

Percutaneous Fixation of Split Fracture Tibial Plateau

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Abstract

Background: tibial plateau fractures represented only 1% of all fractures. If not appropriately treated, the consequences may be severe and have a great social impact. The management of the fracture depends on several factors such as fracture configuration, concomitant soft tissue injury, the patient's age, activity level and bone quality. Tibial plateau fractures may be divided into low energy or high energy fractures. Low energy fractures are common in older patients due to osteoporotic bone and are typically depressed fractures. High energy fractures are commonly the result of motor vehicle accidents, falls or sports-related injuries. Split tibial plateau fractures may be treated by closed reduction and percutaneous fixation using cancellous screws and washers, with very good results as recommended by many authors. **Objective:** the aim of this study was to evaluate the results of closed reduction under fluoroscopic control and percutaneous fixation with cancellous screws 6.5 mm and washers of split type of tibial plateau fractures. **Methodology:** twenty patients were included in this study; they were admitted to the Department of Orthopedic Surgery, Sayed Galal Hospital and Luxor International Hospital, from October 2016 to April 2018. On admission all patients were assessed by history taking, clinical examination and radiological assessment. The mean age of patients in this study was 37.15 ± 11.4 years. Age was ranged from 20 to 55 years. There were 13 males (65 %) and 7 females (35 %). 11 patients (55 %) had right side tibial plateau fracture, while only 9 patients had left side tibial plateau fractures. **Results:** 12 (60 %) patients had traffic accidents as a mechanism of injury, 4 (20 %) were falling from height, 4 (20 %) had direct trauma. Associated fractures of the head of fibulae was present in two patients (10 %), other associated fractures were Colles' fracture (5%), femoral shaft fracture (5 %) and fracture tibia (5 %). The time till operation varied from two days to five days, but the majority of the cases were done within the first two to three days after admission. The mean duration of follow up was 6.5 ± 2.86 months, ranging from six to eight months. After follow up period the result were assessed according to Rasmussen's grading system, eighteen patients (90%) had excellent results, and two patients (10 %) had good results. **Conclusion:** tibial plateau fractures represented only 1% of all fractures. If not appropriately treated, the consequences may be severe and have a great social impact. Early mobilization is an important factor in treatment of intra articular fracture, as immobilization result in death of chondrocyte. Percutaneous reduction and fixation technique is a simple procedure if facilitates, equipment and experience are available.

Keywords: split fracture, tibial plateau

Introduction:

Tibial plateau fractures are one of the commonest intra-articular fractures resulting from indirect coronal or direct axial compressive forces. Fractures of tibial plateau constitute 1% of all fractures and 8% fractures in the elderly. These fractures included many and varied configurations that involved the medial plateau (10-23%), lateral plateau (55-70%) or both (11-30%) with various degrees of articular depression and displacement⁽¹⁾. In case of improper restoration of the plateau surface these fractures could lead to development of premature osteoarthritis, lifelong pain and disability⁽²⁾. For assessment of the initial injury, planning for management and prediction of prognosis, orthopedic surgeons widely use the Schatzker's classification system, which divided tibial plateau fractures into six types.

Each increasing numeric category specifies increased level of energy directed to the bone thereby increasing severity of fracture. First four are unicondylar and type V and VI are bicondylar⁽³⁾. The Lateral tibial plateau split-depression fracture (Schatzker type II) was the most common fracture type encountered clinically, and accounts for 25–33 % of all tibial plateau fractures. The location, the size of the split fragment and the degree of articular compression vary greatly and may be accompanied by fibular head or neck fractures⁽⁴⁾. Conservative treatment was reserved for very simple undisplaced fractures that represent a small minority of the overall tibial plateau fracture population or for very low demand patients with severe co-morbidities. Open or closed reduction and internal or percutaneous

fixation of lateral tibial plateau fractures are accepted as the treatment of choice⁽⁵⁾. The objective of surgery was restoration of the plateau surface through anatomical reduction, rigid fixation and early joint mobility. Various treatment modalities have been used over the years with mixed results. Surgical procedures including circular frames, ORIF,^(6,7) percutaneous screw fixation, arthroscopic assisted reduction⁽⁸⁾. Treatment outcomes for the tibial plateau fractures were inconsistent. Closed reduction (based on ligamentotaxis principles) and internal fixation (with percutaneous cancellous screws and washers) reduce the hospital stay and cost and avoids the disadvantages of both operative and conservative treatments. However, it was not suitable for all types of tibial plateau fractures, particularly grossly comminuted and depressed fractures, Schatzker type-VI fractures, and open fractures⁽⁹⁾.

