Elevation of depressed tibial plateau fractures using rafting one-third of the tubular plate

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Background
Tibial plateau fracture is an intra-articular fracture for which the treatment requires not only anatomical reduction but also reliable fixation to maintain the position of the articular surface. The work aimed to study the effects and benefits of using one-third of the tubular plate as a rafting plate for elevation of the depressed (especially comminuted) tibial plateau fractures to avoid subsidence and collapse of the articular surface even with reliable subchondral fixation.

Patients and methods
This prospective case series study included 30 patients aged from 21 to 50 years old with closed depressed tibial plateau fractures (Schatzker type II, III, IV, and V) diagnosed by radiographs and computed tomography scan with no other skeletal injuries in the lower limb, mean±SD period from injury to surgery was 3.33±0.33 days. Radiological examination was performed using plain radiograph of the knee joint, and computed tomography scans with three dimensional for all patients. Rasmussen clinical and radiographic scoring systems were used for outcome evaluation. Minimum follow-up period was 3 months, and the maximum follow-up period was 12 months. In this study, Kirschner wires were used for temporary fixation. Also one-third tubular plate was used as a rafting plate for the elevation of the depressed tibial plateau fracture through making an osteotomy in the tibia (not <5 mm subchondral) or through the fracture itself. The plate was placed subchondral into the bone straight, then it was bent over the tibia (acting as a lever for elevating the depressed fracture). At the end, the plate was fixed to the tibia by two or three screws.

Results
Rasmussen's clinical score at 3 months was excellent in eight (26.7%) cases, good in 13 (43.33%) cases, fair in six (20%) cases, and poor in three (10%) cases. Rasmussen's clinical score at 6 months was excellent in 14 (46.66%) cases, good in 12 (40%) cases, fair in two (6.67%) cases, and poor in two (6.67%) cases. Rasmussen's clinical score at 12 months was excellent in 16 (53.33%) cases, good in 10 (33.33%) cases, fair in two (6.67%) cases, and poor in two (6.67%) cases. Rasmussen's radiographic score at 3 months was excellent in four (13.33%) cases, good in 11 (36.67%) cases, fair in nine (30%) cases, and poor in six (20%) cases. Rasmussen's radiographic score at 6 months was excellent in seven (23.33%) cases, good in 18 (60%) cases, fair in two (6.67%) cases, and poor in three (10%) cases. Rasmussen's radiographic score at 12 months was excellent in 17 (56.66%) cases, good in eight (26.67%) cases, fair in three (10%) cases, and poor in two (6.67%) cases. There was a significant relation between smoking and union after 3 months (P<0.001) as smokers had experienced delayed union. There was a significant relation between medical history and Rasmussen's clinical score at 12 months (P=0.028). There was a significant relation between medical history and Rasmussen's radiographic score at 12 months (P=0.014). There was no relation between age and Rasmussen clinical or radiographic scores at 3, 6, and 12 months. There was no relation between sex and Rasmussen clinical or radiographic scores at 3, 6, and 12 months.

Conclusions
The usage of the rafting plate to support the tibial plateau articular surface after the open reduction of depressed articular fractures is associated with good clinical and radiological outcomes and a low incidence of articular surface subsidence at 12 months postoperative.

Keywords:
depressed tibial plateau fracture, hypothesis, one-third tubular plate, rafting plate, subchondral

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Introduction

Tibial plateau fracture requires not only anatomical reduction but also reliable fixation to maintain reduction of the articular surface and allow early function rehabilitation [1–3]. However, inappropriate treatment of the fracture can lead to limited movement, articular degeneration, and long-term pain [4].

The stability of the fixation construct could be improved using a fixed angle locking stabilization system and rafting-type fixation for maintaining the reduction of the tibial plateau [5].

The basic concept of subchondral rafting involves the use of up to four 3.5-mm cortical screws placed within 5 mm of the tibial plateau subchondral bone in the axial plane to support subsequent redisplacement of the articular surface [6].

