al (1971) did not scan the medullary canal for fear of jeopardizing the blood supply. Ains (1962) scanned the medullary canal as a routine before seating nail hence in his series in most of the cases 11 mm diameter nail was accepted. We did not scan the medullary canal so in eight cases (57 percent) nine mm diameter nail was passed while in five cases (33 percent) 10 mm diameter nail was introduced.
In our study of 16 cases two cases (14 percent) had failed closed reduction as in one case the fibula was intact and because of pre-existing partial stability of the limb it was difficult to know clinically whether the guide wire and the nail were correctly placed. Post-operative x-ray revealed the nail lying in the soft tissue. However after seven days, the nail was extracted and closed reduction was tried. But intact fibula continued causing problem in the assessment of guide wire passing into the distal fragment. Eventually open nailing had to be done in this case.

In another case the closed reduction was not achieved and we had to open the fracture site and to our surprise we found that one of the comminuted fragment was overlying the proximal end of distal fragment which was not allowing the guide wire to pass through the fracture site.

In one case (seven percent) the nail left the guide wire at the fracture site and got incarcerated in the cortex of the distal fragment. In this case the guide wire was of smaller diameter and the open part of the instrumentation nail left the guide wire while the nail was passing through the fracture site. However we did not try to take out the nail as the reduction achieved was acceptable and the patient had comminuted fragments.

In two (14 percent) of our cases distraction at the fracture site occurred after nailing. Retrospectively...
In one case we made the patient to walk without external splintage four days after the surgery and in doing so the distraction was corrected. The other case had significant unicortical comminuted fragment. This precluded early weight bearing but after ten days when stitches were removed under intravenous effect of pentothal sodium firm pushes were given over the heel with counter pressure given by the assistant over the knee. The check X-ray showed good apposition of the fragments.

Operative time for successful closed nailing ranged from 20 minutes to a maximum of 50 minutes at an average of 35 minutes. The minimum time of 20 minutes was taken in one case in which nailing was done after an interval of 21 days of injury. In this case we had some problem in breaking the soft callus which had formed and was posing problem in reducing the fracture. The time of 35 minutes on average is much less than the time taken for any surgery in which open reduction and internal fixation is done hence closed nailing has an advantage of having shorter time of exposure to the surgical trauma. Uptill now no worker has reported the time taken for closed nailing of tibia.

Average hospital stay in the series of Lettes et al (1988) was 1.2 months. Whereas it was three to four weeks in one series of Home et al (1971). In our series 35 percent cases had an hospital stay of two weeks. Two groups of cases each had hospital stay of three and respectively. Increased period of hospital
-isation in these cases was because we gave time for blistered or punctured wound to heal. In a few cases the patient had to face surgical trauma twice because of some per-operative complication. But with increase in our experience the hospital stay of the patients decreased significantly.

Lottes (1954) reported an incidence of 3.3 percent deaths occurring within a week of operation, 2.1 percent deep infection and 2.1 percent non union in a series of 284 patients. Smith studied 219 fractures of tibial shaft treated by open reduction and internal fixation and found delayed union occurring in 48 percent and infection in 20 percent. Burwell (1971) reported that 101 fractures of the tibia treated with open reduction and internal fixation using Burns or venable plates had a non union rate of 4.6 percent, an infection rate of 6.6 percent. Barkin and Marshall (1972) fixed three sided plates in 92 tibial fractures which resulted in 3 deaths, 6 infection and eleven delayed union. We did not come across any of these complications even in a single case.

Lottes et al (1953) recorded an angular deformity (three degree or more) in 5.7 percent cases and a shortening (six mm or more) in 1.9 percent cases. They had no case of rotational deformity. Weissman and Harold (1966) treated conservatively and found shortening amounting to 11⁄2", 1 1/2" and 1" respectively in four out of 150 cases.혁성 (1970) treated 126 cases of fracture shaft
tibia by a functional below knee brace and found an average shortening of about 0.4 cm with no rotational deformity seen. Dehne et al (1961) reported average shortening of 0.9 cm. Nicoll (1964) reported shortening of more than 2 cm in 2.5 percent of his cases treated by conservative methods. In the present series we had no case who had angulation, rotational deformity or shortening.

Nicoll (1964) reported ankle stiffness long after union had occurred in 75 percent of his cases. Weissman et al (1966) observed temporary limitation of movements in the knee and ankle in most of the patients during the first few months after plaster was removed. Joseph (1974) found frequent possibilities of knee and ankle stiffness with above knee cast. Emerson and Grabian (183) followed up tibial fractures immobilized with bilateral frames and found that the most frequent complaint was ankle and foot stiffness.

