Arthroscopic-Assisted Reduction and Fixation of Uncomplicated Tibial Plateau Fractures

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Abstract: Background: Arthroscopic reduction with internal fixation has long been recognized as a treatment option for select tibial plateau fractures. Benefits of direct visualization of chondral surface reduction, diagnosis and treatment of associated intraarticular soft tissue injuries, joint lavage, decreased soft tissue dissection, and improved rehabilitation have been described in the literature. A review of surgical techniques and instrumentation for various fracture types is presented.

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1. Introduction

The arthroscope has long been recognized as a useful aid in the management of intraarticular fractures. Like other intra-articular fractures, the tibial plateau fracture is challenging for orthopedic surgeons because of its severity and associated soft tissue injuries. Although tibial plateau fractures comprise only 1% of all fractures, the displaced fractures, and the associated injuries, can cause severe consequences if not properly treated.(1) The advantages of arthroscopic reduction and internal fixation for tibial plateau fractures are direct visualization of intra-articular fractures, accurate fracture reduction, reduced morbidity in comparison with arthrotomy, simplified diagnosis and treatment of meniscal and ligamentous injuries, thorough-joint lavage, and removal of loose fragments.(1)

Patients and Methods

Patients:

Patients selection:

This study will involve management of (50) adult patients with acute tibial plateau fracture.

Inclusion criteria

- Acute.
- Skeletally mature.
- Closed tibial plateau fracture Schatzker types **I, II**, **III** and types **IV**.

Exclusion criteria

- Open fracture dislocation.
- Associated neurovascular injuries.
- Severely debilitated patients.
- Highly comminuted plateau and proximal metaphyseal fracture (type V&VI) because extravasations of fluid may lead to compartmental syndrome.
- Patients with previous infection of knee joint.
-

Our study group has included 42 males (84%) and 8 females (16%) Type of fractures cross tabulated with sex by count and percentage of parameters with (P-value<0.2) that meaning there was no statistical significant difference in sex between groups of the study Table 1; Figure 1.

Sex distribution:

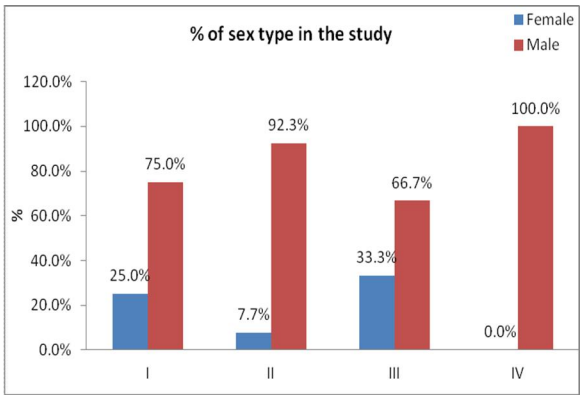


Fig. (1): Sex type in the study.

Age distribution:

Table (1): Sex with Type of fractures cross tabulation.

Group		Sex		Total	P. Value
		Female	Male		
I	Count % within group	4 25.0%	12 75.0%	16 100.0%	0.2
II	Count % within group	2 7.7%	24 92.3%	26 100.0%	
III	Count % within group	2 33.3%	4 66.7%	6 100.0%	
IV	Count % within group	0 0.0%	2 100.0%	2 100.0%	
Total	Count % within group	8 16.0%	42 84.0%	50 100.0%	

Table (2): Descriptive Statistics of age in the study groups.

Groups	%	N	Min	Max	Mean	S.D	P. Value
I	32	16	19.0	49.0	35.0	9.52	0.01*
II	52	26	27.0	63.0	47.23	12.43	
III	12	6	28.0	52.0	40.3	10.75	
IV	4	2	51.0	51.0	51.0	0.01	

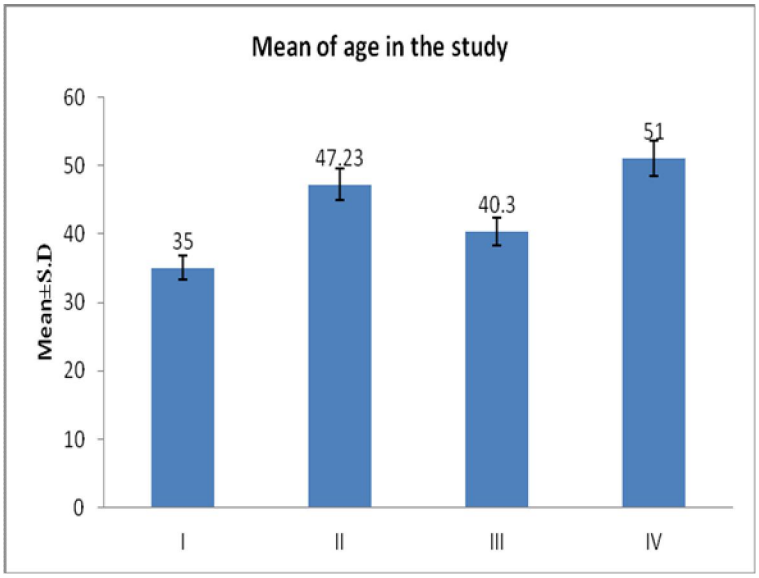


Fig. (2): Mean of age in the study.

Side of fracture

Table (3): Side with Type of fractures cross tabulation.