In a recent study, it was shown that fractures fixed with screws closer to the joint were correlated with less articular subsidence. However, articular comminution has been associated with increased articular subsidence despite an adequate screw-joint distance [1–3].

The work aimed to study the effects and benefits of using one-third tubular plate as a rafting plate for elevation of the depressed (especially comminuted) tibial plateau fractures. We hypothesize that the placement of wider support in the subchondral area of the tibial plateau could create a more stable construction for fragmented articular central depression fragments of the tibial plateau, thus reducing the risk of subsidence [7].

Patients and methods

This prospective case series study was carried out on 30 patients (21 males, nine females), aged from 21 to 50 years old. Inclusion criteria were closed tibial plateau depressed fractures (Schatzker type II, III, IV, and V).

According to three column classification: zero column (Schatzker type III), one column (Schatzker type II), two columns (some of Schatzker type II and type IV), and three columns (Schatzker type V) diagnosed by radiographs and computed tomography (CT) scan, patients with no other skeletal injuries in the lower limb and patients who underwent early surgical intervention (time from injury to surgery <14 days). The study was conducted from April 2022 to April 2023 after approval from the Ethical Committee of Tanta University Hospitals. Informed written consent was obtained from all patients.

Exclusion criteria were skeletally immature patients, patients with radiographic signs of osteoarthritis (Kallgren–Lawrence grade >2), neglected tibial plateau fractures (after 14 days of trauma), associated ligamentous injuries, open tibial plateau fractures, and associated neurovascular injuries.

Radiological evaluation included anteroposterior and lateral plain radiograph of the knee joint and CT scan with three-dimensional reconstruction.

Technique

General or spinal anesthesia was used according to the patient's general condition and the anesthesiologist's preference. With the induction of the anesthesia, all the patients were given a prophylactic dose of antibiotics before the application of the tourniquet.

The patient was placed supine on a radiolucent operating table.

The anterolateral approach of the proximal tibia was used when the depressed fragment was more accessible from the lateral approach by making a skin incision 2–3 cm above the knee joint, then curved down towards the tibial tubercle passing over the Gerdy's tubercle (iliotibial band insertion) then continued distally lateral to the tibial crest.

The medial approach of the proximal tibia was used only in cases with medial tibial plateau fracture (Schatzker type IV).

Regarding the medial approach, the skin incision began from the medial femoral epicondyle, about 2–3 cm over the joint line, and ended 2 cm posterior to the tibial crest. The sartorial fascia was incised in a straight line parallel to the skin incision. The pes anserinus, superficial and deep layers of the medial collateral ligament were identified, preserved as much as possible, and repaired if needed after fixation of the fracture. Laterally, the deep fascia anterior to the iliotibial band was opened, and the iliotibial band was sharply incised or detached from its insertion at Gerdy's tubercle and reflected anteriorly. Then, the tibialis anterior muscle was retracted posteriorly.

Capsulotomy was done through a horizontal incision between the menisco-capsular part of the meniscus (which was tagged by sutures) and the tibia. A submeniscal approach was used to properly visualize articular surface depression.

A submeniscal arthrotomy is performed, and great care not to injure the meniscus. The arthrotomy should involve only the anterior aspect of the joint.

A small portion of the coronary ligament should be left attached to the plateau to aid in later meniscal repair. Placement of a full-thickness stitch through the peripheral portion of the meniscus will aid in retraction and improve visualization of the joint surface.

After proper exposure, the reduction of the depressed articular fragment was done either through direct manipulation from the metaphyseal split or indirectly through a bone window created at the anterolateral tibial surface.