Aim of the Study:

This study aimed to evaluate the results of per-cutaneous fixation as a less invasive method in fixation of the tibial plateau fractures.

Patients and Methods:

The current study included 20 patients with recent tibial plateau fractures treated by the closed reduction and percutaneous fixation with cancellous screws. The study started in October 2016 till April 2018. All patients were admitted to the Department of Orthopedic Surgery, Sayed Galal Hospital and Luxor International Hospital. Tibial plateau fractures were categorized according to the Schatzker classification.

Patients

Patient's selection:

Inclusion criteria

- Age 18-65 years.
- Closed fracture.
- Schatzker's type I.
- Recent fractures within 3 weeks.

Exclusion criteria:

- Age less than 18 years and more than 65 years.
- Open fractures.
- Type II, III, IV, V and VI fractures.
- Fractures with compartment syndrome.
- Fractures with neurovascular injury.
- Severely debilitated patients.

- Patients with paralytic lower limbs .
- Old fractures more than 3 weeks.

Methods

Patient counseling and consenting:

Patient counseling was a crucial part of the procedure. It was explained that the decision of performing this procedure was based on the benefits of the technique, clarifying its suspected complications. Written consent was acquired from all patients.

Patient evaluation:

• **Clinical evaluation:**

Each patient in this study was carefully assessed clinically in the form of detailed clinical history and through examination.

Clinical history:

Each patient asked in details about mode of injury, first aids (If it was done) at site of injury, the duration between injury and hospital admission, temporary maneuvers and drugs were used from time of injury till the operation time. Also, each patient was asked about chronic medical diseases like cardiac, hepatic, renal, DM, blood diseases.....etc., immunosuppressive drugs, previous surgeries and blood transfusion and any patient factor claimed with incidence of failure in proposed surgery.

Patient examination:

General assessment:

This study was done to assess the patient general fitness for such surgery. A detailed physical examination of patient's overall medical status, age and functional demands was necessary, also to detect any additional injuries. These may be other ipsilateral or contralateral skeletal injuries and injuries to other systems that may influence how the plateau fracture is managed.

Local assessment:

Complete and meticulous local examination of the involved knee and leg was routine with particular emphasis on:

• **Vascular condition of the affected limb:**

In all injured limbs vascular examination was done by assaying vascular status and pulsation over the dorsalis pedis and posterior tibial arteries.

• **Motor and sensory function:**

In all patients a detailed motor and sensory examination was done to exclude associated nerve injury as common peroneal nerve.

- **Soft-tissue envelope of the limb:**

In all patients the soft tissue envelope around the knee was carefully examined. Important features of the soft tissues were the severity of swelling, visible contusions and the size, character, and location of fracture blisters. The readiness of the soft-tissue envelope was determined by resolution of swelling marked by the return of skin wrinkles, re-epithelialization of fracture blisters and reduction of edema.

- **Compartment syndrome exclusion:**

The compartments of the lower leg were evaluated with serial examinations for signs of compartment syndrome. Presence of the well-recognized signs, including tense compartments and pain with passive stretching, raise the suspicion of an associated compartment syndrome.

Lastly it was critically important to diagnose associated injuries and complications, to plan for surgical treatment, and to decide on optimal timing of interventions.

- **Radiological evaluation:**

All patients underwent plain films in anteroposterior and lateral views as well as computed tomography of the affected knee, Anterior-posterior (AP) radiographs were taken with the patient facing the x-ray tube, so the x-ray beam enter their anterior side and exits posteriorly. The focal film distance (which is the distance between the source of x-ray beam and the film surface) was 40 inches. Lateral radiographs were taken with patient position is sideways to the x-ray tube. the focal film distance was 40 inches. CT axial, coronal and sagittal cuts were done for all patients for accurate assessment.