Group		Side		Total	P. Value
		RT	LT		
I	Count	14	2	16	0.001**
	% within group	87.5%	12.5%	100.0%	
I I	Count	10	16	26	
	% within group	38.5%	61.5%	100.0%	
III	Count	6	0	6	
	% within group	100.0%	0.0%	100.0%	
IV	Count	0	2	2	
	% within group	0.0%	100.0%	100.0%	
Total	Count	30	20	50	
	% within group	60.0%	40.0%	100.0%	

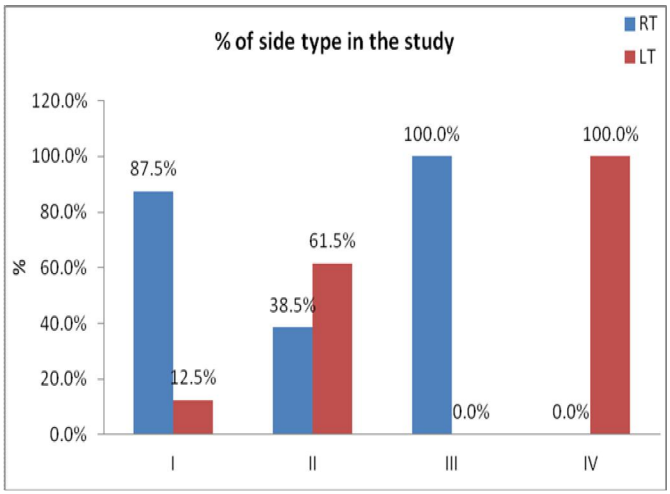


Fig. (3): Side type in the study.

Mechanism of injury

Table (4): Mechanism of injury with Type of fractures cross tabulation.

Group		Mechanism of injury			Total	P. Value
		RTA	FFH	TT		
I	Count	8	0	8	16	0.04*
	%	50.0%	0.0%	50.0%	100.0%	
II	Count	8	8	10	26	
	%	30.8%	30.8%	38.5%	100.0%	
III	Count	2	2	2	6	
	%	33.3%	33.3%	33.3%	100.0%	
IV	Count	0	2	0	2	
	%	0.0%	100.0%	0.0%	100.0%	
Total	Count	18	12	20	50	
	%	36.0%	24.0%	40.0%	100.0%	

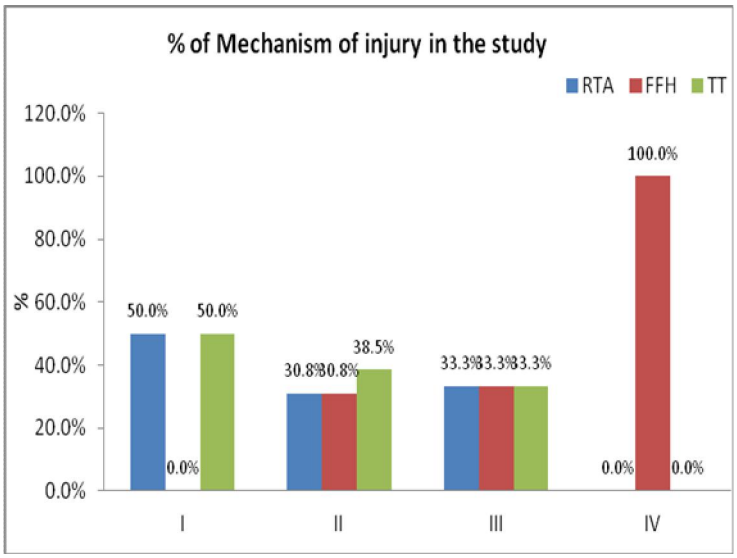


Fig. (4): Mechanism of injury in the study.

Classification of patient

Table (5): Number of patient using the Schatzker classification.

Groups	N	%
I	16	32
II	26	52
III	6	12
IV	2	4

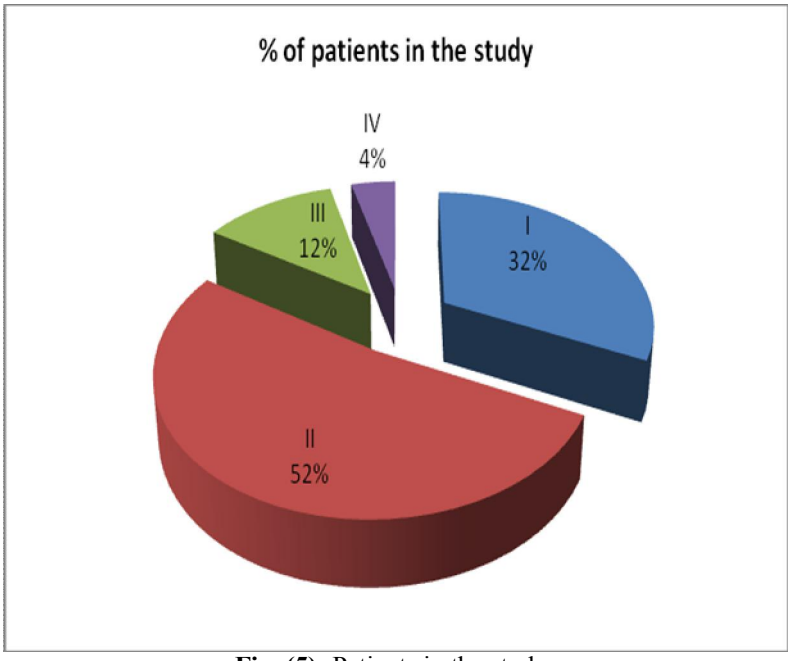


Fig. (5): Patients in the study.

