



Comparison of External and Internal Fixation for Management of Bicondylar Tibial Plateau Fractures in Terms of Surgical Site Infection

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ABSTRACT

Objective: To compare external and internal fixation for the management of bicondylar tibial plateau fractures in terms of surgical site infection (SSI). **Study Design:** Randomized Controlled Trial. **Settings:** Faisalabad Medical University and affiliated Hospitals, Faisalabad, Pakistan. **Duration:** May 15, 2017 to November 15, 2017. **Methodology:** Approval from the institutional ethical committee was taken. All the patients with diagnosis of Bicondylar (Schatzker types V and VI) tibial plateau fractures in acute trauma setting who fulfilled the selection criteria were entered in the study by taking informed written consent. All selected cases were guided/informed regarding risk and benefits of the procedure. Randomization was based on computer generated numbers and allotted A & B groups. Group A patients underwent open reduction and internal fixation and in Group B patients' external fixation with ilizarove ring fixator was applied. All the relevant information was filled on predesigned Performa. Post-operative superficial surgical site infection was noted at 4 weeks after surgery in the ward of each patient. According to the Centre of Disease Control and prevention (CDC) and Healthcare Infection Control Practices Advisory Committee (HICPAC) criteria for defining a superficial surgical site infection, the record from each patient was collected after carefully examining the surgical wound at 4 weeks after surgery. **Results:** Post-operative superficial surgical site infection was 10 % (n=4) in cases of Group-A and 47.5% (n=19) in cases of Group-B, whereas 90% (n=36) in Group-A and 52.5% (n=21) in Group-B had no SSI. **Conclusion:** We found lower rate of infection in cases treated with internal fixation than those undergoing external fixation for bicondylar tibial plateau fractures.

Keywords: Tibial plateau fractures, Bicondylar (type V & VI), External fixation, Internal fixation, Surgical site infection.

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Submitted for Publication: 12-11-2019

Accepted for Publication: 21-01-2020

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Citation: Iqbal MJ, Javid A, Shahid SM, Hussain F, Rakha A. Comparison of External and Internal Fixation for Management of Bicondylar Tibial Plateau Fractures. APMC 2020;14(1):24-7.

INTRODUCTION

Proximal tibia fractures with intra-articular extensions are found in only 1.2 % of all fractures. It is commonly found in younger age group due to high-energy trauma, whereas older age group due to fragility.¹ The commonest cause of these fractures (Schatzker types V and VI) is high-energy trauma. The aim of the treatment is to achieve mobile, stable, pain-free and well-aligned joint by reducing the risk of post-traumatic osteoarthritis.²

The commonly used technique to fix this fracture is open reduction and internal fixation (ORIF) by using plate and screws. In our practice extended anterior incision is used for prevention of soft tissue envelope.³ The commonest cause of this fracture is high energy accidents; however, ORIF in these circumstances associated with soft tissue damage and wound complications including infection and skin necrosis.⁴ Soft tissue complications delay in operative fixation/ORIF is contraindicated usually. Due to the above-mentioned complications, alternative procedures like minimally invasive plate osteosynthesis (MIPO), and hybrid external fixation were invented.^{5,6}

The hybrid external fixation technique is a different modality. Fracture is reduced by using closed manipulation, percutaneous screws, or through small incisions and an application of external fixator (ilizarove -circular frame usually).

ORIF is considered a successful procedure for restoration of articular congruity; however, it compromises the soft tissue cover usually. Several trials reveal that ORIF of these fractures

is followed by the risk of development of deep wound infection and wound breakdown.⁷ Such grave complications can be decreased by using an external fixator. The ilizarove technique is found with good clinical outcome and good alternative treatment option for fixation of proximal tibial fractures.⁶ Those studies reported high rates of unplanned secondary procedures which included incision and drainage, soft tissue flaps, redo ORIF, plate removal, knee manipulation, total knee replacement and even above knee amputation.

The superficial surgical site infection rate in internal fixation it is 7.4%,⁸ whereas in external fixation of tibial plateau fractures is 42.8%.⁹

The rationale of my study is based on hypothesis that the external fixator preserves soft tissue envelope and with it we can achieve lower rate of superficial surgical site infection.⁷ So, a good prospective study involving large number of patients is required to establish a protocol to minimize post-operative complications for this type of injuries.

METHODOLOGY

Study Design: Randomized Controlled Trial.

Settings: Faisalabad Medical University and affiliated Hospitals, Faisalabad, Pakistan.

Duration: May 15, 2017 to November 15, 2017.

Sample Size: A total of 80 cases in two equal groups.

Sample Technique: Non-probability consecutive sampling.

Inclusion Criteria: Patients with the diagnosis of Bicondylar (Schatzker types V and VI) tibial plateau fractures in acute trauma setting in patients between 18-65 years of age with Bicondylar (OTA C1, C2, and C3) tibial plateau fractures of either gender with Close fractures and open type 1 Gustilo Anderson were the part of our study.

Exclusion Criteria: We excluded all cases with pathological bicondylar tibial plateau fracture with or without trivial injury, having fractures schatzker Types I, II, III and IV and having absolute (medically unfit, associated with other injuries) and relative (Quack treated old fractures).