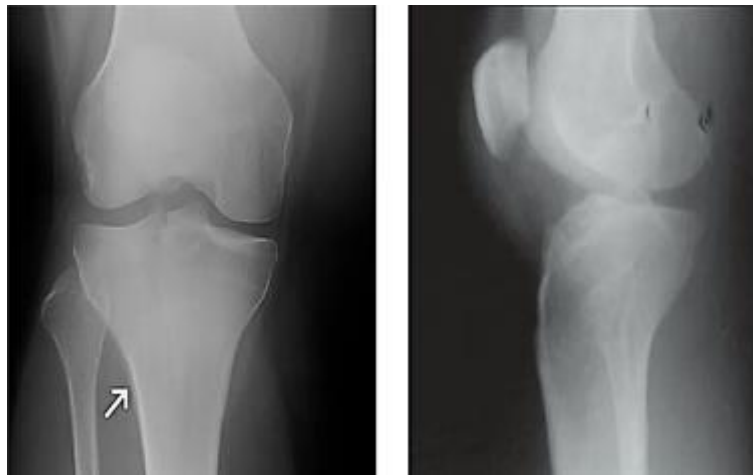


Figure 1: anteroposterior and lateral views of split fracture tibial plateau.

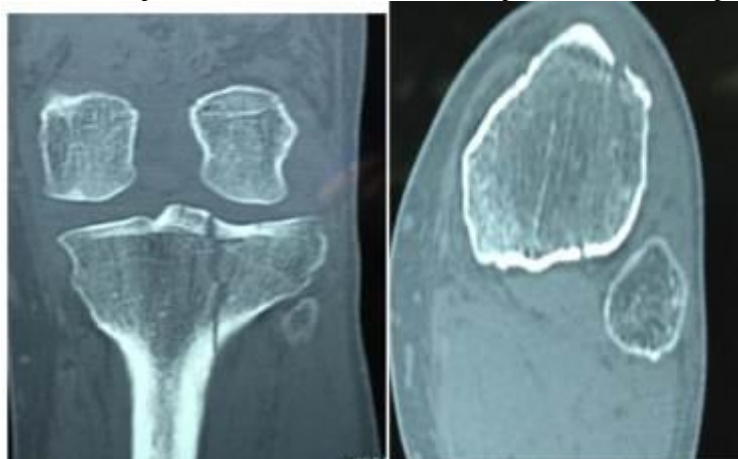


Figure (2): axial and coronal views of split fracture tibial plateau (CT scan)

Preoperative Diagnosis: twenty patients with closed acute split lateral tibial plateau fractures.

Preoperative investigations and consultations:

Beside the routine pre-operative investigations which were carried out for all patients, like (C.B.C, blood sugar tests, Liver & Kidney functions tests, coagulation profile and E.C.G) further special investigations and medical or cardiac consultation were requested by anesthesia specialist to complement anesthetic judgment. Ten patients had a significant soft-tissue trauma (swelling, ecchymosis, blistering or abrasion). A posterior long slab was first placed to allow the soft tissue time to recover and low molecular weight heparin was routinely used for prophylaxis against deep venous thrombosis which stopped twelve hours before operation.

Operative technique:

Timing

In current study the operation was done within three weeks in all patients.

Chemoprophylaxis:

Broad spectrum prophylactic intravenous antibiotic was given before tourniquet inflation for all the patients and for an average of three days postoperatively.

Anesthesia:

The surgery was done to all patients under spinal anesthesia

Patient positioning:

The patient was placed supine position on radiolucent table. The limb was prepared from the ankle to the groin and the foot draped. The C-arm was placed opposite the injured extremity and perpendicular to the patient to aid

the technician with orientation of the fracture. A pneumatic tourniquet was placed at the root of the limb and elevated within average 300 mm Hg pressure

Surgical technique

The basic requirements for this technique included: an image intensifier, radiolucent table, power drill, cancellous screw 6.5 mm and washers, reduction clamps and kirschner wires.

