Outcome of Schatzkar type VI tibial plateau fractures treated with Ilizarov external fixator.

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ABSTRACT

Objective: To analyze the results of schtzkar type VI tibial fractures treated with ilizarov external fixator.

Methods: This study was conducted at Mardan Medical Complex from January 2015 to December 2017.All patients with Schatzker Type VI tibial plateau fractures meeting the inclusion criteria were treated with Ilizarov fixator. Outcome was assessed with radiology for fracture reduction and union and functionally with Knee Society Score(KSS).

Results: Total 26 patients with tibial schatzkar type VI fractures were included in the study. Fifteen patients were open and 11 were closed fractures .Ilizarov external fixator was applied under image intensifier. All patients incurred Schatzker Type VI tibial plateau fractures caused by motor vehicle accident (12 patients), motorcycle accident (6 patients), pedestrian and automobile (8 patients). Five patients had Gustilo Grade IIIA open fractures and 10 had Gustillo type II open factures. Post operatively all the fractures healed. Assessment with knee society score showed fair result in 46.1 %(12) patients, good in 30.7%(8),excellent in 15.3%(4) and poor in 7.6%(2) patients.

Conclusion: Ilizarov external fixator is better treatment option for the schtzkar type VI fractures as adequate reduction, wound care and early mobilization not only reduces knee stiffness but leads to early fracture union.

Keywords: Ilizarov Fixator, Knee society Score, Tibial plateau Fracture.

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INTRODUCTION

Tibial plateau fractures are caused by high energy.[1] These fractures are often associated with knee stiffness and deformities.[2] Compartment syndrome and vascular injury is not uncommon.[3] These fractures have four elements which needs addressing and are articular surface depression, condylar separation, soft tissue damage and metaphyseal extension of the fracture.[3,4]

Various treatment modalities are close reduction and casting, traction and fixation both internal and external but biological approach can minimize the incidence of complication associated with these fractures.[5] Open type VI fractures management needs rigid fixation or at least adequate fixation.[6] Infection is usually associated with internal fixation of the fractures particularly open Schatzkar type VI.[7] Ring external fixator provides multi plane stability to the fracture of this area.[8]

Ilizarov external fixator help in addressing all the pathologies associated with these fractures as it provides adequate stabilization of fracture, correct displacement and helps in soft tissue damage.[9] Small wires reduces the iatrogenic injury of the neurovascular structures.[10]

METHODS

All adults patients of either gender presenting to Mardan Medical complex Mardan with Schatzker Type VI tibial plateau fractures between January 2014 and December 2017 were included in the study. Poly trauma patients with other injuries, vascular injuries and pathological fractures were excluded. The study was approved by the Ethical Review Board of the hospital and Informed consent was taken from all the

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patients. Plain radiographs were used to classify fracture. Patients with open fractures were treated with immediate irrigation and debridement, followed by definitive fixation. Patients with closed fractures were evaluated for fracture blisters, edema (absence of skin wrinkles), extensive subcutaneous hemorrhage, and bruising before surgery. Timing of percutaneous procedures was not influenced by these factors. Limited open approaches were not attempted until these signs were resolved. Distal tibial or calcaneal pin traction or bulky dressing was used for preoperative immobilization.

Preoperative preparation includes a computed tomography (3D CT) scan to determine olive wire and/or percutaneous screw placement, a radiolucent table to allow for 360° of axial fluoroscopic freedom at the fracture site, and an assistant, femoral distractors or a fracture table, to provide traction. A traction radiograph or fluoroscopic image initially was taken to assess reduction and if the articular surface had less than 3 mm step off, then percutaneous screw placement was undertaken immediately. If necessary, temporary Kirschner (K) wires did stabilize the fracture after percutaneous reduction of the CT scan defined major fracture fragments. Grasping the major fracture fragments percutaneously with a large bone reduction clamps allowed reduction by angling, rotating, and compressing the clamp. If open reduction was necessary, an incision was made directly over the major fracture line. If necessary, bone graft was placed though this incision to elevate depressed fragments before fixation.