Methods: All the patients fulfilling the inclusion criteria were entered in the study after informed written consent. All selected patients were guided/informed regarding benefits and risk of the procedure. Randomization was based on computer-generated numbers and allotted A or B groups. Group A patient underwent open reduction and internal fixation through medial approach and Group B patient underwent external fixation (ilizarov ring fixator). All the relevant information was filled on predesigned Performa (Annexure 1). Post-operative superficial surgical site infection was noted at 4 weeks after surgery in the ward of each patient. According to the Centre of Disease Control and prevention (CDC) and Healthcare Infection Control Practices Advisory Committee (HICPAC) criteria for defining a superficial surgical site infection, the record from each patient was collected after carefully examining the surgical wound at 4 weeks after surgery. We analyze the data for comparison in both groups with the help of SPSS-20.

RESULTS

Patients were distributed in age groups which shows that 57.5% (n=23) in cases of Group-A and 65% (n=26) in cases of B Group were between 18-40 years of age whereas 42.5% (n=17) in Group-A and 35% (n=14) in Group-B were between 41-65 years. Mean \pm SD was calculated as 40.78 \pm 7.74 years in cases of Group-A and 39.3 \pm 8.35 years in cases of Group-B. (Table No. 1)

Table 1: Age distribution (n=80)

Age (in years)	Group-A (n=40)		Group-B (n=40)	
	Cases	%	Cases	%
18-40	23	57.5	26	65
41-65	17	42.5	14	35
Total	40	100	40	100
Mean \pm SD	40.78 \pm 7.74		39.3 \pm 8.35	

Patients were distributed according to gender showing that 70% (n=28) in cases of Group-A and 75% (n=30) in cases of Group-B were male while remaining 30% (n=12) in cases of Group-A and 25% (n=10) in cases of Group-B were females. (Table 2)

Table 2: Gender distribution (n=80)

Gender	Group-A (n=40)		Group-B (n=40)	
	Cases	%	Cases	%
Male	28	70	30	75
Female	12	30	10	25
Total	40	100	40	100

Patients were distributed according to BMI of the patients which shows that 62.5%(n=25) in cases of Group-A and 67.5%(n=27) in cases of Group-B had <30 while remaining 37.5%(n=15) in Group-A and 32.5%(n=13) in Group-B had \geq 30 BMI. Type of fracture shows that 52.5%(n=21) in Group-A and 45%(n=18) in Group-B had type V fracture while remaining 47.5%(n=19) in Group-A and 55%(n=22) in Group-B had type VI fracture. Comparison of post-operative superficial surgical site infection in these fractures treated by external fixation and internal fixation shows that 10%(n=4) in Group-A and 47.5%(n=19) in Group-B had surgical site infection whereas 90%(n=36) in Group-A and 52.5%(n=21) in Group-B had no SSU, p value was 0.0002. (Table No. 3)

Table 3: Comparison of post-operative superficial surgical site infection of operatively treated bicondylar tibial plateau fractures by external fixation and internal fixation (n=80)

SSI	Group-A (n=40)		Group-B (n=40)	
	No. of patients	%	No. of patients	%
Yes	4	10	19	47.5
No	36	90	21	52.5
Total	40	100	40	100

P value=0.0002

DISCUSSION

In our study, mean age was calculated as 40.78 \pm 7.74 years in Group-A and 39.3 \pm 8.35 years in Group-B, 70%(n=28) in Group-A and 75%(n=30) in Group-B were male while remaining 30%(n=12) in Group-A and 25%(n=10) in Group-B were females, comparison of post-operative superficial surgical site infection was 10%(n=4) in Group-A and 47.5%(n=19) in Group-B, whereas 90%(n=36) in Group-A and 52.5%(n=21) in Group-B had no SSI, p value was 0.0002.

Our data for superficial surgical site infection is comparable with the previous literature that is 42.8% in external fixation and 7.4% in internal fixation.^{8,9}

CC Chan and others¹⁰ compared the outcome of external fixation and internal fixation in terms of Rasmussen score, need of total knee replacement (TKR) and development of osteoarthritis. Infection was recorded significantly higher in cases treated with external fixation (9 patients, 26%) because

of pin tract infection, whereas in patients treated by internal fixation no deep infections was reported.

External fixation treatment is surgically less invasive and soft tissue complications are minimal. In our study, pin tract infections were the well-recognized complication which is common with illizarove external fixation.

In a study by Mallik *et al* (1992) which included 10 patients, three of them were treated with external fixator whereas the remainders seven were treated with internal fixation.¹¹ Although they reported high rate of infection in internal fixation group but due to small data size any firm conclusion about treatment options cannot be withdrawn.

A second posteromedial incision with limited surgical exposure limits the complication rate of wound infection.¹² This posteromedial incision is a good option in selected cases where a large posteromedial fragment is a part of bicondylar tibial plateau fracture.¹³

The findings of our results are primary in this regard and needs to be validated through some other trials (multicenter), which will further helpful while deciding to choose the method of fixation of bicondylar tibial plateau fracture.

CONCLUSION

Based on our results, internal fixation was found to be less infected as compared to external fixation for bicondylar tibial plateau fractures.

LIMITATIONS

The sample size of our study (40 cases in each group) is small, moreover, the study is conducted in a single center (Faisalabad Medical University and affiliated hospitals whose results cannot be generalized.

SUGGESTIONS / RECOMMENDATIONS

The findings of our results need to be validated through some other trials (multicenter), which will further helpful while deciding to choose the method of fixation of bicondylar tibial plateau fracture.

CONFLICT OF INTEREST / DISCLOSURE

No conflict of interest to be declared.

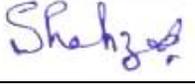
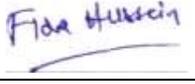
ACKNOWLEDGEMENTS

We acknowledge our residents especially Dr. M. Umar, Dr. Usman Siddique and Dr. Usman Akmal who helped us in collecting the data and counseling of the patients.

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