Evacuation of hemoarthrosis with wide pore needle was started before the manipulation. With the image intensifier properly draped, and the knee region and the upper part of the leg sterile and well draped, the knee was examined for associated ligamentous injuries. Stress films and traction films were taken. A small stab incision in the safe zone for common peroneal nerve was then done. Split fractures typically were reduced by ligamentotaxis, a combination by manual traction with varus or valgus stress, then we use kirschner wires or percutaneous clamp to maintain the reduction, the reduction was assessed with multiple c-arm radiographic images. Once the anatomical reduction of the articular surface has been obtained, the percutaneous screws and washers placement were applied, most split fractures were treated with two or more screws and washers. A lag screw and washer was placed at the apex of the condylar fracture to provide a buttressing effect and prevent axial displacement of the condyle.

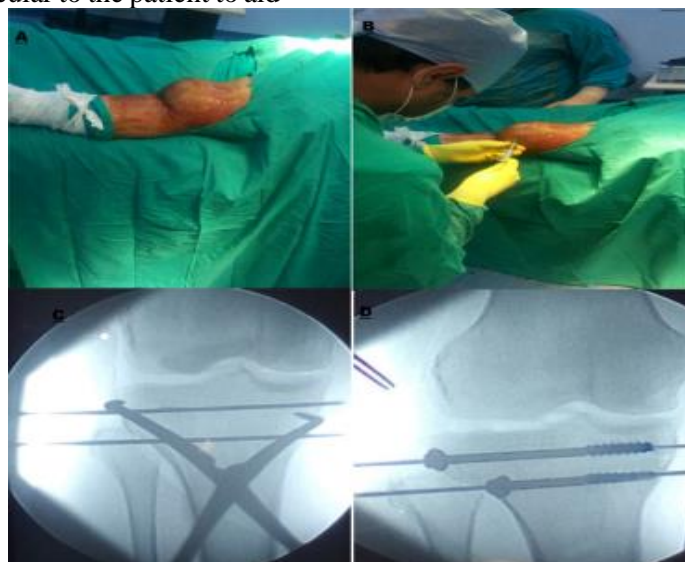


Figure 3: manipulation and reduction. (A) Supine position. (B) Evacuation of haemarthrosis. (C) application of reduction clamp and Drilling a guide wire and check the direction under image. (D)

Application of screw and check the direction under image

In the ward: patients were given analgesics for the first 24-48 hours; elevation of

the operated limb, peripheral circulation and vital data were observed and recorded.

Postoperative instructions:

1-Medications:

Intravenous antibiotic in the form of third-generation cephalosporins (Ceftriaxone) as prophylaxis was given for all patients starting from the day of surgery and continued till drain removal after 48 hours. An anticoagulation therapy was given for three weeks and oral antibiotic for one week.

- 2- Active range of movement exercises up to 90 degree between the third and fourth days post operative.
- 3- Isometric quadriceps strengthening exercises for four weeks.
- 4- Mobilization of patient non weight bearing was started soon after operation using walking frame for six weeks.
- 5- Weight bearing was allowed between 6 and 12 weeks after surgery, progressing from partial weight bearing after 6 weeks till full weight bearing after 12 weeks after achieving clinical union and radiological union.

6-Discharge and follow up visits:

Hospital stay length ranged from 2 to 3 days postoperatively; Then all our patients were advised for the first four weeks after discharge to report immediately chest pain, excessive swelling of the affected leg, redness. First visit was after 14 days from surgery for check up of the wound and removal of stitches. Range of motion was checked and recorded. Second visit was at 4 weeks, third visit was after 6 weeks, fourth visit was after 3 months with the start of full weight bearing. Each visit had clinical evaluation of the wound, measuring range of motion and plain (AP& lateral) X-rays were done. Other visit was after 6 months and post operative evaluation was done using Rasmussen knee scoring system. Plain (AP and lateral) X-rays done for all patients six months post operative for accurate assessment of union. Clinical healing was defined as an absence of pain at the fracture site with weight bearing. Radiographic healing was defined as continuity of both cortices in two radiographic planes, presence or absent fracture line and lack of any evidence of failure at the articular

surface. The outcome following surgical intervention was determined using Rasmussen knee Score at the last visit after 6 months post operative. This scoring tool consists of anatomical (radiological) and functional grading. Functional grading consisted of five parameters that were used to assess the function of the knee including pain, walking capacity, degree of extension, range of motion and degree of stability as shown in table 2. Functional score was considered excellent if the points were between 27 to 30 points. Good results between 20-27 points while fair results between 10-20 points and results were considered poor if the range was less than 10.

