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A RE-VISIT STUDY OF PLASTER CAST AND INTRAMEDULLARY NAILING FOR CLOSED DIAPHYSIAL FRACTURE OF TIBIA

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ABSTRACT:

Background: There is considerable debate regarding the best method of treatment of tibial fractures. A number of treatment methods have been well documented. External fixation is used mainly for the treatment of open tibial shaft fractures. When the external fixator was not available, skeletal traction is used for temporary stabilization, especially if closed intramedullary nailing is to be performed in 48-72 hours.
Methodology: The study conducted was a comparative analysis. The study population comprised of a total number of 34 patients who had closed fractures of the tibial shaft, who attended the accident and emergency or out patients department of Liaquat University Hospital, Jamshoro and Hyderabad. This study was carried out from June, 2010 to July 2012. Only patients who fulfilled the underlying criteria were included in the study after obtaining informed consent.
Results: A total of 34 patients with closed recent fracture of shaft of tibia were treated by intramedullary nailing and conservatively with application of above knee plaster cast. Out of 34 patients, 17 patients were managed with intramedullary nailing with reaming and 17 were managed closed reduction and a cast. The two groups were comparable with regards o radiographic union, clinical union and time off work. These were also comparable with regard to complicationsi.evarus or vulgus angulation, rotation and shortening.
Conclusion: We conclude that treatment of displaced closed fractures of tibial shaft with intramedullary nailing with reaming produced functional results that are superior to those obtained with use of a plaster cast.

Keywords: tibia fracture, intramedullary nailing, plaster cast, closed reduction, reaming

INTRODUCTION

It is because of its subcutaneous location and poor muscular envelope that the tibia is more vulnerable to injury and fractures.

Tibial shaft fractures have long been an issue of debate and research. There is no dearth of ideas as to how theyshould be managed. On the contrary it is the availability of so many modalities of treatment that continue to perpetuate the discussion. There are so many ways these fractures may be dealt with, and may result in as satisfactory outcome. In rural areas of Punjab and Sindh a mere splintage with bamboo sticks and immobilization for three months may be satisfactory treatment .But on the other hand in the urban areas the intramedullary nailing, plating and p.o.p cast application is common practice.In Pakistan the closed reduction and immobilization with p.o.p cast in nearly all closed or grade-1 open fractures of tibia is very much in practice. Internal fixation is reserved for cases in which the closed reduction fails.[1]

The appropriate treatment of the tibial shaft fracture is one of the problems faced in

orthopedics although all treatment modalities attempt to encourage early bony union and early return of function. The expected result after a tibial shaft fracture has changed radically in the past 3-4 decades.[2]

Speed [1928][3] in his publication refers to a series from St;Michael's hospital in Toronto of 54 consecutive tibial shaft fractures,with result of four deaths, two amputations, six delayed unions and one non-union.In the past four decades movement has been away from the position of accepting a definite percentage of delayed union, non-union, infection and joint stiffness, but is towards the position of demanding no nonunion and more than ninety percent functionally and cosmetically excellent results. Fractures of the tibia occur in all ages but commonest age group is between 20-40 years. Males are affected much more frequently than the females. [4,5,6] 175 closed tibial shaft fractures have been analyzed. They have been classified depending on the location and shape of the fracture line. Clinical and radiological assessments were taken into consideration. The best results have been achieved in fractures of middle third of the tibia and in those with a transverse fracture line. [7] The mechanism of injury is either direct or indirect violence. Direct violence accounts for an increasing number of these fractures, because of increased incidence of road traffic accidents and fire arm injuries. In our country motor cycle accidents are the major cause of these fractures in comparison to western countries like Austria, Switzerland and Sweden where skiing is a common cause of tibial shaft fractures.

Indirect injuries are usually due to sports like hockey, football, fall from heights and kabadi (Traditional game of rural areas in Sindh and Punjab.) As the majority of fractures of shaft of the tibia usually appear uncomplicated, and they are often relegated to the care of the junior surgeon, however with the exception of intracapsular fractures of the femoral neck, no fracture raises more controversy with regards to the method of treatment than a tibial fracture.

Both of these methods i.e. intramedullary nailing and plaster cast application are very popular in the modern world and developed countries but there is a need to compare both types of treatment modalities, keeping in mind that we are a developing nation and our patient population comprises mostly of people belonging to a lower socio-economic set-up.