Kirschner wires were used as temporary fixation, followed by the application of a one-third tubular plate as a rafting plate to maintain the reduction of the elevated tibial plateau fragments through the subchondral void created after the elevation of the depressed fragments. The plate was placed straight beneath the subchondral bone, then bent over the outer tibial cortex (acting as a lever for elevating the depressed fracture), at the end the plate was fixed to the tibia by two or three screws. Intraoperative C-arm fluoroscopy was used to assess the reduction (Fig. 1a). After securing the reduction, a pre-contoured locking plate was placed anterior or posterior to the one-third tubular plate to buttress the metaphyseal fragment and checked with an image intensifier (Fig. 1b). With the fracture reduced and fixed, the meniscus was sutured back to the tibial plateau, the capsule and the iliotibial band were closed, and a drain was inserted and kept for 48 h.

Postoperative care

Early postoperative protocol included

Cooling, limb elevation, monitoring of the neurovascular state, and a hinged knee brace was applied the second day after surgery to allow early range of motion as tolerated. Patient was kept nonweight bearing for 6 weeks followed by partial weight bearing until full radiological consolidation, radiographs were obtained the second day of surgery, 6 weeks, 3 months, and 12 months postsurgery. All patients received oral anticoagulants during the period of nonweight bearing.

Statistical analysis

Statistical analysis was done using SPSS v26 (IBM Inc., Chicago, Illinois, USA). Shapiro–Wilks test and histograms were used to evaluate the normality of the distribution of data. Quantitative parametric data were presented as mean and SD. Quantitative nonparametric data were presented as the median and interquartile range. Qualitative variables were presented as frequency and percentage.

Results

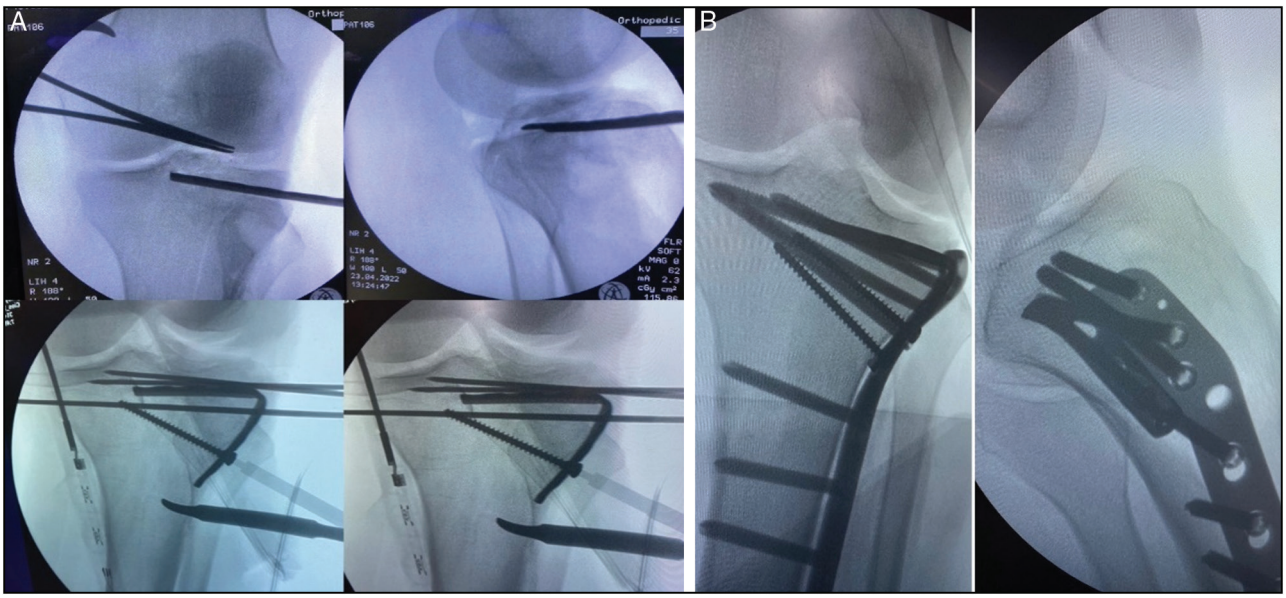
Patient demographics

The age of the patients in this work ranged from 21 to 50 years. There were 21 (70%) males and nine (30%) females with male to female ratio (3: 1). According to Schatzker classification: 20 (67%) cases had type II fracture, six (20%) cases had type III fracture, three (10%) cases had type IV fracture, and one (3%) case had type V fracture (Table 1).