Associated soft tissue injury

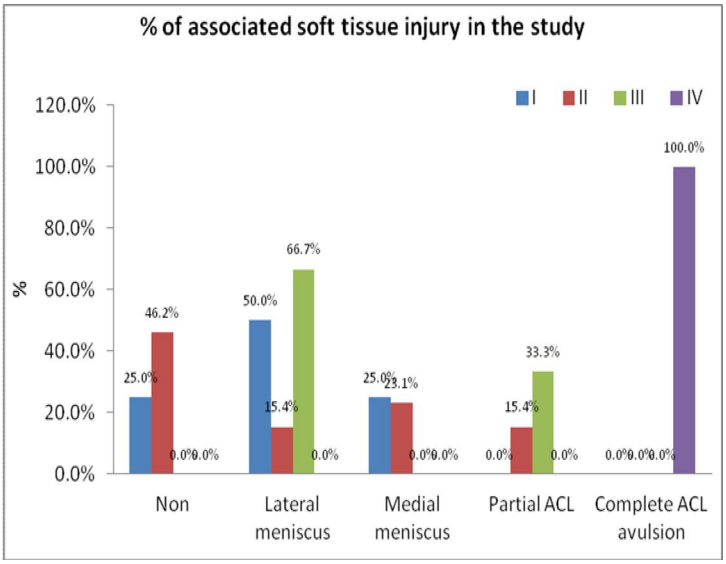


Fig. (6): Associated soft tissue injury in the study.

Table (6): Associated soft tissue injury with Type of fractures cross tabulation.

Group		Associated soft tissue injury					Total	P. Value
		Non	Lateral meniscus	Medial meniscus	Partial ACL	Complete ACL avulsion		
I	Count	4	8	4	0	0	16	0.04*
	%	25.0%	50.0%	25.0%	00.0%	0.0%	100.0%	
II	Count	12	4	6	4	0	26	
	%	46.1%	15.4%	23.1%	15.4%	0.0%	100.0%	
III	Count	0	4	0	2	0	6	
	%	0.0%	70.0%	0.0%	30.0%	0.0%	100.0%	
IV	Count	0	0	0	0	2	2	
	%	0.0%	0.0%	0.0%	0.0%	100.0%	100.0%	
Total	Count	16	16	10	6	2	50	
	%	32.0%	32.0%	20.0%	12.0%	4.0%	100.0%	

Type of fixation

Table (7): Type of fixation with Type of fractures cross tabulation.

Group		Type of fixation			Total	P. Value
		PCS	P&S	IL		
I	Count	12	4	0	16	0.001**
	% within group	75.0%	25.0%	0.0%	100.0%	
II	Count	14	12	0	26	
	% within group	53.8%	46.2%	0.0%	100.0%	
III	Count	0	4	2	6	
	% within group	0.0%	66.7%	33.3%	100.0%	
IV	Count	0	2	0	2	
	% within group	0.0%	100.0%	0.0%	100.0%	
Total	Count	26	22	2	50	
	% within group	52.0%	44.0%	4.0%	100.0%	

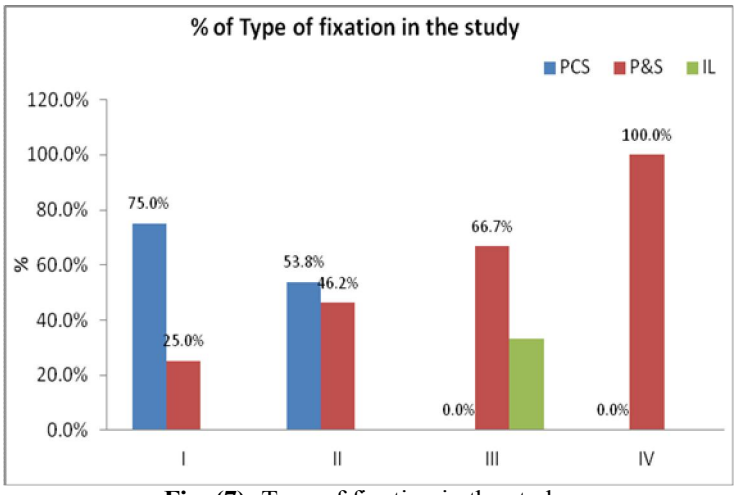


Fig. (7): Type of fixation in the study.

Table (8): Rasmussen Score (Criteria of Clinical assessment) [2].

Clinical Parameter	Points	Excellent	Good	Fair	Poor
Subjective					
Pain		5	4	2	0
▪ None	6				
▪ Occasional pain, needs no medication	5				
▪ Stabbing pain	4				
▪ Intense, activity-related	2				
▪ Night pain, at rest	0				
Walking capacity		6	4	2	1
▪ Normal	6				
▪ Outdoors walking >1 hour	5				
▪ Outdoors walking< 1 hour	4				
▪ Indoors only	1				
▪ Wheelchair/bedridden	0				
Objective					
Extension		6	4	2	2
▪ Normal	6				
▪ >10° loss	4				
▪ < 10° loss	2				
Total range of motion		5	4	2	1
▪ >140°	6				
▪ >120°	5				
▪ >90°	4				
▪ >60°	2				
▪ >30°	1				
▪ 0°	0				
Stability		5	4	2	2
▪ Normal	6				
▪ Abnormal in 20° flexion	5				
▪ Instability in extension<10°	4				
▪ Instability in extension >10°	2				
Total (minimum)		27	20	10	6

***The results are rated as follows: Excellent: 27 to30** points. **Good: 20 to 26** points. **Fair: 10 to 19** points. **Poor: less than 10** points.*

Table (9): Rasmussen Score Criteria for Radiological Assessment.