MATERIAL AND METHODS

The study conducted was a comparative analysis. The study population comprised of a total number of 34 patients who had closed fractures of the tibial shaft, who attended the accident and emergency or out patients department ofLiaquat University Hospital, Jamshoro and Hyderabad. This study was carried out from June, 2010 to July 2012. Only patients who fulfilled the underlying criteria were included in the study.

Criteria for selection:

1. Those patients who presented within 24 hours after trauma.
2. Those patients who had sustained closed fractures of the tibial diaphysis(from 5cm distal to tibial tuberosity to 7cm proximal to the ankle joint)
3. Those patients with a mature skeleton.
4. Those patients who had no associated injuries e.g. Compartment syndrome or neurovascular injury.

No fixed criteria were used to further divide the patients into two groups. They were randomly selected to comprise of two equal groups of 17 patients each. One group was treated with intramedullary nailing and the other with plaster casting.to ascertain fracture union, the criterion to asses results in this study was varus or valgus angulation of 5 degree or less , rotation of 10 degree or less and shortening of 1.5cm or less.(89). Fracture healing was defined as bridging callus on anterioposterior and lateral radiographs with no pain on palpation and weight bearing. (90). Delayed union has been most commonly defined as healing occurring after 6 months.(73) nonunion is established when a minimum of 9 months has elapsed since injury.(70) seventeen patients were managed with intramedullary nailing and seventeen had closed reduction and application of an above knee cast.

The intramedullary nailing procedure was performed twelve hours to three days after the injury. All the nails were inserted after reaming and eleven millimeters (range 10-12mm) was the most common size of nail that was used. All the nails used was the slotted k –nail with Herzog bend.

STATISTICAL ANALYSIS

In this study 34 patients were selected to compare the results of intramedullary nailing and the closed cast tibial diaphysial fracture. Out of these thirty-four patients, seventeen patients were considered for intramedullary nailing and seventeen patients were managed by close reduction and above knee plaster of paris cast.

RESULTS

The criteria for fracture union was pain free, unaided walking, and union was also assessed radio graphically and clinically. Healing was defined as bridging callus on anterioposterior and lateral radiographs with no pain on palpation and weight bearing. The criterion to assess results in this study was varus and valgus angulation of 5 degree or less, rotation of 10 degree or less and shortening of 1.5cm or less.no case was declared as a healed fracture until both the above-mentioned criteria were met.

A non-union of a fracture is defined as being established when a minimum of 9 months has elapsed since injury and the fracture shows no visible progressive signs of healing for 3 months.

There was no case of non-union seen in-patients who were managed with intramedullary nailing and only one case (5.88%) of non-union occurred in male patient of 40 years with fracture of distal third who was managed by plaster of paris above the knee cast. This fracture did not heal in nine months and was defined as a non-union. Mean time to union was twenty eight weeks (14-38weeks) for 17 patients who had been managed with intramedullary nailing. The mean time to union was significantly shorter in-group of patients who were managed by intramedullary nailing. Delayed union has been most commonly defined as healing occurring after 6 months.

There was one delayed union (5.88%) in each type of treatment. In case of intramedullary nailing there was fracture of proximal third and in case of plaster of paris cast there was a spiral fracture of distal third. A policy of wait and watch was adopted. The fracture united clinically and radiographically at 34 weeks and 38 weeks respectively. Fractures of proximal third of tibia healed on average of 14 weeks and those of distal third on average in 12 weeks.

There was significantly more angular deformity and shortening in patients who were managed by plaster of paris cast as compared to the patients who were managed by intramedullary nailing. Rotational problem (>5degree) was encountered in one patient

treated by intramedullary nailing and no rotation problem occurred in patients who were treated by plaster of paris cast. Shortening was detected in three cases who were managed by plaster of paris cast, but it is insignificant in two cases, in one case there was shortening of more than 2cm. only one case of shortening was detected in-group of patients who were managed by intramedullary nailing but it was less than 1cm.

Two patients suffered from angular deformity who was managed by plaster of paris cast. In one patient varus deformity was 5 degree and valgus deformity of 10 degree in the other case. No angular deformity was seen in intramedullary nailing.