Time lag

The mean time from injury to surgery was 3.33±0.33 days. The duration of operation with a mean±SD value of 102.67.±9.24 min (Table 2).

Figure 1



Intraoperative C-arm fluoroscopy images to assess the reduction.

Table 1 The distribution of the patients according to age, sex, side affected, mechanism of injury, fracture type, medical problems, and smoking

	n (%)
Age (years)	
21–<30	16 (53)
30–<40	9 (30)
40–<50	5 (17)
Sex	
Males	21 (70)
Females	9 (30)
Smoking	14 (47)
Side affected	
Left	18 (60)
Right	12 (40)
Mechanism of injury	
RTA	16 (53)
FFH	9 (30)
Twisting	5 (17)
Fracture type	
Type II	20 (67)
Type III	6 (20)
Type IV	3 (10)
Type V	1 (3)
Medical problems	
Absent	24 (80)
Present	6 (20)

FFH, falling from height; RTA, road traffic accident.
Type II: lateral split depression. Type III: lateral depression. Type IV: medial plateau fracture. Type V: bicondylar tibial plateau fracture.

Clinical and radiological evaluation

It included range of motion which was more than 60° in two (6.67%) patients, more than 90° in six (20%) patients, more than 120° in nine (30%) patients, and more than 140° in 13 (43.33%) patients. Rasmussen's clinical score at 12 months was poor in two (6.67%) patients, fair in two (6.67%) patients, good in 10 (33.33%) patients, and excellent in 16 (53.33%) patients.

Rasmussen's radiographic score was poor in two (6.67%) patients, fair in three (10%) patients, good in eight (26.67%) patients, and excellent in 17 (56.67%) patients (Table 2).

Complications

Complications included a malpositioned plate in one (3.33%) patient. Occasional postoperative pain in five (16.67%) patients, constant pain in two (6.67%) patients. One case with infection and one case with neurological complication had fair Rasmussen clinical and radiographic scores. One case with stiffness had good Rasmussen clinical and radiographic scores. Two cases with nonunion had poor Rasmussen clinical and radiographic scores. After 12 months, six out of 10 cases with delayed union improved to good union (Table 2).

Table 2 Time Lag, duration of operation of the studied patients, complications, range of movement of the studied patients, Rasmussen clinical score, and Rasmussen radiographic of the studied patients at 12 months and union after 3 and 12 months

	N=30
Time lag (days)	3.3±0.33
Duration of operation (min)	102.7±9.24
Complication	
Preoperative	0
Intraoperative	
Malposition of 1/3 plate	1 (3.33)
Postoperative pain	
Occasional pain	5 (16.67)
No pain	23 (76.67)
Constant pain	2 (6.67)
Postoperative complication	
Infection	1 (3.3)
Stiffness	1 (3.3)
Neurological complications (Neuropraxia)	1 (3.3)
Nonunion	2 (6.7)
Range of movement	
> 60 deg.	2 (6.67)
>90 deg.	6 (20)
>120 deg.	9 (30)
>140 deg.	13 (43.33)
Rasmussen clinical score	
Poor	2 (6.67)
Fair	2 (6.67)
Good	10 (33.33)
Excellent	16 (53.33)
Rasmussen radiographic score	
Poor	2 (6.67)
Fair	3 (10)
Good	8 (26.67)
Excellent	17 (56.67)
At 3 months	
Union	
Delayed	10 (33.33)
Good	18 (60)
Poor	2 (6.67)
At 12 months	
Union	
Delayed	4 (13.33)
Good	24 (80)
Poor	2 (6.67)

Data are presented as *n* (%).

Rasmussen's clinical score and Rasmussen's radiographic score were significantly different between different measurements (P<0.001). It was significantly higher at 6 and 12 months compared to 3 months (P<0.001) (Table 3).

