The incidence of open fractures is on the increase owing to the increasing high speed automobile accidents and mechanisation in various fields of life. These fractures are mostly the result of high energy trauma and are associated with large local damage.

The treatment of compound and unstable fractures of tibia has remained the most controversial and unsolved problem in the science and art of fracture healing. Moreover, the scanty blood supply of the bone adds a lot to the problem of management of compound fractures of the tibia.

We have included 22 cases of open diaphyseal fractures of the tibia in our series. The clinical results in our series were compared with results in various other studies and assessed accordingly. In our series the cases ranged from 17 to 60 years of age with an average of 32 years. In series of Chang Leung (1980) the average age was 36 years ranging from 7 to 74 years. The male : female ratio was 13 : 4. 40.8% of cases belonged to the 21-30 years of age group. This is due to the fact that persons in this age group are more exposed to the road traffic accidents, the so called "motor cycle disease". There were 21 males (95.47%) and 1 female (4.5%) patient, again showing the vulnerability of males to high velocity trauma due to active outdoor activities.
The commonest mode of injury in our series was road traffic accidents, 20 cases (90.9%), out of which 68.1% were vehicle occupants while 22.7% cases were pedestrians. In Widerfalk et al series road traffic accidents were the cause in 65% cases. The incidence of injury was slightly higher (54.5%) on the right side as compared to 40.9% in the left side. 4.5% cases had bilateral injury.

Based on the classification of compound fractures by Gustilo and Anderson (1984), 31.8% cases belonged to grade I, 31.8% to grade II and 36.3% cases were of grade III injury. In Velazoo series (1983) there were 24% type I, 12% type II and 64% type III injuries.

In our series the radiological type of fractures revealed transverse fractures in 31.8%, oblique in 18.18%, spiral fractures in 4.5%, segmental fractures in 13.6% and comminuted in 31.8% cases. In series of Gustilo and Anderson (1984), there were 57.5% comminuted, 18.4% transverse, 12.6% segmental and 3.4% oblique + spiral fractures. Two cases were in proximal third, 16 cases in middle 1/3rd and 4 cases in distal 1/3rd of tibia. We observed that the severity of soft tissue injury correlated with the complicated fracture pattern as well. Gershuni and Halma (1983) reported that out of 19 fractures, 5 were the proximal, 15 in middle and 9 cases in distal 1/3rd of tibia. Sarmiento (1986) has reported 12% cases in proximal 1/3rd, 49% in middle 1/3rd and 39% in distal 1/3rd of tibia. Thus in all series middle 1/3rd is the commonest site of fractures.
Most of the patients, 10 (45.4%) cases came to us between 6-12 hours of injury. 5 (22.7%) cases came within 6 hours while 4 (18.1%) cases and 3 (13.6%) cases were admitted between 12-24 hours and after 24 hours respectively, with a mean duration of 12 hours from injury to admission.

In all the patients who were admitted, a thorough debridement and surgical toilet was done in the emergency O.T. as soon as the patients condition permitted us to do so. If external fixation was planned (10 cases) it was applied after the debridement in the Emergency Operation Theatre (2 cases - 9%) within 6 hours, 4 cases - 18.7% between 6-12 hours 1 case - 4.5% between 12-24 hours and 3 cases - 13.6% were operated after 24 hours of injury while if intramedullary nailing was planned (12 cases), a A/K post operative plaster slab was given after debridement and intramedullary nailing was done at the earliest available elective operation theatre (2 cases - 9.09% between 6-12 hours, 3 cases - 13.6% between 12-24 hours and 7 cases - 31.1% after 24 hours of admission). The external fixation was applied in 2 grade II and 8 grade III injuries intramedullary nailing done in 7 grade I and 5 grade II injuries.

Primary closure was done in only 8 cases - 36.3% (grade I - 7 and grade II - 1) while delayed primary closure was done in 2 cases - 9% (grade II). 6 cases (1 grade II and 5 grade III) were left open followed by skin
grafting while 6 cases (3 grade II and 3 grade III) were left open for secondary healing. Most of the cases were discharged from the hospital within 3 weeks of the admission.