One out of the twelve successful close nailing had limitation of dorsiflexion of ankle joint one and half months after the plaster was removed which gradually recovered by the last follow up. Rest of the patients did not have any limitation of ankle or knee stiffness because while tapping down the nail we threaded on the guide wire another Kuntscher nail of similar diameter as the one being introduced. This greatly facilitated the
seating of nail without trouble. It was because of this improvisation that we were able to sink the upper end of the nail a few millimeters in the tibial plateau without inflicting any soft tissue and bony trauma which went a long way in restoring full range of knee extension post-operatively.

In the present study soon after closed nailing long leg dorsal slab was given. Suitable patients were allowed to walk in the slab a few days after surgery with the help of walker or stick. Initially we hesitated in making them walk early in post-operative period. As we grew in experience and confidence we abandoned over-cautious approach in early ambulation of patients in selected cases. Patients with oblique/spiral fracture and with significant commination were not allowed to walk until good bridging callus had formed. In all, four cases underwent assisted protected weight bearing at an average of 3.3 weeks. Out of these there were two patients who were ambulant within four days of nailing, unassisted protected weight bearing was started at an average of 5.9 weeks.

Unprotected assisted weight bearing was started at an average of 10.4 weeks whereas unprotected unassisted weight bearing was started at an average of 11.7 weeks which is much earlier than in the series of Letten et al (1982) and Letten (1954). Letten et al (1983) allowed full weight bearing in cast at an average of 1.9 months and unprotected unassisted weight bearing was resumed.
on an average five months after injury.

Due to the presence of nail in the medullary canal it was difficult to judge the progress of union clinically as the stability at the fracture site was achieved soon after successful nailing was done. Criteria of absence of pain at the fracture site, good muscle tone and resumption of unassisted weight bearing were certain features to judge the progress of union. Radiologically start of formation of bridging callus and partial obliteration of fracture line were other criteria to consider the rate of union.

In our study average period of start of bridging callus formation and partial obliteration of fracture line were three weeks and six weeks respectively. Absence of pain at the fracture site was reported to be four weeks on an average. Unprotected assisted and unassisted (full weight bearing) was 10.6 weeks and 11.7 weeks respectively. In patients where early weight bearing was started resulted into minimal periosteal callus and early obliteration of fracture site.

Other Linden reported average healing time as 22.3 weeks in patients treated conservatively. Robert Feinstein (1945) reported average healing time to be 11.2 weeks for clinical union and 18.4 weeks for radiological union. Average time of union of fracture was 16 weeks according to the study done by Miscell (1966) in his survey of 708 cases treated conservatively.
Karlstrom and Olsson (1975) treated tibial fracture with stable external frame fixator. The average time for full weight bearing without external support was 7.9 months. Dahm (1961) treated fracture tibia by immobilization in a near skin tight cast with knee in full extension and in these cases average healing and mobilization was within four to six months.

Vander Linden and Larson (1979) reported average time of healing in fractures treated by plate and screw as 12 weeks as compared to conservative treatment where the healing time was found to be 17 weeks.

Out of 12 patients of successful closed nailing ten were working men who returned to their work at an average interval of 10 weeks. The early return to work could be attributed to early weight bearing, restoration of joint movements and consequently, also, to early fracture union.

On the other hand conservative method of above knee cast immobilization, not only prevents early ambulation but also delays return to work. Michael Ams (1962) found an average period of 12 weeks and 22 weeks in patients treated by closed nailing and above knee plaster cast respectively. Statis (1967) noted that 90 percent of his cases of fracture leg treated by long leg cast could resume work by 12 months.
Follow up varied from 12 weeks to seven weeks. No case was lost to follow up. Patients reported faithfully whenever called to the hospital.

Out of 16 cases twelve underwent successful closed nailing. No post operative complications was found in any patient. Suitable patients were kept for early ambulation depending upon the type and fixity of the nail. All except one patient had loss of dorsiflexion at the ankle joint. Excellent results were found in 92 percent whereas good in eight percent of our clinical study.

The technique of closed nailing which had been done by the workers before had been simplified by us, as in this no costly instruments or apparatus were used and we could get 100 percent healing with good alignment of fragments, absence of infection, early ambulation and rapid return to work. We believe that due to the simplicity of the technique it can be brought into practice even at a small centre by a person with some experience related to the subject mentioned above.