Parameter	Points	Excellent	Good	Fair	Poor
Depression		6	4	2	0
None	6				
< 5 mm	4				
6-10 mm	2				
>10 mm	0				
Condylar widening		6	4	2	0
None	6				
<5 mm	4				
6-10 mm	2				
>10 mm	0				
Angulation (valgus/varus)		6	4	2	0
None	6				
<10°	4				
10°-20°	2				
> 20°	0				
Total (minimum)		18	12	6	0

The results are rated as follows: ***Excellent*: *18 points (minimum)*. *Good: 12 to 18 points*. *Fair: 6 to 11 points*** ***Poor: less than 6 points.***

Methods:

Preoperative planning:

Preoperative planning allows formulation of alternative plans and anticipation of intra-operative challenges in cases that are unusual in any way. *Also The Preoperative investigations like pxr,ct,mri must be confermed with the clinical data.*

Patient counseling:

That was a crucial part of the procedure, it must be explained that the decision of performing this procedure was based on the benefits of the technique rather than the traditional one, beside clarifying its suspected complications like extravasation and compartment syndrome.

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:

We are aiming in this part to carefully identify the detailed history that led to the present of unacceptable situation.

We 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.

Patient examination:

- ***General assessment:***

This was done to assess the patient general fitness for such surgery.

- ***Local assessment:***

Complete and meticulous local examination.

- ***Neurovascular condition of the affected limb:***

In all injured limbs, but particularly in patients with certain fracture patterns, a thorough neurovascular examination is mandatory by assaying vascular status in terms of pulsation over the dorsalis pedis and posterior tibialis arteries.

Soft-tissue envelope and sensorimotor function of the limb:

In all patients, but particularly when an intervention is planned, the soft tissue envelope around the knee must be carefully examined. The timing and, in some fractures, the type of surgical approach will be dictated by this examination. Important features of the soft tissues are the severity of swelling, visible contusions, and the size, character, and location of fracture blisters.

Surgical Techniques (*In operating room)*

Asepsis:

In all cases the operative theater was equipped with a high flow ventilator system in order to minimize contaminated particles.

Anesthesia;

Usually general anesthesia done for most of the patient unless there is contraindication for GA spinal anesthesia was the choice.

General Considerations and patient position:

Patient positioning is somewhat of a dilemma, because the arthroscope requires varying degrees of knee flexion and varus/valgus stress to adequately view the joint and concomitant fluoroscopic viewing is generally with the knee extended. This study found that use of an arthroscopic leg holder with the foot of the patient dropped 90 degrees give best exposure of all compartment of knee joint in addition drawing

anatomical landmark help to define approach of percutanous screw fixation (Fig. 8,a).

Firstly hematoma evacuation for good visualization and quite examination of knee joint (Fig. 8,b). A figure-4 position allows good access to the lateral compartment with little to no assistance, and the fluoroscope can be brought in from the opposite side of the table and appropriately angled.

Arthroscopic work:

The anterolateral and anteromedial portals were used to insert the arthroscope as well as working instruments. Fluid extravasation was not problematic because inflow was achieved by gravity.

In all operations the surgical procedure was started with arthroscopic inspection of the joint as soon as permitted evacuation of hematoma and loose particles, which is a lengthy and tedious step.

When intra-articular visibility becomes sufficient, a shaver can be introduced to assist in removing the clots and small bone fragments within the joint cavity. Once joint lavage is complete, a comprehensive evaluation is performed to identify the bone and cartilage lesions, as well as any damage to other structures such as the menisci and ligaments by probing of the capsuloligamentous structures.

Fracture reduction and fixation:

The fracture pattern will dictate the operative approach, the technique of reducing the fracture, and the appropriate use of method of fixation.

A- Schatzker Type I Fractures (Lateral Split):

In our study there were sixteen patients with this fracture type all of them were treated successfully with fluoroscopic using the joystick and ligamintotaxis principle to tilt the fracture percutaneously to achieve optimal reduction; followed by holding the plateau by large bone holder clamp and percutaneous two screws fixation.

However, the potential added benefit of the arthroscope was the management of twelve menisci was injured among these sixteen fractures eight lateral and four medial meniscus treated by partial menisectomy and last four patient no associated soft tissue injury this is beside hematoma evacuation, removal of smaller chondral fragments, and direct visualization of the joint.

