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PIN SITE INFECTION AND COMMON PERONEAL NERVE INJURY AFTER SPANNING ILIZAROV FIXATION FOR HIGH ENERGY TIBIAL PLATEAU FRACTURES

Orthopaedics

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ABSTRACT

Introduction: High energy tibial plateau fractures are complex lesions that are often associated with soft tissue damages and severe complications. The consequences of an inadequate treatment can be serious and accompanied with various complications. **Aim and Objective:** The aim of this study was to show the incidences of pin site infection and common peroneal nerve injury after spanning ilizarov external fixation for high energy tibial plateau fractures **Materials and Methods:** This retrospective study included 25 patients with Schatzker type 5 and type 6 fractures of tibial plateau treated with ilizarov external fixator. This study was not intended to report the results, but rather, to discuss the problems like pin site infection and common peroneal nerve injury after spanning ilizarov external fixation for high energy tibial plateau fractures. The Kurgan protocol was used for postoperative pin site dressings and the Checketts-Otterburns classification was used to describe pin site infections. **Results:** There were 8 (32%) cases of Pin tract infections, 6[24%] cases with grade 1 and 2 [8%] case with grade 2 which were managed by oral antibiotics . None of the cases developed common peroneal nerve injury following surgical management by spanning ilizarov fixator. **Conclusion:** Ilizarov external fixator provides acceptable outcome in complex tibial plateau fractures with minor complications.

KEYWORDS

Tibial plateau fracture, Spanning external fixation, Ilizarov external fixator, Complications, Pin site infection, Common peroneal nerve injury

INTRODUCTION

High-energy tibial plateau fractures represent a rare and difficult subset of fractures to treat as a result of the complex nature of the fracture pattern, the damage to the articular surface, the compromised soft tissue envelope as well as concomitant injuries.

Failure to restore articular congruity and presence of ligamentous instability are the most important factors causing poor outcome in a long term [1]. Success depends on restoration of articular cartilage, preservation of biology, alignment of mechanical axis, restoration of joint stability and preservation of functional motion [2].

Non-operative management yields poor results and internal fixation has its own complications, like wound break-down, skin necrosis, deep infections, stiffness and ankylosis depending on the extent of injury and surgery leading to multiple debridements, arthrodesis and even amputation [3, 4]. The advent of minimally invasive techniques of internal fixation could not solve this challenge completely [5].

Ilizarov external fixation is an attractive treatment option to address all treatment goals. It has been shown that temporizing treatment with a spanning external fixator can provide stability, help maintain fracture length, and provide increased pain relief while allowing the soft tissues to recover [6]. Concern for pin site colonization over time with knee-spanning external fixation and its potential source for operative wound site infection has led orthopaedic surgeons to advocate caution in the placement of external fixator constructs. It is generally believed that external fixator pins should be placed outside the zone of future internal fixation to prevent potential pin site colonization from interfering with definitive fixation and postoperative wound infection [7-11]. To our knowledge, no prior published report has attempted to validate this association. The purpose of this study was to show the incidences of pin site infection and common peroneal nerve injury after spanning external fixation for high energy tibial plateau fractures.

MAERIALS AND METHODS

This retrospective study included 25 patients with Schatzker type 5 and type 6 fractures of tibial plateau treated with ilizarov external fixator from September 2020 to November 2022 at Postgraduate department of Orthopaedics, Govt. Medical College Srinagar.

Inclusion Criteria

- Patients age between 18-70 years.
- All sexes.
- Schatzker type V and VI Fractures.
- Both open and closed fractures (Except type IIIc compound fractures).
- Fracture less 3 weeks old.

Exclusion Criteria

- Age less than 18 years
- Schatzker type I, II, III, IV Tibial plateau fractures.
- Fracture in paralytic limb.
- Fractures associated with compartment syndrome.
- Associated Neurovascular injury.
- Final follow-up less 1 year.
- Fractures more than 3 weeks old.

