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Original Research Article

Functional outcome of hybrid external fixator in proximal tibial fractures Schatzker type V and VI with Gustillo grade-II

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ABSTRACT

Background: Management of high energy tibial plateau fractures along with extensive soft tissue damage is still challenging to many orthopaedic surgeons. This study evaluates the purpose of hybrid external fixator intreating high energy tibial plateau fractures with minimal invasion and accurate reduction.
Methods: Twenty patients with high energy Schatzker type V and VI tibial plateau fractures with severe soft tissue injury were enrolled into the study in RNT medical college, Udaipur.
Results: The results- bony union, range of movements and associated complications were assessed. All fractures united in an average time period of 20 weeks. Ten patients developed knee stiffness, five patients developed delayed union andthreenon-union.15 patients required split skin graft. Final outcome showed excellent score in 53 patients.
Conclusions: Hybrid external fixation is a safe option for managing complex high energy tibial plateau fractures by simultaneously providing adequate fracture stabilization and necessary protection to soft tissue healing to achieve bony union.

Keywords: Hybrid external fixator, High energy, Tibial plateau fractures

INTRODUCTION

Proximal tibial fractures are usually high velocity injuries with severe soft tissue damage. Despite many advances in the care of intra-articular fractures, tibial plateau fractures continue to be a difficult surgical problem.[1] Tibial plateau fractures are the commonest intra-articular fractures. They occur as a result of indirect coronal or direct axial compressive forces. Hybrid external fixator for high energy tibial plateau fractures usually protect soft tissue envelope. It relies on periarticular ring construct for stable fixation of tibial condyles and monolateral fixator for fixation on the shaft to provide stable fixation. The purpose of the current study was to test the hypothesis whether minimal intervention and hybrid external fixation can provide a fair outcome with less complications when used as a definitive management in proximal tibial fractures.

Aim and objectives

Aim and objectives of current study were to analyse the functional outcome of proximal tibial fractures Schatzkertype V and VI with skin compromise managed surgically with hybrid external fixator as a definitive management and to study the effectiveness and complications of proximal tibial fractures Schatzker's type V and VI with skin compromise managed surgically with hybrid external fixator as a definitive

management.

METHODS

This study was prospective interventional type study conducted in orthopaedics department of RNT medical college and MBGH, Udaipur, Rajasthan. 100 patients were selected on the basis of OPD and Emergency admission who met the inclusion criteria and the study period would be between 1 May 2020 to 30 May2021.

Inclusion criteria

Inclusion criteria for current study were; skeletally mature patients both male and female, patients presenting with proximal tibial fractures Schatzker type V and VI with skin compromise.

Exclusion criteria

Exclusion criteria for current study were; skeletal immaturity, patients not willing for surgery and external fxator placement, patients not fit for surgery and lost for followup/death

Pre-operative evaluation

Following admission to the hospital, a careful history was followed by examination including examination of the fracture site. Careful inspection of the deformity, swelling and ecchymosis were done. Clinically, tenderness, bony irregularity and crepitus were elicited. Movements of the knee, ankle and all the toes and distal vascularity were checked. Primary management was done and the patient's general condition was stabilized and vitals maintained. The involved limb was stabilized with a groin to toe Pop slab with knee in 15 o flexion and was elevated with a Bohler Braun splint.

Radiographic examination

Standard radiographs in AP and lateral views were taken for confirmation of the diagnosis and also to know the type of fracture.

Surgical procedures

Anaesthesis: the procedure was performed under spinal anesthesia or general anaesthesia. The lower limb was then thoroughly scrubbed, painted with betadine and spirit and draped. The procedure was done using a traction table. Reduction was based on ligament atoxis under fluoroscopy control. Depending on the fracture type, a short incision was made to lift the plateau using a spatula under fluoroscopy control; a sub-meniscal arthrotomy was done if necessary. Cannulated screws were placed in the subchondral bone parallel to the joint line. After selecting the optimal ring size, the first K-wire (closest to the joint) was inserted percutaneously lateral to medial so it completely crossed the fibular head at least 10 mm below the articular surface, to finish 2 cm inside the tibial tuberosity. The second K-wire was inserted parallel to the first, under the ring. The third K-wire was inserted medial to lateral at an angle of least 60° to the first two K-wires; the K-wires were then tensioned to 1200 N. The body of the fixator was locked to the ring and fixed distally with three diaphyseal pins on the medial side of the tibia. At this point in the procedure, the reduction could still be modified if needed. Mobilization exercises were initiated on the first day postoperative; weight bearing was allowed 3 weeks to 3 months later, depending on the fracture type.