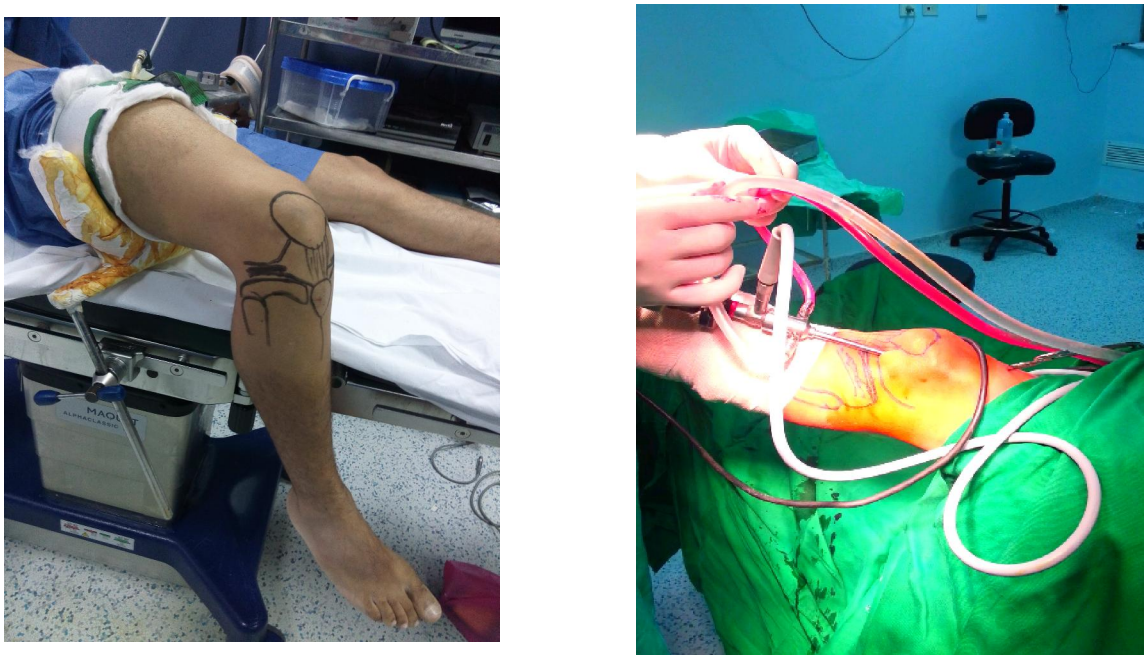


Fig. (8): a)The patient is in the supine position on a flat radiolucent table with thigh over leg holder. b) Washing of fracture hematoma.

B- Schatzker Type II Fractures (Lateral Split With Depression):

(Of the three types of lateral plateau fractures, split depression fractures have slightly poorer outcomes than split or local compression fractures partially because of the likelihood of these occurring in elderly patients and partly because some very severe lateral plateau injuries are in this category).

This fracture type which has a specific pattern referred to lateral split beside articular surface depression which formed difficulties in arthroscopic reduction particularly in these fractures with comminuted depressed articular surface of that study; while the other fractures with milder degrees of depression have less comminution were more easily addressed arthroscopically.

The arthroscopic approach obviates the need for detachment of the anterior portion of the lateral meniscuses which cover and overlap the plateau and this could be avoided by retraction of the meniscus using meniscal retractor or sutures.

The depressed central plateau is accessed through either medial or lateral cortical windows with the goal of elevating the major fragments, maintaining enough supporting subchondral bone for fixation, and maintaining a congruous surface.

We used for this reduction the basic tools of A.C.L reconstruction as the following:-

The basic sequence involved initially placing a guide wire up through metaphyseal bone to the apex of the fragment using an A.C.L guide; Once position is checked arthroscopically, the cortical window is created with a reamer which introduced manually or using a power tool, up to 2 cm below the depression. To cut out a cancellous bone core, which is then gently packed subchondrally using a bone impactore. Elevation was performed very gently, under fluoroscopic and arthroscopic guidance. Once the reduction was obtained temporary stabilization was achieved using one or two pins introduced 1 cm below the joint surface. Pin position was evaluated on anteroposterior and lateral fluoroscopy views (Fig. 9).

After impaction of autologous iliac crest bone grafting from the iliac bone (in 15 cases) and allograft(in 11 cases); Lateral buttress plates were used for fixation of comminuted depressed articular surface with split fracture type, using minimal invasive technique; while percutaneously two cancellous or cannulated screws were used for fixation of fractures with milder degrees of depression and have less comminution.

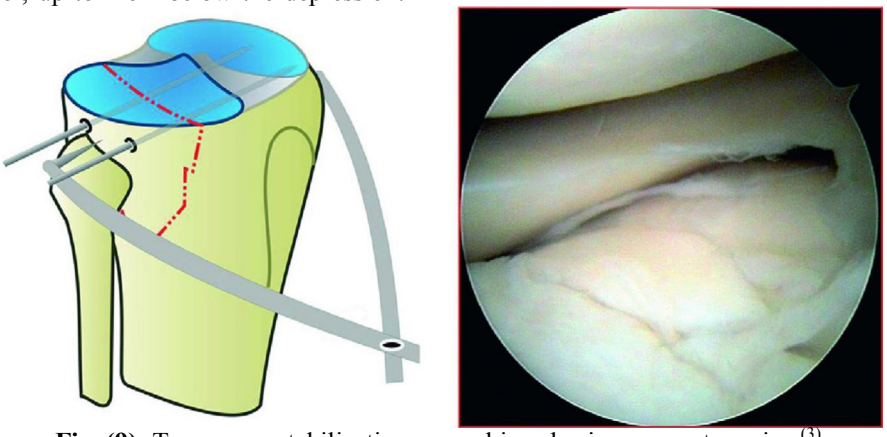


Fig. (9): Temporary stabilization was achieved using one or two pins [3].

C- Schatzker type III fractures (lateral plateau central Depression):

In our study these fractures type (6 patients) were similar in many ways to the type **II** fractures in their surgical technique with the sequence of guide wire placement, fracture access via reamer and serrated hollow trephine cutter, elevation with bone impactor, temporary fixation percutaneously, bone grafting, and four of them were fixed with two cannulated or cancellous screws and washers and last two patients fixed by external fixator (ilizarov).

D- Schatzker type V fractures (lateral &medial plateau fracture).

In that study, there were two patients with type **V** fracture, all of them underwent to ARIF technique, and there were no associated articular surface depression. Avulsion of ACL was present in the two case (fixation was done in the same procedure), all cases were fixed buttress plates & screws on one side and cancellous screws and washers on the other side.

Treatment of other lesions

In all cases associated intra-articular pathology was noted and treated in the appropriate sequence after fracture fixation.

Meniscal lesions:

Meniscal tears considered for repair by arthroscopically if located within 5 mm of the menisco synovial junction, because there is a good chance of healing as the following:-

- Meniscal suturing were done for repairable six menisci; conven- tional methods for arthroscopic meniscal suturing were used in the form of *(In Out In)*technique.
- Partial meniscectomy and trimming were done for twenty menisci as meniscal suturing were not feasible.