Table 1: Demographic characters of patients (N= 25, Mean age 40.76 ±4.061)

Parameters		No. of patients	Percentage
Sex	Male	18	72
	Female	7	28
Age distribution	<20 Years	1	4
	20-40 Years	10	40
	41-60 Years	13	52
	>60 Years	1	4
Mode of trauma	Road traffic accident	17	68
	Fall from height	7	28
	Direct trauma	1	4
Side	Right	12	48
	Left	13	52
Schatzker's classification	Type 5	11	44
	Type 6	14	56

This study was not intended to report the results, but rather, to discuss the problems like pin site infection and common peroneal nerve injury after spanning external fixation for high energy tibial plateau fractures. Fractures classification was done according to Gustilo and Anderson classification. For compound fractures surgery was performed on the same day. Besides general physical examination, the examination of the affected limb was performed. Any deformity, soft tissue condition (swelling, skin condition, blisters, ecchymosis or compartment syndrome) and neurological or vascular deficit (if any) was documented. Soft tissue injuries were classified according to Oestern and Tscherne classification of soft tissue injury in closed fractures.

At each follow up patient was examined for pin track problems like pain, irritation, pus discharge, limb length discrepancy etc. The patients were advised to gradually increase weight on the effected limb and full weight bearing was started at a mean of 11.64 weeks. The Kurgan protocol was used for postoperative pin site dressings and the Checketts-Otterburns classification was used to describe pin site infections (Table 2).

Table 2: Checketts and Otterburn's Grading System for pin track infection

Grades of infection	Characteristics	Treatment
Grade I	Slight discharge Redness around the pins	Improved pin site care
Grade II	Redness of the surrounding skin. Pain and tenderness in the soft tissue Discharge of pus.	Improved pin site care, oral antibiotics.
Grade III	Similar To Grade II Fail to improve with intensive local treatment and antibiotics.	Affected pin or pins re-sited and external fixation can be continued.
Grade IV	Severe soft tissue involvement Affecting more than one pin. Associated loosening of the pin.	External fixation must be abandoned. ·
Grade V	Clinical appearance same as grade IV Bone involvement Radiographs show osteomyelitis	External fixation must be abandoned
Grade VI	Sequestrum formation within the bone. A persistent sinus develops	Curettage of the pin tract ·

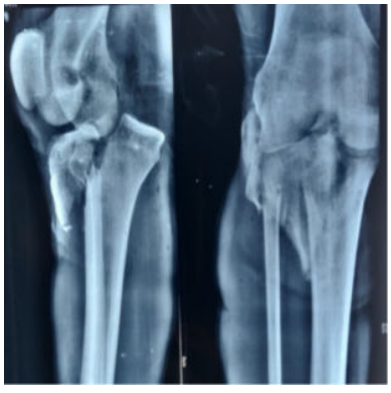

Figure 1: A 45 years old male patient with open fracture Schatzker type 5

RESULTS

There were 18 (72 %) male and 7 (28 %) female patients in this study. Mean age of the patients 46.84 ± 2.827 (range 18–63) years. Maximum number 13 (52 %) patients were in age group 41-60. The commonest mode of trauma was Road traffic accident in 17 (68%) of patients. Full weight bearing was started at a mean of 11.64 ± 0.456 weeks (Table 1).

In this series of 25 cases, there were 8 (32%) cases of Pin tract infections (six [24%] cases with grade 1 and two [8%] case with grade 2) which were managed by oral antibiotics (Table 3). 7 of these were closed fractures and 1 was open injury. None of the cases developed any common peroneal nerve injury after surgical management.