Postoperative protocol

Daily thorough pin track care with immediate passive range of motion was started on 1st POD. The patients were encouraged to start controlled knee movement as soon as possible. Wound management was done with daily dressing, higher antibiotics according to pus culture and sensitivity, wound debridement on necessary basis and plastic surgery. management for the patients who had loss of soft tissue. Static quadriceps strengthening exercises, knee mobilization exercises, seated knee extension exercises and non weight bearing walking with walker were started on 2nd-3rd POD. Partial weight bearing also was started from 6 to 10 weeks depending on radiographic appearance of callus. Weight bearing walking was started from 10 to 16 weeks depending on the clinical and radiological signs of union.

Follow-up

Each patient were thenfollowed up at 3 months, 6 months, 9 months and 1 year and assessed for outcome and complication.

RESULTS

Of the 100 patients, 21 were females and 79 were males. There were 62 cases of open fractures and 38 cases of closed fractures. On follow up assessment of complications, ten patients developed knee stiffness, five patients developed delayed union and three non-union. There was one case of septic non union. Split skin graft was required in 15 patients. The assessment of score showed 50 cases with excellent score, 35 cases with good score, 10 cases with fair score. There were 5 cases which gave a poor outcome.

DISCUSSION

In our study, the mean age of the patient at the time of injury was 47.50 years (range 23-70 years). Comparing to the similar study of modified hybrid fixator for high energy Schatzker V and VI tibial plateau fractures conducted by Ariffin et al the mean age was almost the same. Male predominance was seen (80%) and it was contributed to the increased usage of motor vechicles by

men. Among the 62 patients who had open fractures with soft tissue injury, 16 patients had type I Gustilo Anderson injury, 20 patients had typeII Gustilo Anderson injury, 20 patients had type IIIA Gustilo Anderson injury, 6 patients had type IIIB Gustilo Anderson injury. Comparing to a similar study of high energy tibial palteu fractures treated with hybrid external fixation conducted by Babis et al our study has higher rate of open fractures. In our study 75 out of 100 patients had Schatzker type VI tibial plateau fracture.

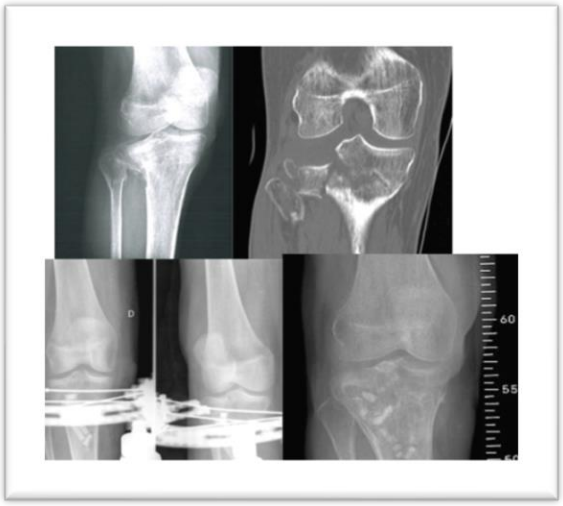

Figure 1: X-ray of a Schatkzer VI tibial plateau fracture before surgery, after surgery and at the last follow-up.

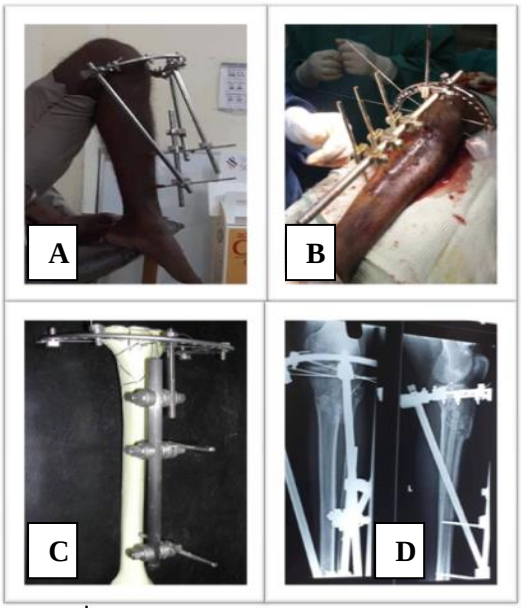

Figure 2: A) followup, B) intra operative, C) bone model showing hybrid fixator for tibial plateau fractures and D) post operative X-ray.