Postoperative care & Rehabilitation

Drainage necessary except in few cases, there was no need for posterior splint and mid thigh mid leg bandage was satisfactory; then patient was transferred to Recovery room.

In Recovery Room:

The patient was observed by a nurse and pulse oximeter was used to record the pulse & oxygen saturation in addition, the blood pressure was checked and patient controlled analgesia was started.

In the ward:

Patient controlled analgesia was continued for the first 24-48 hours; elevation of the operated limb, peripheral circulation and vital data were observed and recorded.

Rehabilitation:

The physiotherapist saw the patient on the morning of the first postoperative day and the following protocol was usually applied:-

- *First 48 hours postoperative.*

1- Chest check and chest exercises.

2- Venous foot pumps, if ankle swelling was developed.

3- Compressive ice and a postoperative knee brace were applied Cold therapy was ongoing and ***Continuous Passive Motion*** (CPM) was initiated on the morning of the first postoperative day.

4- Dressing and removal of portovac.

- *Third postoperative day.*

All of the patients were mobilized with crutches without weight bearing.

- *On discharge.*

Hospital stay length ranged from 2 to 5 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 or discharge from the wound and lastly patient was stressed on that; weight bearing was delayed until there was radiological evidence of healing of the fracture, generally at about 8 to 10 weeks.

Results

According to data of the patients; there was no significant relation between patient age, gender, or injured limb.

A- Clinical Assessment:

Table (10): Clinical outcome of study with 96% satisfactory results.

		Frequency	Percent
Valid	Excellent	29	58
	Good	19	38
	Fair	2	4
	Total	50	100

Of our 50 patients, The mean clinical Rasmussen score was 26(range, 21–30). 29 had excellent results 58.0%, (14 type I, 11 type II, and 4 type III) 19 had good results38.0% (2 type I, 15 type II,2 type III) and 2 had fair results4% (2type IV); in total, 48 patients (96%) achieved satisfactory results table (10). The difference between results in these group were not statistically significant (P = 0.000).

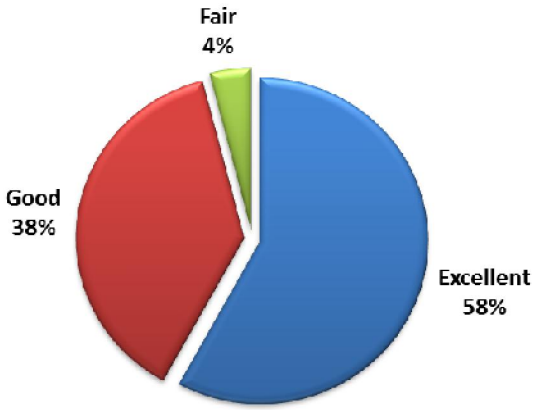


Fig. (10): Clinical outcome of the cases.

Table (11): Clinical results regarding fracture type.

			Clinical Result			Total
			Excellent	Good	Fair	
Type of Fracture	I	Count	14	2	0	16
		% within Type of Fracture	94.10%	5.90%	0.00%	100.00%
	II	Count	11	15	0	26
		% within Type of Fracture	44.00%	56.00%	0.00%	100.00%
	III	Count	4	2	0	6
		% within Type of Fracture	70.00%	30.00%	0.00%	100.00%
	V	Count	0	0	2	2
		% within Type of Fracture	0.00%	00.00%	100.00%	100.00%
Total		Count	29	19	2	50
		% within Type of Fracture	58.00%	38.00%	4.00%	100.00%

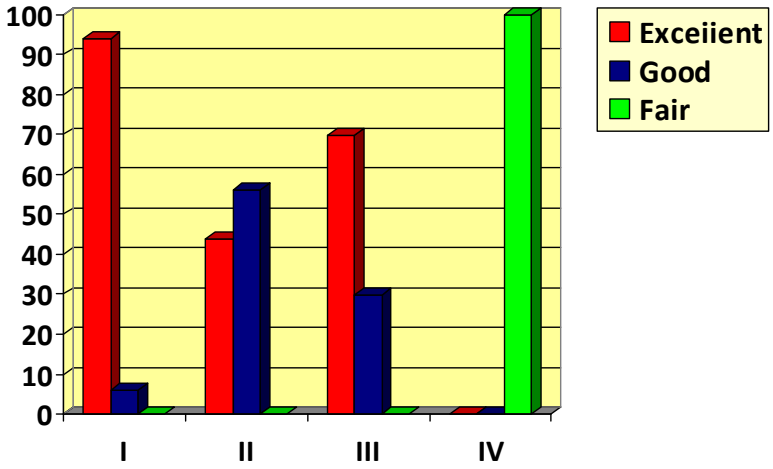


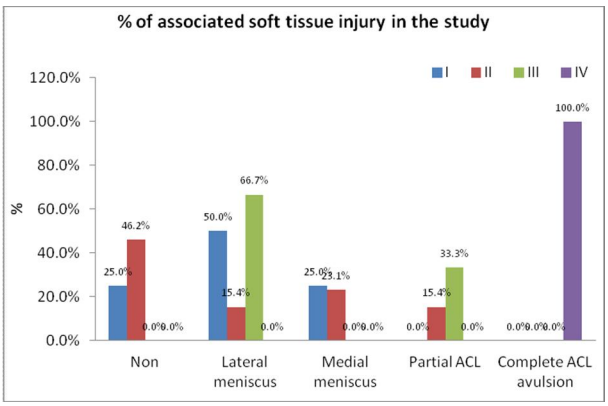
Fig. (11): Clinical outcome regarding fracture type.