Statistical analysis:

Recorded data were analyzed using the statistical package for social sciences, version 20.0 (SPSS Inc., Chicago, Illinois, USA). Quantitative data were expressed as mean± standard deviation (SD). Qualitative data were expressed as frequency and percentage.

The following tests were done:

- Chi-square (χ^2) test of significance was used in order to compare proportions between two qualitative parameters.
- The confidence interval was set to 95% and the margin of error accepted was set to 5%. So, the p-value was considered significant as the following:
- Probability (P-value)
 - P-value \leq 0.05 was considered significant.
 - P-value \leq 0.001 was considered as highly significant
 - P-value $>$ 0.05 was considered insignificant

Results:

According to Schatzker classification, all cases in our study were classified as type I (split fracture) and all of this cases were managed by closed reduction and internal fixation using a cancellous screws.

Gender distribution:

There were 13 males (65%) and 7 females (35 %). The distribution of the gender in the current study is shown in **table 1**.

Table 1: gender distribution

Gender	Number of patients	Percent
male	13	65%
female	7	35%

Age distribution:

Distribution of age in the current study as shown in **table 2**

Table 2: age distribution

Age	number	Percent
<35	8	40%
35-45	7	35%
>45	5	25%
total	20	100%

Mode of injury:

Distribution of mode of injury in the current study is shown in **Table 3**.

Table 3: frequency of the mode of injury

MODE OF TRAUMA	Number of patient	Percent
Road traffic accident	12	60%
Falling from height	4	20%
Direct trauma	4	20%
total	20	100%

Distribution of special habits:

Distribution of special habits of medical importance in the current study is shown in **table 4**.

Table 4: distribution of special habits of medical importance

Special habits	Number of patient	Percent
No special habits	8	40%
Cigarette smoker	6	30%
Shisha smoker	5	25%
Oral tobacco	1	5%

Distribution of associated fractures:

Table 5: distribution of associated fractures

ASSOCIATED FRACTURES	NUMBER OF PATIENT	PERCENT
Colles	1	5 %
Head fibula	2	10%
Femur	1	5 %
tibia	1	5 %
No fracture	15	75%

Distribution of patient's occupation:

Distribution of patient's occupation in the current study is shown in **table 8**.

Table 6: distribution of patients occupation

OCCUPATION	NUMBER of PATIENT	PERCENT
Manual worker	8	40 %
House wife	3	15 %
student	2	10 %
Others	7	35 %

Side distribution

11 patients (55%) had right side tibial plateau fracture, while only 9 patients had left side tibial plateau fracture .

Ligamentous injury:

We initially assessed ligamentous instability under anesthesia. We found in our study that four cases had associated ligamentous injury, All ligament injuries were treated conservatively.

Duration of follow up and weight bearing:

The mean duration of follow up reached 6.5 ± 2.86 months. The minimum follow up was 6 months and the maximum was 8 months.

The mean time to partial weight bearing was 7.46 ± 1.3 weeks.

The mean time to complete weight bearing was 10.5 ± 1.9 weeks.

Table 7: functional results according to Rasmussen scoring system

RESULT	COUNT	PERCENT
Poor	0	0 %
Fair	0	0 %
Good	2	10 %
Excellent	18	90 %

Table 8: functional results according to Rasmussen scoring system in details

No. of patient	pain	Walking capacity	extension	Total range of motion	stability	Total points
1	6	5	6	5	6	28
2	5	5	6	6	6	28
3	4	5	6	6	6	27
4	5	4	6	6	6	27
5	5	6	4	6	6	27
6	5	5	6	5	6	27
7	5	6	6	6	6	29
8	4	5	6	6	6	27
9	6	5	6	6	6	29
10	5	5	6	5	6	27
11	5	6	6	6	6	29
12	4	4	4	4	6	22
13	5	6	6	6	6	29
14	5	6	6	6	6	29
15	4	5	6	6	6	27
16	5	5	6	6	6	28
17	5	6	6	6	6	29
18	4	5	4	4	6	23
19	6	6	5	6	6	29
20	5	6	6	5	6	28

In the current study, the clinical results showed that there were 18 patients (90%) had an excellent result and only 2 patients (10%) had a good result and none had poor or fair results. The mean final score for this study was 27.45 ± 3.62 , the minimum was 22 and the maximum was 29 according to Rasmussen scoring system.