Adequacy of articular surface reduction was defined as less than 3 mm of articular incongruity. After an adequate reduction, olive wires were placed distal to the subchondral cortex of the tibial plateau, fixing all major fracture fragments.[11] Attempts were made to prevent intracapsular olive wire placement, but occasionally wires must be placed in the proximal 1 cm of the metaphysis through the joint capsule to stabilize the fracture fragments sufficiently. Olive wires were placed parallel to the knee to restore the tibial mechanical axis if the proximal ring was aligned parallel to the distal rings which, in turn, were parallel to the ankle. Tensioning the olive wires compresses sagitally oriented fractures.[12] Additional wires placed in the safe zone increased the stiffness of the construct. The safe zone is the area between the anterior tibia to posterior fibula plane and the plane of the medial tibial face, which is free of vital neurovascular elements.[13]

After closure of any skin incisions or soft tissue coverage of exposed bone, skin tension at the pin sites was relaxed by incision in the vector of maximal tension. Dressing consists of nonadhering gauze and a snug gauze wrap around the pins, minimizing skin friction against the pins. Equinus deformity was prevented by application of tethered proximally to the fixator by a minimally tensioned elastic bandage directly attached to the fixator.

Postoperative management of patients with stable fractures included early ROM and weight-bearing as tolerated began on second postoperative day.Patients with unstable fractures were kept non-weight bearing for 4 weeks, followed by incremental progression to full weight bearing by 8 to 12 weeks. Daily hydrogen peroxide pin care was taught to each patient, and an oral first generation cephalosporin as needed for pin site erythema was administered. Additional active compression and fixator dynamization 3 months postoperatively were pursued in the clinic setting for patients with delayed union. Fixators were removed after clinical and radiographic evidence of fracture healing.

Data was analysed with SPSS version 21. Data represented in table where necessary.

RESULTS

Twenty six patients, 20 male and 6 female, were treated by small wire external fixation and limited internal fixation was used when closed reduction was deemed inadequate. Mean patient age was 44.9 years (range, 16-70 years). The 26 patients were followed for at least 12 months (range12 -42 months). All patients incurred Schatzker Type VI tibial plateau fractures caused by motor vehicle accident (12 patients), motorcycle accident (6 patients), pedestrian and automobile (8 patients). Five patients had Gustilo Grade IIIA open fractures, 10 had Gustillo type II open factures. Mean articular displacement was 11 mm (range, 0-18 mm) on preoperative radiographs. Mean delay to surgery was 5 days (range, 1-13 days).

All achieved union in 16.8 weeks (10-25 weeks on average). Patients were dynamized at about 2.5 months. Initial weight bearing helped the patients in achieving good range of motion at knee joint and helped the patients in rehabilitation.

Six patients had 2-6 degrees of knee flexion while one patient had 10 degrees of knee flexion contracture. Ten patients had initial bone grafting done taken from iliac crest to align the articular surface.

Articular congruity was displaced at average of1.8 mm (range 0-3mm).

Outcome at time of final follow up was judged according to the Knee Society clinical rating system.[14] (Table 1) This system evaluates the knee score by assessing pain, ROM, stability, and alignment. A second evaluation used function score, walking rates, and stair climbing abilities with deductions for weight bearing aids. These two independent scores are averaged to obtain a knee rating that was graded as follows: excellent (90-100, maximum score), good (80-89), fair (70-79), and poor (<70). Majority (46%,n=12) of our patients were having fair results. Good result was in 30 % (8) patients.Excellent results were in 15.3%(4) patients while 7.6%(2) patients had poor result with knee society score. Pin tract infection was found in 10 patients, which were treated by first generation cephalosporin. Peroneal nerve injury was noted in 2 patients treated by foot drop splint in one patient and change of wire in other patients, both the patients recovered in four months. One patient with poor result was having chronic osteomyelitis. Fixator was removed, antibiotic and curettage was done and osteomyelitis was cleared.