Associated concomitant soft-tissue injuries

Type of fractures cross tabulated with associated soft tissue injury by count and percentage of parameters with (P-value<0.04) that means significant difference between associated soft tissue injury according to the types of fracture **Fig. 12(a, b) Table 12.**

Table (12): Associated soft tissue injury with Type of fractures cross tabulation.

Group		Associated soft tissue injury					Total	P. Value
		Non	Lateral meniscus	Medial meniscus	Partial ACL	Complete ACL avulsion		
I	Count	4	8	4	0	0	16	0.04*
	%	25.0%	50.0%	25.0%	0.0%	0.0%	100.0%	
II	Count	12	4	6	4	0	26	
	%	46.1%	15.4%	23.1%	15.4%	0.0%	100.0%	
III	Count	0	4	0	2	0	6	
	%	0.0%	70.0%	0.0%	30.0%	0.0%	100.0%	
IV	Count	0	0	0	0	2	2	
	%	0.0%	0.0%	0.0%	0.0%	100.0%	100.0%	
Total	Count	16	16	10	6	2	50	
	%	32.0%	32.0%	20.0%	12.0%	4.0%	100.0%	



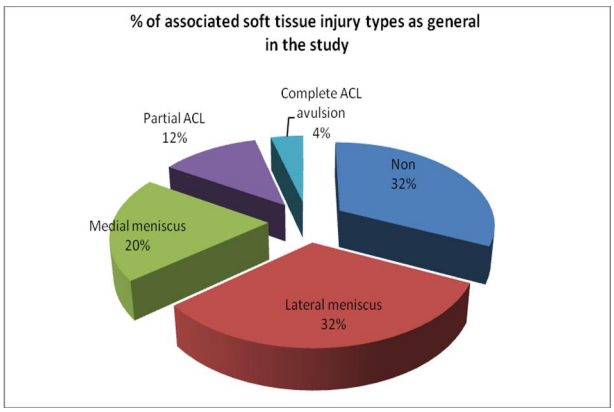


Fig. (12): A) Associated soft tissue injury in the study, B) Associated soft tissue injury types as general in the study.

The menisci were treated both by suturing or partial meniscectomy; Avulsed A.C.L was fixed during the procedure and the six partial A.C.L were treated conservative.

Complications

All 50 patients in our study were treated by use of arthroscopy-assisted surgery, and the associated soft-tissue injuries were accurately diagnosed during surgery with the following complications.

- ***Infection;*** which was reported in 1case.
- ***Compartment syndrome***; reported in 1 case and improved with conservative management. Without intervention.
- ***Peroneal nerve neurapraxia;*** it was encountered in 2 cases and this transient peroneal nerve injury may occurred due to local swelling from the fracture hematoma. Improved spontaneously.

Table (13): Complications of the cases among study.

		Frequency	Percent
Valid	Compartment syndrome	1	2%
	Infection	1	2%
	None	46	92%
	Parethesia over Lat calf of leg	2	4%
	Total	50	100%

Of the patients, 45 (95%) reported that they were able to return to normal work and subjectively reported satisfaction with the treatment, 5 were only mildly satisfied (5%).

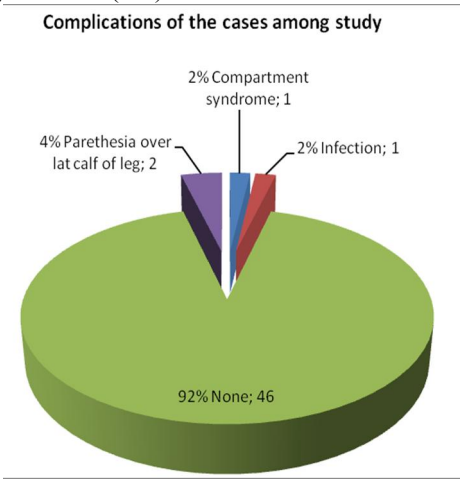


Fig. (13): Complications among the study.

B- Radiologic Assessment:

Radiologic results were excellent or good in 96% of cases; excellent results (22 cases 44.0%) and good results (26 cases 52.0%), and fair results in the other group (2 cases 4%) which had the worst results, the group differences were not statistically significant (P = 0.000). The mean radiological Rasmussen score were 17, with satisfactory results (*P* >.05). The mean time to achieve union was 9.12 weeks (range, 8 to 12 weeks).

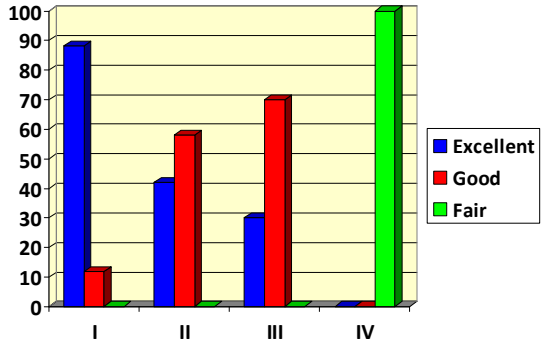


Fig. (14): Radiological results with the fracture type.

Table (14): Radiological results with the fracture type.

			Radiographic Result			Total
			Excellent	Good	Fair	
Type of Fracture	I	Count	14	2	0	16
		% within Type of Fracture	88.20%	11.80%	0.00%	100.00%
	II	Count	10	16	0	26
		% within Type of Fracture	42.00%	58.00%	0.00%	100.00%
	III	Count	2	4	0	6
		% within Type of Fracture	30.00%	70.00%	0.00%	100.00%
	IV	Count	0	0	2	2
		% within Type of Fracture	0.00%	00.00%	100.00%	100.00%

Table (15): Comparison of the results.