Group of patients treated by intramedullary nailing spent longer time in hospital (average 10 days), compared with group of patients treated by plaster of paris cast (average 3 days), but they have significantly more outpatient visits and radiographs. Two patients out of 17 were elected to have the nail removed more than 18 months after the injury, because of pain in the knee. The group of patients managed with intramedullary nailing was allowed weight bearing in about 6-8 weeks and those treated with POP cast were allowed in 8-10 weeks' time. The 17 patients who had nailing returned to work significantly sooner than did the 17 patients who had been managed with a plaster of paris cast (mean 4 compared with 5-6 months). Patients treated by plaster cast had no infection or wound problem. Only two cases of pressure sores were seen.in 17 patients treated by intramedullary nailing only one patient had infection(5.88%) but it was superficial and was treated by antibiotics(intravenous cephalosporin) and wound healed uneventfully. There was no evidence of fat embolism in any case of this study.

There were 5 cases in which closed intramedullary nailing failed, because there was problem in reducing the fracture in three patients, so fracture site had to be opened. While in other 2 patients, while crossing the fracture site the reamer caused displacement of comminuted butterfly fragment. No technical difficulty was encountered in conservative management.

DISCUSSION

There is considerable debate regarding the best method of treatment of tibial fractures. A number of treatment methods have been well documented and objective information is available eg. on the use of plaster cast [8] and functional braces [9,10]. External fixation is used mainly for the treatment of open tibial shaft fractures especially in grade – 11 and 111 open fractures. When the external fixator was not available, skeletal traction is used for temporary stabilization, especially if closed intramedullary nailing is to be performed in 48-72 hrs. The use of A.O dynamic compression plates has been well documented. Infection rates are the highest in the group of patients treated by plating [11] and relatively a high incidence of flap necrosis over the plates. The average time in hospital is longer in case of tibial plating than when compared with closed plaster cast and intramedullary nailing. Intramedullary devices have been used to stabilize tibial fractures for many years. The technique for reamed nailing was described by kuntscher [12]. The recent introduction of interlocking nails has greatly increased the scope of the technique of intramedullary nailing and excellent results have been obtained in the treatment of tibial shaft fractures. In the western world closed intramedullary nailing is the treatment of choice for closed or grade – 1 open (Gustilo) fractures. However court brown and Christie (1991) (2) have shown favorable results even in grade 11 or 111 fractures. Patellar tendon bearing cast allows early weight bearing and ambulatory treatment of tibial shaft fractures.

This study was a comparative analysis of two groups of patients- 17 each-treated with plaster casting and intramedullary nailing in closed tibial shaft fractures respectively. Different parameters were assessed to conclude as to conclude as to which modality is a better form of management for closed tibial diaphysial fractures; amongst which were time to union, malunion and shortening, range of movement, time in hospital, nail removal, weight bearing, return to work, infection, fat embolism and technical difficulties. Our study shows that patients who were treated with nailing had no problems of non-union, but one patient who was treated with above knee cast developed non-union.

In search of an appropriate definition of union times- A review of literature shows union times of between15.3 weeks and 19.4 weeks [8]. B Bone in 1997 [13] in study of 25 patients reported mean union time of 26 weeks, whereas 18.31 weeks quoted by Hooper et al (1991) [14] in treatment of tibial shaft fractures treated by above the knee plaster of paris cast.

Tibial shaft fractures treated with intramedullary nailing shows the mean union time as 19 weeks, in a study on 125 tibial shaft fractures. Hooper et al reported union rate as within 20 weeks of nailing. [14]

B.Bone carried out a study on twenty five patients and reported mean union time as eighteen weeks.[13] WU CC et al [15] quoted a union time of 24 weeks. Mean time to union quoted by Oysterman (1993) [16] in treating by reamed intramedullary nailing was 23.5 weeks.

Functional bracing has been reported to show union times of between 14.1 weeks [9] and 16.7 weeks [10]. The times following A.O plating are reported to be between 12 weeks [17].

De Bastiani et al (1984) [18] reported a mean union time of 15.6 weeks using the dynamic axial fixator for closed tibial shaft fractures.There was one delayed union in each type of treatment in our study i.e. 5.88%. Many authors have used delay of over 20 weeks as an indicator of delayed union. [19]

Above figures show that there is little difference in union time which ever treatment mode you chose. Our figure of mean union time of 28 weeks in case of plaster of paris cast treatment and 23 weeks in case of intramedullary nailing management are comparable with above quoted results.

CONCLUSION:

It was concluded that the decision as to have nailing versus cast should be undertaken with the consent of patient. The results of our study, however, show that closed intramedullary nailing may yield better functional results than of a cast for many patients who have a displaced closed fractures of the tibial shaft.

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