The average period of immobilization in external fixator was 9.7 weeks following which the fixator was removed and either a PTB POP cast (6 cases) or a A/K POP cast was given (4 cases) depending upon the stability and configuration of the fracture. In the series of Edge and Denham (1979), the fixator was maintained until clinical and radiological union with an average of 22 weeks, ranging from 3 months to 1 year. But in our series we removed the fixator when the wound was covered to prevent complications like pin tract infection etc. In the 12 cases of intramedullary nailing the stitches were removed at 10-14 days following which a PTB POP cast was given at 3 weeks for 6-8 weeks (8 cases) or a A/K POP cast was given for 6 weeks depending upon the stability of the fixation.

The average period of soft tissue healing was 5 weeks. 8 cases (7 grade I and 1 grade II) healed within 3-4 weeks. The average period of fracture healing by external fixator was 23.4 weeks. Saljavaara et al (1985) reported a mean union time of 24.0±3 weeks with external fixator while in Court Brown and Hughes (1985) series it was 31.9 weeks. The mean union time with intramedullary nailing in our series was 19.2 weeks. In P. Smyrnis series (1985) mean union time ranged from 6-22 weeks, while
Ekeland et al (1983) reported it to be 16 weeks (8-40 weeks). The average duration of follow up was 8.5 months. One patient was lost in follow up at 2 months.

In our series of 12 cases of intramedullary nailing, 2 developed superficial infection which was controlled by adequate dressings and appropriate antibiotics. There was no deep infection.

There were 3 cases of delayed union (>20 weeks) which led to solid bony union by prolonging immobilization. One case of non union was treated by modified Phemister bone grafting. 3 cases developed stiffness of ankle (0-10°) which recovered after physiotherapy. There was no knee stiffness, shortening and osteomyelitis and one case had an angulation of 15°. In Claffey series (1960) of 43 cases, he reported an infection rate of 35% with 17% non unions and 5% delayed union. Velazoo et al (1984) reported 50 cases with an infection of 60% and 16% delayed unions.

In the 10 cases of external fixation, there were 4 severe post operative wound infections which were controlled by regular debridement and dressings, 5 cases had delayed union, while 2 cases went into non-union which were treated by bone grafting. There were 4 major pin tract infections following removal of external fixator. They required curettage and repeated dressings and healed within 2-4 weeks. Two patients developed chronic osteomyelitis and required sequestrectomy and saucerization. One
patient had gap non-union and was treated by Ilizarov fixation and bone transport technique. Chen and Leung (1984) in their cases of 17 severe open fractures treated by external fixation reported delayed union in 60% of cases, malunion in 41% cases and re-fracture in 1 case. Karlstrom and Olerud (1983) reported some degree of pin track infection in 90% cases, however, majority of infection was cleaned after removal of fixator. Gershuni and Helma (1983), after external fixation in 19 cases, reported severe loss of dorsiflexion in 8 patients, significant loss in 3 patients and insignificant loss in 6 patients. For plantar flexion these figures were 3, 6 and 8 patients respectively.

Concerned with problems of osteoporosis, joint stiffness, muscle wasting, post plaster oedema, prolonged period of morbidity and absence of work, non-acceptable reduction and difficulty in maintenance of reduction and general medical problem of prolonged immobilization, the conservative treatment of open unstable fracture of tibia by plaster cast immobilization has fallen into disrepute.

Oscar Lindon (1938) observed in a study of 52 cases, the average healing time of 22-3 weeks, with average period of hospital stay of 72 days. Average shortening was 1-2 cms, 5-10° valgus in 20 cases (38.4%) and varus in 13 cases (25%).

Ellis (1958) treated 315 tibial fractures with conservative means and found average healing time of 10,
15, and 23 weeks in mild, moderate and severe injuries respectively. He reported limitation of knee flexion, foot and ankle motion and pain and oedema in foot and ankle as important disabilities. Jackson and Menab (1959) reported similar findings.

Weismann et al (1966) reported average union time of 19.4 weeks in 200 cases with complication of delayed union and non-union in 12% and 5% respectively.

We have found our results to be satisfactory and comparable with that of various other workers and advocated external fixation for severe open fractures (Grade III and Grade II). Intramedullary nailing in grade I fracture to be a safe method of treatment for this problem of continuing concern.