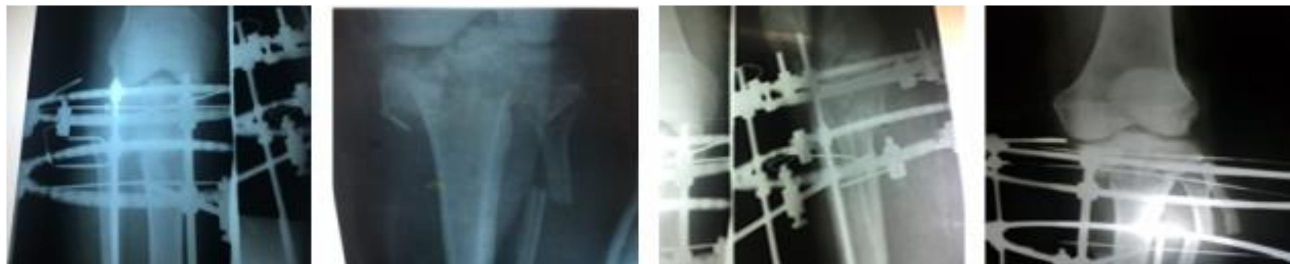

Fig. 1: Pre and post op x rays of Schatzker type VI fracture treated with Ilizarove fixator.

Table 1: Results of the patients according to the knee society score(KSS).

Results	No. of patients	Percentage
Excellent	4	15.3%
Good	8	30.1%
Fair	12	46%
Poor	2	15.3%

DISCUSSION

Tibial plateau fractures especially Schatzker type v and vi are high energy trauma cases and usually associated with soft tissue damage, resulting in knee deformity and stiffness.[15]The goal of treatment is early mobilized knee with normal range of motion without deformity.

Plate and screw fixation is still the best treatment for the minimal displaced fractures but for open comminuted fractures ilizarov is good as it is minimal invasive procedure with excellent stabilization of the bone fragments.[16]

An external fixator with limited internal fixation placed through an incision centered over the major fracture line allows stable fracture reduction while preserving soft tissue integrity. Marsh [15] reported on 17 Schatzker Type VI fractures treated with percutaneous screws and unilateral knee spanning external fixation. Despite fixation across the knee, patients regained an average of 115° motion, and only one patient had a 5° knee flexion contracture. Patients in our study had limited arthrosis and infection rate was very low as good postoperative range of motion ROM were achieved very early.

Ring tensioned fine wires provide superior metaphyseal purchase compared with half pins because the wires avoid crossing the knee joint, cause less soft tissue and bony trauma, allow early weightbearing.[17] Fine 1.8-mm wires allow precise reduction of small intraarticular fragments that otherwise would remain unreduced by conventional open reduction and internal fixation or by external fixation. If intracapsular wires are used, meticulous attention to pin care and judicious use of antibiotics can prevent joint infection. This technique is not advocated unless fracture reduction and stability is achieved under image intensifier.

In a study conducted by Mikulak [7] using small wires for high energy comminuted tibial plateau fractures excellent results were achieved in one patient, good result in sixteen patients, fair in eight while poor result was in one patient as we achieved excellent result in four patients, good in eight patients, fair result in twelve patients while poor result in two patients.

In another study by El Barbery in 2005[2] The Knee Society clinical rating system was used for evaluation and reported that 18 knees gave excellent, seven as good, one as fair, and two as poor. These results are comparable with us as the total numbers of patients in their study were 30 and our patients were 26 in total.

In a series by Dendrinos,[11] 24 patients were treated with the Ilizarov circular fixator, and there was no incidence of osteomyelitis or septic arthritis. Chin[5] reported similar results of 18 patients, none of whom developed wound dehiscence, infection, osteomyelitis or septic arthritis. The current series is comparable to these studies in that no case of wound dehiscence was noted and infection was very low(one patient).

We recommend larger sample size studies of comparative designs and longer follow up period on this topic to confirm our results.

CONCLUSION

Ilizarov external fixator is better treatment option for the schatzkar type VI fractures as adequate reduction, wound care and early mobilization not only reduces knee stiffness but leads to early fracture union

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Authorship and Contribution Declaration

Dr. Haziqdad Khan, Conception and design of the study, Collected the data
Dr. Zahir Khan, Final approval of the version for publication
Dr. Tariq Ahmad Drafted the manuscript
Dr. Rahim Khan Revised the manuscript critically for important intellectual content
Dr. Khalid Khan interpreted the data