Rasmussen's clinical score at 3 months was excellent in eight (26.7%) cases and remained with the excellent scores after 6 and 12 months. However Rasmussen's radiographic score at 3 months was excellent in four (13.33%) cases and remained with excellent scores after 6 and 12 months (Table 4).

Table 3 Rasmussen clinical and radiographic score measurements of the studied patients

	At 3 months	At 6 months	At 12 months	*P* value
Rasmussen clinical score	22.5 (18.25–26.75)	25.5 (22–28)	27.5 (24–29)	<0.001*
Rasmussen radiographic score	6.5 (5–8)	7.5 (6.25–8.75)	9 (7–9)	<0.001*

Data are presented as median (interquartile range).
*Significant *P* value less than or equal to 0.05.

Table 4 Rasmussen clinical score and Rasmussen radiographic score of the studied patients

	At 3 months	Fair		Good		Excellent		*P* value
		At 6 months	At 12 months	At 6 months	At 12 months	At 6 months	At 12 months	
Rasmussen clinical score								
Poor	3 (10)	1 (33.3)	1 (33.3)	–	–	–	–	P_f=1.00
Fair	6 (20)	–	–	4 (66.7)	5 (83.3)	–	–	P_g=0.50
Good	13 (43.3)	–	–	–	–	4 (30.7)	8 (61.5)	P_e=0.12
Excellent	8 (26.7)	–	–	–	–	8 (100)	8 (100)	–
Rasmussen radiographic score								
Poor	6 (20)	–	–	2 (33.3)	2 (33.3)	1 (16.6)	2 (33.3)	–
Fair	9 (30)	–	–	–	–	6 (66.6)	4 (44.4)	–
Good	11 (36.6)	1 (9.1)	–	–	–	–	–	4 (36.3)
Excellent	4 (13.3)	–	–	–	–	–	–	4 (100)

Data are presented as *n* (%).
P_f: *P* value of fair between 6 and 12 months, P_g: *P* value of good between 6 and 12 months, P_e: *P* value of excellent between 6 and 12 months.

Table 5 Relation between Rasmussen radiographic score, smoking, and union after 3 months of the studied patients

	Rasmussen radiographic score				*P* value
	Poor	Fair	Good	Excellent	
Union, after 3 months					
Good	0	0	1 (3.3)	16 (53.3)	<0.001*
Delayed	0	2 (6.6)	7 (23.3)	1 (3.3)	
Poor	2 (6.6)	1 (3.3)	0	0	
Union, after 3 months					
	Good	Delayed		Poor	
Smoking	4 (13.3)	10 (33.3)		2(6.7)	<0.001*

Data are presented as *n* (%).

There was a significant relation between Rasmussen radiographic score, smoking, and union after 3 months (*P*<0.001) (Table 5).

There was no relation between age and sex with Rasmussen's clinical score also, with Rasmussen's radiographic score at 3, 6, and 12 months (Table 6).

There was a significant relation between medical history, Rasmussen clinical score, and Rasmussen radiographic at 12 months (*P*=0.028) (Table 7).

Case 1

An old male patient (38 years) presented with left lateral tibial plateau depression fracture (Schatzker type III) due to falling from height (FFH), with no pre-existing medical conditions nor associated injuries. Treated with the anterolateral approach of the tibial plateau using one-third tubular plate as rafting plate and proximal tibia locked plate with radiological union after 14 weeks. The postoperative radiographic Rasmaussen score was excellent (9/10), and the postoperative clinical Rasmaussen score was excellent (28/30). The range of movement was more than 120° (Fig. 2).

Case 2

An old male patient (30 years) presented with left bicondylar tibial plateau fracture (Schatzker type V) due to FFH. No pre-existing medical conditions or associated injuries. Treated with the anterolateral approach of the tibial plateau using one-third tubular plate as rafting plate and proximal tibia locked plate and percutaneous fixation of the medial tibial condyle using two cannulated screws with the radiological union after 12 weeks. Postoperative radiographic Rasmaussen score was excellent (9/10), and postoperative clinical Rasmaussen score was excellent (27/30). The range of movement was more than 140° (Fig. 3).