Table 9: relation between outcome and demographic data

Demographic Data	Good (N=2)		Excellent (N=18)		Chi-square test	
	No.	%	No.	%	x2	p-value
Age (years)						
<30 years	0	0.0%	5	27.8%	3.333	0.189
30-40 years	0	0.0%	7	38.9%		
>40 years	2	100.0%	6	33.3%		
Gender					0.220	0.639
Female	1	50.0%	6	33.3%		
Male	1	50.0%	12	66.7%		

This table showed no statistically significant relation between outcome and demographic data.

Table 10: relation between outcome and associated fractures

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Associated fractures	Good (N=2)		Excellent (N=18)		Chi-square test	
	No.	%	No.	%	x2	p-value
Colles	0	0.0%	1	5.6%	9.630	0.047*
Femur	1	50.0%	0	0.0%		
Head fibula	0	0.0%	2	11.1%		
Tibia	0	0.0%	1	5.6%		
No	1	50.0%	14	77.8%		

This table showed statistically significant relation between outcome and associated fractures.

Table 11: relation between outcome and side

Infection	Good (N=2)		Excellent (N=18)		Chi-square test	
	No.	%	No.	%	x2	p-value
No	1	50.0%	18	100.0%	9.474	0.002*
Yes	1	50.0%	0	0.0%		

This table showed statistically significant relation between outcome and infection.

Table 12: relation between outcome and limitation of movement

Limitation of movement	Good (N=2)		Excellent (N=18)		Chi-square test	
	No.	%	No.	%	x2	p-value
No	1	50.0%	17	94.4%	3.951	0.047*
Yes	1	50.0%	1	5.6%		

This table showed statistically significant relation between outcome and limitation of movement.

Cases Presentation:

Case 1:

Male patient, 32 years old, manual worker, presented post falling down stairs with type I plateau fracture of right knee joint. Closed reduction and percutaneous fixation was done by two partial threaded cancellous screw. The patient achieved full flexion two weeks postoperative. Full weigh bearing and union was achieved after 10 weeks postoperative. According to Rasmussen's Scoring System his score was 27 in the clinical scoring system which is excellent.

Pre-operative X-ray and C.T:



Figure 4: pre operative Type I Fracture Plain x-ray A-P(A)&Lat.(B),Coronal C.T(C) and Axial C.T(D)

Immediate post-operative X-ray:



Figure 5: first day post- operative plain x-ray A-P and Lat. views

Six months follow up:



Figure 6: six months follow up plain x-ray A-P, Lat. views.

Discussion:

Tibial plateau fractures represented only 1% of all fractures. If not appropriately treated, the consequences may be severe and have a great social impact. The management of the fracture depends on several factors such as fracture configuration, concomitant soft tissue injury, the patient's age, activity level and bone quality⁽¹⁰⁾. Tibial plateau fractures may be divided into low energy or high energy fractures. Low energy fractures are common in older patients due to osteoporotic bone and are typically depressed fractures. High energy fractures are commonly the result of motor vehicle accidents, falls or sports-related injuries. Split tibial plateau fractures may be treated by closed reduction and percutaneous fixation using cancellous screws and washers, with very good results as recommended by many authors⁽¹¹⁾.

Nature of trauma

In the presented study, the most common mode of injury was caused by road traffic accidents (60%), the next most common was fall from a height (20%), direct trauma (20%), this explained by the increased rate of traffic accidents in our roads and deficient occupational safety measure. **Srivastava and Vijay**⁽¹²⁾ in their study in 2016 reported the most common mode of injury was caused by road traffic accidents (86%), the next most common was fall from a height (9%), followed by physical assault (5%)⁽¹²⁾.

Age incidence

Authors stated that fractures of tibial condyle occur around the ages of forty in this study the fractures was found to occur below age 35 years this explained by increased activity during this age group⁽¹³⁾. **Srivastava and Vijay**⁽¹²⁾ reported that The majority of fractures occur between the ages of 20 and 70 years with

the maximum incidence involving the productive age group 20 – 40 years (59%)⁽¹²⁾.

