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Comparison of Radiological Quantification of Callus Formation in Tibial Shaft Fractures- A Prospective Study of Twenty one Cases Treated by Various Methods in a Rural Set Up

Dr.V.P.Mohan Gandhi M.S Ortho, Professor and Head of the Department of Orthopedics Govt. Vellore Medical College, Adukkambarai, Vellore 632011

Dr.A.Senthil Kumar M.S Ortho., D.Ortho, Assistant Professor in orthopedics, Govt. Vellore Medical College, Adukkambarai, Vellore 632011

ABSTRACT

Background: Tibial shaft fractures are treated by various methods. The standard protocol is interlocking nailing. However in a rural set up certain cases are treated y conservative methods and some cases by plating. Callus formation is considered as a radiological sign for fracture healing. This study aims at comparing quantity of callus formation by various methods.
Materials and methods: This is a short term prospective study of 21 cases of fracture shaft of tibia treated at Govt Vellore Medical College, Adukkambarai , Vellore, Tamil Nadu, India during the period of 2010 to 2015. Pathological fractures, compound fractures, tibial plateau fractures, tibial pilon fractures, poly trauma were excluded. Age group 15 to 65 yrs. of age. Mode of injury was RTA in all the cases. Eight cases underwent conservative method of treatment, eight cases were treated by nailing, and five cases were treated by plating. The patients were followed up at 6 weekly intervals. They were evaluated for radiological callus formation. RUST scoring was used to evaluate amount of callus formation.
Results: All cases treated by conservative methods showed good callus formation, followed by nailing. Minimal callus noted in plating.
Conclusion: Radiological abundant callus formation occurs in tibial shaft fractures treated by conservative methods resulting good consolidation of fracture site.

KEYWORDS Tibial shaft fractures, radiological quantification of callus formation.

Introduction:
Tibial shaft fractures are treated by various methods. For the past twenty years interlocking nailing is considered the treatment of choice. Other treatment options available are plating, external fixator application, conservative method in which plaster of Paris is applied. Union of fracture is evaluated by radiological visible callus formation. It is often noted that abundant callus is formed in cases treated by conservative methods. In this prospective study of twenty one cases radiological quantification of callus formation is noted and compared.

Materials and methods:
Twenty one cases of tibial shaft fractures were taken up for prospective study from 2010 to 2015. All cases were treated at Govt.Vellore Medical College, Adukkamarai, Vellore, Tamil Nadu, India. Age group ranged from 15 to 65 yrs. The mode of injury in all cases were RTA.

Following were excluded: Compound fractures, tibial plateau fractures, pathological fractures, poly trauma. Eight cases underwent conservative treatment, eight cases underwent intramedullary nailing, and five cases underwent plating.

The patients were evaluated preoperatively with standard antero-posterior and lateral radiographs.

The conservative treatment consisted of above knee plaster of Paris application after closed reduction of fractures. After the reduction in swelling above knee slab was converted to above knee cast. Patient was followed up at 6 weekly intervals. At 6 weeks, the cast was converted to patellar tendon bearing cast. Partial weight was permitted when x rays showed radiological callus formation. During every visit, quantification of radiological callus was done by RUST scoring. Bony union was sound after 4 months after fracture.

Eight cases underwent intramedullary nailing. Patient was placed under regional anesthesia. In supine position, knee was flexed to ninety degrees. 4 cms incision was made over medial aspect of patellar tendon and knee joint was opened. Using an awl, medullary canal of tibia was opened and serial reaming was done. Intramedullary nail was inserted and distal locking was done first, followed by proximal locking. Wound was closed in layers. Active toe movements were begun on day one, followed by mobilization of knee after pain permitted. Partial weight bearing was begun after radiological callus formation was seen. Full weight bearing permitted after consolidation. Bone consolidation was noted after 3 months in all cases.

Five cases underwent open reduction and internal fixation with plating. Patient was laced in supine position. Regional anesthesia was administered in all cases. 10 cms to 15 cms incisions was used to expose the fracture site. Minimal dissection was carried out to expose the fracture ends for reduction. Narrow dynamic compression late was used in all cases. Wound closed in layers. Sutures were removed on the twelfth post-operative day. Non weight bearing was practiced until radiological evidence of bony union was present. The cases were followed up at 6 weekly intervals. Bony consolidation was noted after 5 months of plating.

The radiological quantification of callus formation was done using standard antero- posterior and lateral views. When no callus was present the RUST score was one for one cortex. When callus was present but fracture line was visible the score was two for one cortex. When callus was present and fracture line was not visible score was 3 for one cortex. Hence in fully consolidated bone the score was 12. The score of twelve indicated excellent callus formation.

In our study we found that fracture treated by conservative methods had score more than 10. Fractures treated by nailing had moderate amount of callus formation. Fractures treated by plating had minimal amount of callus formation.

Picture 1 showing 30 year old male treated by conservative method.

Picture 2 showing 35 year old male treated intramedullary nailing.

Picture 3 showing 40 year old male treated by plating.

Discussion:

The standard treatment for tibial shaft fracture is closed interlocking nailing. But in economically weaker sections of the society when implant is not affordable the conservative treatment is undertaken. In spite of immobilizing for longer periods, the bony callus formed after conservative treatment is enormous compared to that of nailing or plating. The disadvantages of conservative treatment are prolonged immobilization, stiffness of surrounding joints, late return to occupation. But the advantage is avoidance of infection, good amount of callus formation. There is no problem with implant failure in conservative cases.

Conclusion:

Fractures of shaft of tibia treated by conservative methods results in abundant callus formation. Fractures of tibia treated by intramedullary nailing produced moderate amount of callus formation. Fracture of tibia treated by plating resulted in minimal amount of callus formation.

Literature review:

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