Table 6 Relation between age, sex, and Rasmussen clinical score of the studied patients

Rasmussen clinical score				*P* value
Age	At 3 months	At 6 months	At 12 months	
Poor	43.33±4.23	50	50	0.604
Fair	29.33±2.83	26.67±2.51	28.5±2.12	0.758
Good	31.92±2.75	32.23±3.14	31.5±2.3	0.968
Excellent	34.13±3.41	32.92±2.48	32.63±3.26	0.906
Sex				
Poor				
Male	2 (66.6)	1 (50)	1 (50)	0.907
Female	1 (33.4)	1 (50)	1 (50)	
Fair				
Male	5 (83.3)	2 (66.7)	1 (50)	0.632
Female	1 (16.7)	1 (33.3)	1 (50)	
Good				
Male	10 (76.9)	10 (76.9)	10 (100)	0.250
Female	3 (23.1)	3 (23.1)	0	
Excellent				
Male	8 (66.7)	8 (66.7)	9 (56.3)	0.801
Female	4 (33.3)	4 (33.3)	7 (43.7)	
Rasmussen radiographic score				
Age				
Poor	36±3.4	43.75±3.48	50	0.221
Fair	34.11±2.38	28±2.8	31±3.1	0.309
Good	30.64±2.78	31.62±3.18	29.89±2.54	0.834
Excellent	33.5±3.32	33.5±3.32	33.25±2.34	0.996
Sex				
Poor				
Male	5 (83.3)	3 (75)	1 (50)	0.641
Female	1 (16.7)	1 (25)	1 (50)	
Fair				
Male	5 (55.6)	4 (80)	3 (100)	0.294
Female	4 (44.4)	1 (20)	0	
Good				
Male	8 (72.7)	8 (61.5)	8 (88.9)	0.366
Female	3 (27.3)	5 (38.5)	1 (11.1)	
Excellent				
Male	3 (75)	6 (75)	9 (56.3)	0.591
Female	1 (25)	2 (25)	7 (43.7)	

Data are presents as mean±SD or *n* (%).

Table 7 Relation between medical history, Rasmussen clinical score, and Rasmussen radiographic at 12 months of the studied patients

	Medical history (DM)		*P* value
	Yes	No	
Rasmussen's clinical score at 12 months			
Poor (*N*=2)	2 (100)	0	0.028
Fair (*N*=2)	0	2 (100)	
Good (*N*=10)	2 (16)	8 (80)	
Excellent (*N*=16)	2 (12.5)	14 (87.5)	
Rasmussen radiographic score at 12 months			
Poor (*N*=2)	2 (100)	0	0.014
Fair (*N*=3)	1 (33.3)	2 (66.7)	
Good (*N*=9)	0	9 (100)	
Excellent (*N*=16)	3 (18.75)	13 (81.25)	
Poor (*N*=2)	2 (100)	0	

Data are presented as *n* (%).
DM, diabetes mellitus.