Table 3: Checketts and Otterburn's Grading System for pin track infection

Grade of infection	No. of patients	Percentage
Grade I	6	75
Grade II	2	25
Grade III	0	0
Grade IV	0	0
Grade V	0	0
Grade VI	0	0

DISCUSSION

High-energy tibial plateau fractures often present with associated soft tissue trauma and are potentially further complicated by open wounds and compartment syndrome [12-14]. The high complication rate associated with these injuries has led to new techniques for fracture fixation. Pin site infection and hardware related infection have been continuously reported, but these reports are now much less frequent than earlier. By staging treatment with a temporizing spanning external fixator, the soft tissue envelope about the proximal tibia is allowed time to recover. This has been shown to decrease rates of wound infections, and although it may result in a transient increased compartment pressure, has been shown not to lead to compartment syndrome [15]. Attempts to decrease complication rates by minimizing further soft tissue injury have led other authors to advocate circular fixators [16, 17], medial external fixation with lateral plate internal fixation [18], combination internal fixation and hybrid external fixation [19-21], indirect reduction and percutaneous screw fixation [22], and a two incision approach to the proximal tibia for complex bicondylar tibial plateau plates [23, 24]. Ilizarov external fixation has evolved as an attractive option in the treatment of these fractures.

Our study comprised of age group of 18- 63 years average being 40.8 years consistent with the series of Dendrinos GK et al (1996) [25], where in his study there were age group of 18-69 years and average being 39 years. In this study men dominated over women. Predominant male sex involvement is surely because of their more outdoor activities therefore more chances of trauma especially road traffic accidents which happens to be the commonest mode of trauma in this series, which is near about equivalent to the study done by Lalić I et al (2014) [26].

The tibial plateau fractures that are a result of high energy injuries, especially types V and VI according to the Schatzker's classification are difficult to treat. The risk to not obtain good reduction and stability and the risk to result in malunion are related to the comminution of the fracture, to the compromise of soft tissues, and of the correct realignment and stability of the fracture [27]. To prevent non-union as well as posttraumatic arthrosis [28] or arthritis [23] joint congruity and axial alignment need to be re-established.

The introduction of the Ilizarov external fixation has decreased the rate of complications related with plating, being more respectful of the biology of bone and soft tissue [27], [29]. Besides its many advantages, the Ilizarov method has theoretical risks that may occur even in experienced hands, including pins infection or loosening, neurovascular injury, infection, muscular damage, articular injury and deep venous thrombosis, persistent pain, algodystrophy, and scar problems. The major advantage of the external fixation is the ability to stabilize the short periarticular segments encountered in bicondylar tibial plateau fractures, avoiding the application of plates and soft tissue dissection.

Our strategy of treatment was to extend the frame onto the distal femur with two levels of fixation. In such cases, the tibial and femoral frames were connected with rods, knee was spanned for a period of 6 weeks. The femoral ring allowed distraction of the joint, aided in reduction of the fracture thus minimising the number of patients requiring open reduction. It also permits the use of fewer peri-articular wires traversing the zone of injury, which we suggest contributes to the absence of deep infection in this series. Spanning also permits resting' of the articular surface from the shear force described by Irrgang et al [30] in relation to microfracture, recovering cartilage is protected against shear forces when loading but it is still possible to bear weight. Femoral ring was removed at 6th week and knee range of motion was commenced.

It is known that the stability of the external fixator construct is improved with pin placement closer to the fracture site, pins have traditionally been placed away from the field of future internal fixation to prevent possible pin site colonization from interfering with definitive fixation, ultimate fracture healing, and postoperative wound infections.

Our data show no correlation between this distance and subsequent infection rates. Based on this, we recommend the use of an external

fixation construct with pin placement that provides for the best reduction of the fracture and stability of the construct without regard for ultimate plate placement.

This study has numerous limitations as less number of study population, we did not follow any strict criteria to offer Ilizarov as a treatment for Type V and VI Schatzker fractures, this could have led to selection bias and also the patients need longer follow-up to monitor for arthritic changes. Finally the lack of control group limits us from making firm conclusions about the results of Ilizarov fixation in these types of fractures.

CONCLUSION

We conclude that Ilizarov external fixator provides acceptable outcome in complex tibial plateau fractures with minor complications. Care must be taken to look for minor loss of alignment especially in Type VI Schatzker fractures after removal of fixator. However given the small number of cases in this study, we cannot offer firm conclusions.

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