The remaining 25 patients had type V tibial plateau fracture. In a similar study conducted by Babis et al he quoted almost equal amount of type V and VI fractures. The average duration of hospital stay after surgery was 8.20 days (range 3-18 days). The mean interval between the time of injury and time of surgery was 5.55 days (range 0-30) days. The mean duration of surgery was 66.55 min (range 55-90) min. All fractures (98 out of 100) united in an average time of 18 weeks (16- 25 weeks). In similar studies conducted by Babis et al and Ariffin et al, they quoted the average union at 14 weeks which was four weeks earlier comparing to our study. However we feel that the delay in union was acceptable since we encountered more of open fractures and type VI tibial plateau fractures According to the Rasmussens knee score the results were evaluated as excellent in 50%, good in 7 patients 35%, fair in 10% and poor in 5%. Comparing to similar study done by chin et al we had 50% better outcome in excellent/good group. In our study, a total of 89 patients regained functional use of the knee joint, good axis without pain or instability. Patient's knee ROM was gradually increasing at consecutive clinical evaluations.

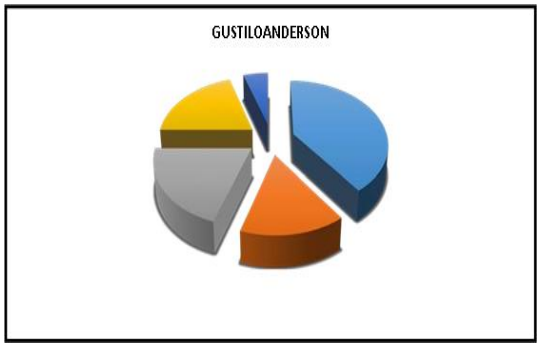

Figure 3: Gustilo Anderson classification showed 20 cases each of type II and type III A, 6 cases of type III B and 16 cases of type I fractures.

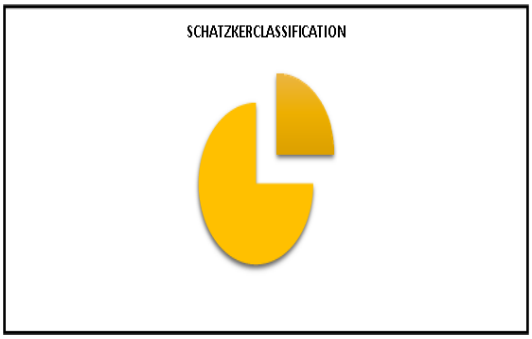

Figure 4: There were 75 cases of Schatzker type VI and 25 cases of Schatzker type V fractures.

In our study, 10 patients developed knee stiffness. Delayed union was encountered in five patients. It was treated with dynamisation of the hybrid external fixator and improved. One fracture was complicated with deep infection and diabetic cellulitis leading to septicnon-union. The patient with septic non union was treated with surgical debridement and higher antibiotics until CRP

and ESR reached normal. Hutson et al in a meta-analysis of 16 studies with a total 568 patients found pin site infection rates of 10%.[29] Our rate of pin track infection was encountered in 3 patients. These infections were superficial or limited to the soft tissue and did not extend to the bone. None of the patients required hospital admission. These were treated with oral antibiotic and local pin care.

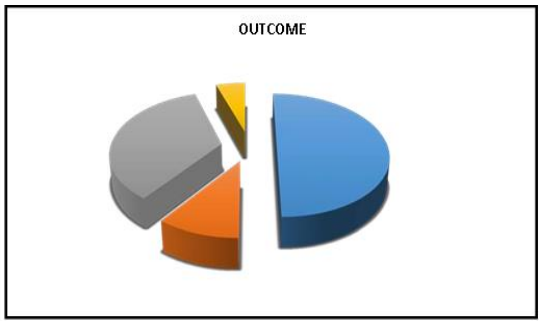

Figure 5: Outcome of the study.

CONCLUSION

To conclude, modified hybrid external fixator is a safe and effective choice for treating high energy tibial plateau fractures. It reduces the soft tissue complications and improves bony union with acceptable reduction and favourable outcome. It allows early mobilization of the patient. Fracture fixation using a hybrid fixator is a reliable method for treating Schatzker V and VI proximal tibia fractures. Despite the high rate of imperfect reduction and secondary displacement, it leads to satisfactory functional outcomes in 64% patient and has a low rate of major complications. Bone grafting reduces the occurrence of secondary displacement. The functional outcomes are strongly correlated to widening of the plateaus, the tibial slope, and the mechanical axis – it is essential that these be restored. Given that the clinical outcomes are the same as those obtained with plate fixation, the study findings reinforce our resolve to use a hybrid fixator. In addition, hybrid fixators have several advantages: shorter operative time, less blood loss, lower deep infection rate, shorter wait before treatment and shorter hospital stay. Lastly, this fixation method allows revision by TKA to be performed if the patient's progression is not acceptable.

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Conflict of interest: None declared
Ethical approval: The study was approved by the institutional ethics committee

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