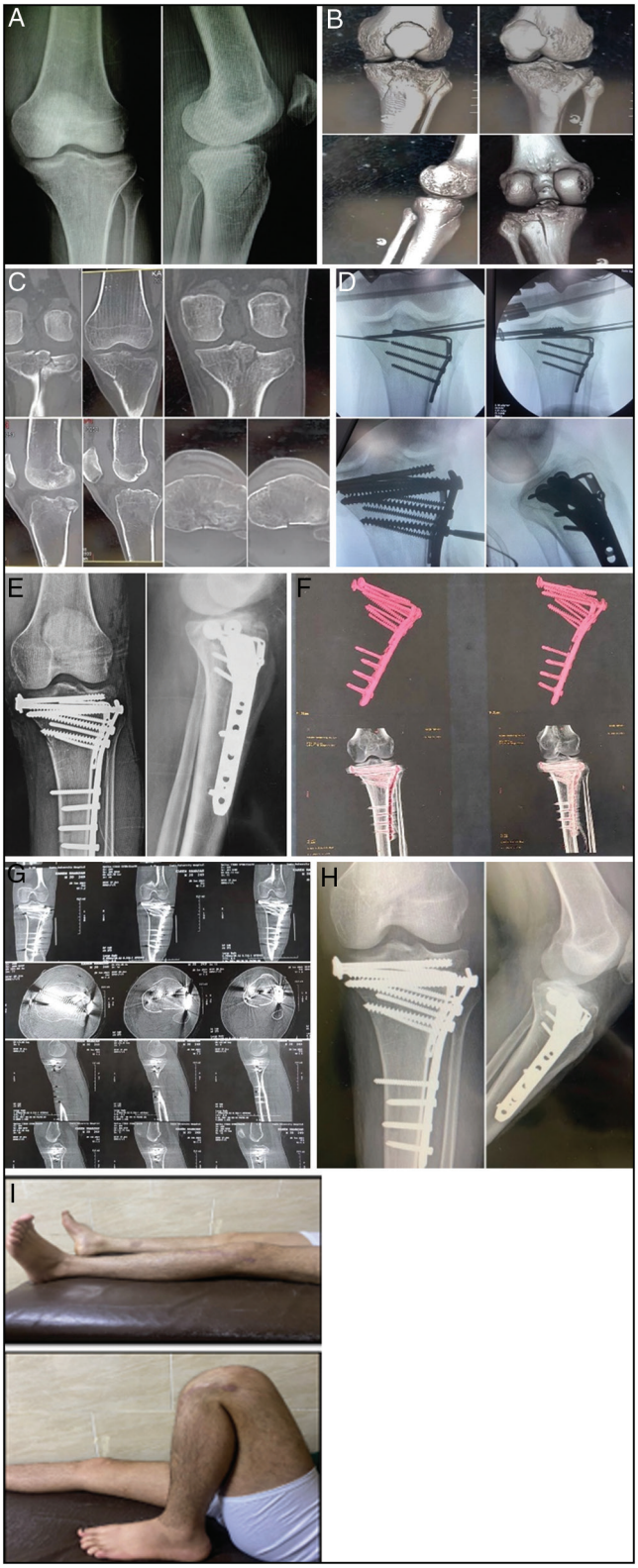
Figure 2

Case 1 showed preoperative (a) radiographs and (b) CT scan, (c) intraoperative fluoroscopy images, postoperative, (d) immediate radiographs, (e) 3D reconstruction, (f) CT scan, (g) follow-up radiographs after 12 months showing complete union, and (h) range of movement after 12 months. 3D, three dimensional; CT, computed tomography.

Discussion

Anatomical reduction of impacted articular fragments is a cornerstone concept in tibial plateau fracture. The most important finding of the study was that using a stable subchondral construct, such as one-third tubular plate in the comminuted depression of the plateau, had

Figure 3



Case 2 showed preoperative (a) radiographs, (b) 3D reconstruction, (c) CT scan, (d) intraoperative fluoroscopy images, (e) immediate postoperative radiographs, postoperative, (f) 3D reconstruction, (g) CT scan, (h) follow up radiographs after 12 months showing complete union, and (i) range of movement after 12 months. 3D, three dimensional; CT, computed tomography.

decreased the risk of subsidence of the articular surface after reduction compared to using rafting screws and had satisfactory clinical and radiographic outcomes.

In this study, the age of patients ranged from 21 to 50 years, with an average of 35.5 years and the highest incidence in the age group of 21–30 years (53%). Most literature discussing tibial plateau fractures had a similar age incidence as in this study. Lee *et al.* [8] showed that the mean age of tibial plateau fractures in patients was 43 years. Vasanad *et al.* [9] showed that the age incidence was 20–60 years, with maximum incidence in the productive age group of 31–40 years (50.25%).