Sex incidence

Many studies reported that sex incident of tibial plateau fractures was equal⁽¹³⁾, however in this study The difference in the incidence of fracture in males and females (65% versus 35%) can be attributed to the upper Egypt setup where the female population largely works indoors and are generally not involved in sporting activities and road traffic accidents., this observation also reported by **Farag**⁽¹⁴⁾ and **Weisman and Herold**⁽¹⁵⁾.

Side incidence:

Right and left side injuries were nearly equal in this study, which confirm with another study⁽¹³⁾.

Occupation:

In this study, eight (40 %) patients were working as manual workers, this observation may be explained by the fact that they are more prone to traffic and occupational accidents, three (15 %) were housewives, most of them were above 45 years and mechanism of trauma was direct trauma and valgus stress, this may be explained by osteoporotic changes at this age group .

Result of treatment:

There are many options in management tibial plateau fractures in the past conservative non operative treatment was adopted. Open reduction and internal fixation remained for years the best management of tibial plateau fractures⁽¹⁶⁾.With further development in surgical technique and facilities minimally invasive technique, percutaneous methods of tibial plateau fractures, became in use to solve a lot of problems especially in fractures with soft tissue problems⁽¹⁷⁾. In our study, 20 patient patients treated with closed reduction and percutaneous screw fixation, were followed-up for a period of 6 months, there were 90% excellent result, 10 % good, no fair or poor results, which is comparable to the study done by **Angarwal et al.**⁽¹⁸⁾ in 2016 in their study 29 patients,22 men and 7 women, Closed reduction was achieved by manual ligamentotaxis technique under image intensifier control and fixed percutaneously with two cancellous screws (6.5 mm) with or without washers in a parallel fashion, there were 26.4% excellent, 50.00% good, 20.00% fair, and 3.6% poor results. Also **Hohl**⁽¹⁹⁾ reported an about 60% good result and 11% poor result with open reduction and internal fixation, compared to a

70% good result and no poor result by percutaneous screw fixation.After evaluating the results, we found that treatment of tibial plateau fracture requires detailed consideration of the following:We initially assessed ligamentous instability under anesthesia. We found that 4 cases had associated ligamentous injury, which is comparable to the results reported by **Rasmussen**⁽²⁰⁾ who also showed that ligament injuries occur in 10–33% of tibial plateau fractures. All ligament injuries were treated conservatively. We used pointed reduction clamps for final reduction, as suggested by **Kankate et al.**⁽²¹⁾, with satisfactory results. We have not used intraoperative arthroscopic evaluation for the reduction or to repair any meniscal injury. **Pogliacomini et al.**⁽²²⁾ in 2005 managed 4 patients arthroscopically of type I fracture with using of 6.5 cancellous or 7.3 cannulated screws & washers for fixation , He obtained an excellent results of the whole patients.

Follow up:

Our study included 20 cases in a total period of 6 months. We analyzed the data in relation to age, sex, cause of injury and compared and contrasted the result with other series.

Hohl and Luck⁽¹⁶⁾ studied 227 cases with follow-up of 2-13 years. **Duwelius and Connolly**⁽²³⁾ studied 60 cases with follow-up of 1-10 years; **Rasmussen**⁽²⁰⁾ studied 204 cases with follow up of 4-11 years, Burn et al 278 cases.

Conclusion

- Tibial plateau fractures represented only 1% of all fractures. If not appropriately treated, the consequences may be severe and have a great social impact.
- In our community males were more prone to fracture of tibial plateau than females due to increase activity.
- The management of the fracture depends on several factors such as fracture configuration, concomitant soft tissue injury, the patient's age, activity level and bone quality.
- Traffic accident was the most common causative trauma in this study followed by falling on the ground.
- The method of percutaneous reduction and fixation under image of tibial plateau fracture was a good method of treatment for selected type of fracture.

- Split type fracture was found to be good candidates for treatment with percutaneous reduction and fixation.
- Early mobilization is an important factor in treatment of intra articular fracture, as immobilization result in death of chondrocyte.
- Percutaneous reduction and fixation technique is a simple procedure if facilitates, equipment and experience are available.

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