	Gill T. J., et al.	Pogliacomi F, et al.	Chan and Yuan	Our study
No. of patients	29 patients	18 patients	54 patients	50 patients
Mean age	45 years	49 years	48 years	29 years
Mean follow up period	24 months	12 months	87 months	10 months
Associated Injuries	16(64 %)as;8 LMt,1 MMT, 1MCL, 5ACL, 1complete tear ACL	7 (39%); as 4LMT,1MMT, 1ACL &,1 PCL tear	(65 %) as; 21 meniscal tear(15 LMT,3MMT); 8 partial ACLT, and 1 MCLT	21(42%) as;16LMT, 10MMT,6ACLT and two avulsion ACL
Hardware fixation	Only 3 AO 7.3 mm cannulated screws and washers for each case	Only two cancellous bone screws for each case	Either by buttress plate & screws or cannulated and cancellous screws	Either by buttress plate & screws or cannulated and cancellous screws
Type of Fracture (Schatzker classification)	two Type I, five Type II, 16 Type III, and two Type IV	4 type I, 6type II 6type III, and 2 type IV	1 typeI,21 type II,4type III,10 type IV and 10, 8type V were type VI	16 type I,26 type II,6 type III and 2 type V
Mean time to union (wk)	Not reported	Not reported	10 Wks	9Wks
Mean Clinical (Rasmussen Score)	**27.5** as 76% excellent,16% good and 8% was fair	45% excellent,37% good, 12%fair and 6% were poor	**28.4** as; 943% excellent, 3% good and 3% fair	**29** as;58.0% excellent, 38% good and 4% fair
Mean Radiographic (Rasmussen Score)	Not reported	5 (29 %)excellent, 7(39%)good, 4(32%) fair and 2(16%) were poor	**16,1** as 59% excellent, 33% good, and 8% were fair	**17** (96%) as; excellent (22 cases 44.0%) and good (26 cases 52.0%), and fair (2 cases 4%)
Void filler	Bone graft substitute in 17 patients (64%)	2 patients autologous bone grafting	(55%) received autogenous iliac bone graft alone and 23 (43%) received allogeneic bone graft.	21 (42%) received autogenous iliac bone graft; (13 type II,6 type III and 2 type V)
Pos op. Complications ***Compartment syndrome***	Two patients			One cases
Infection				One cases
Stiff knee				
Articular surface depression	One patient	Two cases	One case	No case
Neurological complications			5 cases of peroneal nerve neurapraxia	2 cases of peroneal nerve neurapraxia
Vascular complications				
Post-operative Osteoarthritic Changes	one patient	Two cases mild & one mild to moderate	10 cases (19%) as;7 knees mild and 3mild to moderate	Not reported

Discussion

As with any other intra-articular fracture, the tibial plateau fracture is always challenging for orthopaedic surgeons, because of its widely varying trauma, and associated soft-tissue injuries.

Open reduction introduces tremendous complication risks, especially in wound healing after traditional dissections. Previous surgical methods achieved satisfactory results in 70% - 80% of cases and have a high incidence of complications including loss of reduction, pin-tract infections, deep infection, and septic arthritis [4].

Arthroscopy-assisted surgical treatment for tibial plateau fractures is becoming more common. with the assistance of arthroscopy, the articular surface is easily observed after irrigation without detaching the

menisci. The intra-articular structures can be thoroughly examined while fragments are fixated with minimal soft-tissue dissection [5]. **Tscherne** and **Lobenhoffer 1993** suggested that major treatment objectives should be reconstructing articular surfaces, obtaining stable fixation for early motion, and repairing all concomitant lesions [6]. **Buchko et al.** recommended that joint congruity and stability should be the main treatment consideration [7].

Ohdera in **2003** concluded that there were no significant differences between both treatments in terms of duration of surgery, postoperative flexion and clinical results. On the other hand, he demonstrated an easier and faster postoperative rehabilitation and the possibility to diagnose and treat any associated joint pathology [8].

Honkonen in **1994** described criteria for surgical intervention in tibial plateau fractures, which were: step off equal to or exceeding 3 mm in the articular surface, condylar widening of up to 5 mm, or a lateral tilt exceeding 5°c [3]. This table show the Comparison of the result between our work and another study table (15).

Summary

Tibial plateau fractures have always been a challenge for orthopedic surgeons. These fractures may be difficult to manage and, although these lesions are relatively rare representing approximately 1% of all fractures, the consequences of an inadequate treatment can be serious.

In any case, the goals of treatment are restoration of normal alignment, joint congruity, joint stabilization and, ultimately, the prevention of degenerative osteoarthritis. A precise reduction and a stable fixation of the fracture fragments, obtained through out a good visualization of the articular surface with minimal dissection, can help to achieve these goals and allows early mobilization and a faster recovery.

These advantages include: *better visualization of the articular surfaces, better reduction of the fracture, better anatomical restoration of the joint surface, the possibility to assess and treat the associated intra-articular ligamentous and meniscal injuries, the possibility, through joint lavage, to remove loose fragments,* the possibility to achieve stable fixation with the least amount of soft-tissues dissection, low risk of complications and low morbidity, the possibility of converting to arthrotomy if necessary and shorter hospital stay with faster recovery of joint motion.

Conclusion

In agreement with other workers we concluded that ARIF technique was highly suggested to do in tibial plateau fracture (Schatzker type I and III), suggested to do in non comminuted type II, while it is not recommended in comminuted type II and not suggested to do in the other three types (Schatzker type IV, V and VI) due to difficulty in reduction, high susceptibility of arthroscopy fluid extravasation and compartment syndrome.

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