Age and sex were not significant factors affecting clinical or radiographic outcomes of the patients. There was a significant relation between smoking and union after 3 months (P<0.001) as 17 patients were smokers and had delayed union after 3 months, and 13 patients were nonsmokers who had good union after 3 months.

In this study, males were more than females, with a ratio of 70 to 30%; this is in line with the study reported by Eggli *et al.* [10], who had 71% males and 29% females and also Walia *et al.* [11], reported high male predominance with male to female ratio 9: 1. This may be attributed to males are more liable for road traffic accidents and FFH injuries.

In this study, road traffic accident were the main cause of injury (53%), followed by FFH (30%), followed by twisting injuries (17%). This result was the same as that reported by Kayali *et al.* [12] and Kulkarni *et al.* [13]. However, Albuquerque *et al.* [14] reported that FFH was the main cause of injury. This could be due to a lack of awareness and recklessness, especially among young people, which leads to plenty of hazards.

Kulkarni *et al.* [13], Cross *et al.* [15], and Kayali *et al.* [12] used periarticular rafting screws only on Schatzker type II fracture tibial plateau (lateral split depression). However in the study of Langhi *et al.* [16], all samples were Schatzker type III (lateral depression). In this study, we had both types II and III with the incidence of 67 and 20%, respectively, and other types, including depressed tibial plateau fractures (Schatzker types IV, V, and VI), had an incidence of 13%, this is correlated with the study published in 2018 by Kripalani *et al.* [17], in which type II was 62% and type III was 38%.

Cross *et al.* [15] described the debate on ideal internal fixation for preventing subsequent loss of reduction during postoperative rehabilitation. Adequate maintenance in the postoperative period is important to avoid this outcome due to the risk of posttraumatic arthritis. The subchondral raft technique is a well-known method to resist depression and loss of reduction.

Two points are important to lower the arthritis rate: obtaining the anatomic joint line and normal mechanical axis during surgery and maintaining this reduction throughout the healing period [15–18].

In this study, the functional and radiographic results were promising. According to the functional Rasmussen score, the functional results ranged from 9 to 30 points and the mean was 27.5 points. Satisfactory results were 86.66% (53.33% were excellent and 33.33% were good), while nonsatisfactory results were 13.34% (6.67% fair and 6.67% poor). According to the radiographic Rasmussen score, the radiographic results ranged from 5 to 10 points and the mean was 7.93 points. Satisfactory results were 83.34% (56.67% were excellent and 26.67% were good), while nonsatisfactory results were 16.66% (10% fair and 6.66% poor).

Kripalani *et al.* [17], recommended use of rafting screws without bone graft or bone substitute in Schatzker types II and III. The authors found significant results, according to the functional Rasmussen score; 90.5% of patients had satisfactory results, while only 9.5% had nonsatisfactory results, which were quite the same as our results. Also, according to the radiographic Rasmussen score, 90.5% satisfactory results and 9.5% nonsatisfactory, which were quite the same as our radiographic results.

Kulkarni *et al.* [13] reported that the use of a periarticular raft construct in anatomically reduced split-depression tibial plateau fractures (Schatzker type II) provided sufficient rigidity and prevented collapse, irrespective of the underlying bone quality. According to the functional Rasmussen score, 94.7% had excellent and good results, but 5.3% had fair results. According to the radiographic Rasmussen score, the authors found the same results as the functional score.

Accordingly, one can say that a rafting plate in fixation of Schatzker type II lateral split depression and type III pure depression fractures is far better than using an angle locking plate only (buttress plate), even with bone graft, and it supports the subchondral bone from collapsing also avoiding complications related to bone graft.

Limitations: small sample size, noncompliance of the patients with follow-up appointments, short time of the patients' follow-up, which did not cover any possible future complications

Conclusions

Using subchondral one-third tubular plate as a rafting plate for elevation of the depressed tibial plateau fractures is an effective method, especially in fragmented articular central depression.

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Nil.

Conflict of Interest
There are no conflicts of interest.

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