

Research Article

The Prognosis of Management Following Tibial Plateau Fractures

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Abstract

Background: Tibial Plateau Fractures (TPF) consist for one percent of all treated fractures. Open Reduction Internal Fixation (ORIF) and reconstruction of articular surfaces are the mainstay of management. In this study, we sought to assess the risk of identifying cases with high risks for poor postoperative outcomes.

Methods: A total of 123 tibial plateau fractures treated at the Basrah Teaching Hospital were prospectively enrolled. The demographics, injury data, surgical management and SMFA scores were obtained. Variables included sex, age, BMI, comorbidity, open fracture, high-energy injury mechanisms, vascular or nerve injuries, residual TP depression, tibial spine fracture and OTA fracture types.

Results: Morbidity was recorded in 55(44.7%) patients. Seventy-one patients smoked during the study period. The high-energy mechanism of trauma was documented in 55.3% of cases, whereas low-energy was found in 44.7% of cases. Compartment syndrome was reported in 34.1% of cases. Open fractures were observed in 32.5% of the cases. The tibial spine was involved in 29.3% of cases. OTA class (C) was more frequently reported than class (B) (63.4% vs. 36.6%). Residual tibial plateau depression was reported in 43.1% of cases. The preoperative fracture depression range value was 1-39 mm while the postoperative fracture depression range was 0-5.5 mm.

Conclusion: SMFA score was used to assess the risk of postoperative dysfunction. Older age, obesity, severe comorbidity, tobacco smoking, alcohol consumption, high trauma energy, large postoperative depression, tibial spine involvement, female sex, complicated open fracture, type C fracture and high SMFA score are predictive risk factors for poor outcomes.

Conflict of Interest declaration:

The authors declare that they have no affiliations with or involvement in any organization or entity with any financial interest in the subject matter or materials discussed in this manuscript.

Keywords: TPF; Open-Reduction-Internal-Fixation; Articular Surfaces; Fracture Depression; OTA Class

Introduction

TPF accounted for one percent of all fractures treated, with annual incidence of 10.3/100,000 [1,2]. ORIF and reconstruction of articular surfaces are the mainstay [3-5]. In the literature, the most commonly evaluated outcome is the functional outcome [6]. The assessment was performed using questionnaires such as the SMFA, SF-36 and KOOS scores. Poor functional outcomes in the SMFA score are associated with poor clinical prognosis and vice-versa [7-9]. Other interesting tools include postoperative pain continuity, radiographic malalignment or fixation failure, intraoperative complications, posttraumatic arthrosis development and unplanned reoperation [6,10-12]. Several studies have determined the postoperative functional outcomes of TPF and have recorded the risk factors associated with poor outcomes. The commonest risk factors are older age, mal-alignment of the mechanical tibia axis, fractures classes and decline qualities among others [13-16]. The ability to investigate poor functional outcome risk factors is vital to the treatment of these injuries, as it may facilitate the initiation of aggressive and specialized physical therapies for higher-risk groups with poor overall outcomes. Here, we sought to assess the risk of identifying cases with a high risk of poor postoperative outcomes.

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Methods

Study Design and Setting

In total, 123 tibial plateau fractures treated at Basrah Teaching Hospital were prospectively enrolled. Data on demographics, injury, surgical intervention and SMFA scores were collected.

Inclusion Criteria

1. ≥ 18 years
2. Tibial plateau fracture

Postoperative Therapy

All patients enrolled in a structured physical management program 14 days postoperatively

- Range of motion of the knee: active and graduated passive
- Strengthening of quadriceps and hamstrings: Graduated
- Weight-bearing: 3 months postoperatively

Outcomes

Poor Functional Outcome (PFO) was defined as any case with a functional SMFA (>10 points) above the median at the most recent follow-up visit. The most recent follow-up was at least 12 months postoperatively (>21.4). SMFA scores at this level have been revealed to be one SD $>$ the mean in normative data and are linked with worse clinical outcomes and capability [7-9].

Data Collection

Variables included sex, age, BMI, comorbidity, open fracture, high-energy injury mechanisms, vascular or nerve injuries, residual TP depression, tibial spine fracture and OTA fracture types.

Statistics

SPSS ver.24 was used for data analysis. Frequency, range and percentage are described variables. Logistic regression was used to predict risk factors using odds ratios (OR). $P < 0.05$ and 95% CI were considered significant.

Results

A total of 123 patients were prospectively followed for an average of 19.7 months prospectively followed. Based on our data, poor functional outcomes were observed at the long-term follow-up. The age of the patients ranged from 19 to 80 years. BMI ranged between 19.8 and 43.1 kg/m². The male to female ratio was 2.15:1. Morbidity was recorded in 55(44.7%) patients. Seventy-one patients smoked during the study period. Approximately 14.6% of patients had alcoholism. The high-energy mechanism of trauma was documented in 55.3% of cases, whereas low-energy was found in 44.7% of cases. Compartment syndrome was reported in 34.1% of cases. Vascular and nerve injuries were recorded in 48.8% and 31.4% of the patients, respectively. Open fractures were observed in 32.5% of the cases. The tibial spine was involved in 29.3% of cases. OTA class (C) was more frequently reported than class (B) (63.4% vs. 36.6%). Residual tibial plateau depression was reported in 43.1% of cases. The preoperative fracture depression range value was 1-39 mm while the postoperative fracture depression range was (0 - 5.5) mm (Table 1).

Characteristic		No.	%
Age (years) range		19-80	-
BMI (kg/m ²) range		19.8-43.1	-
Sex	Males	84	68.3
	Females	39	31.7
Comorbidity	Yes	55	44.7
	No	68	55.3
Smoking	Yes	71	57.7
	No	52	42.3
Alcohol	Yes	18	14.6

	No	105	85.4
Trauma mechanism	High Energy	68	55.3
	Low Energy	55	44.7
Compartment syndrome	Yes	42	34.1
	No	81	65.9
Vascular trauma	Positive	60	48.8
	Negative	63	51.2
Nerves injuries	Positive	39	31.7
	Negative	84	68.3
Open fractures	Positive	40	32.5
	Negative	83	67.5
Tibial spine involvement	Positive	36	29.3
	Negative	87	70.7
OTA class	B	45	36.6
	C	78	63.4
Residual of tibial plateau depression	Yes	53	43.1
	No	70	56.9
Preoperative fracture Depression		1-39 mm	-
Postoperative fracture Depression		0-5.5 mm	-

Table 1: Demography.

At the long-term follow-up, poor outcomes were analyzed using the logistic regression models listed in Table 2. Old age ($p=0.03$), high BMI ($p=0.04$), comorbidity ($p=0.02$), smoking ($p=0.01$), alcoholism ($p=0.03$), trauma mechanism ($p=0.01$), postoperative depression ($p=0.03$), tibial spine involvement ($p=0.02$), female sex ($p=0.03$), open fracture ($p=0.05$), fracture type ($p=0.001$) and SMFA score ($p=0.02$) were predictive risk factors for poor outcomes.

Variables	OR	P-value	95% CI	
Age (years)	0.78	0.03	1.068	5.46
BMI	0.37	0.04	1886	2.809
Comorbidity	0.5	0.02	2.022	4.378
Smoking	1.02	0.01	1.231	5.998
Alcohol	0.81	0.03	0.734	0.989
Trauma mechanism	2.7	0.01	1.777	7.656
Postoperative Depression	0.4	0.03	1.061	1.657
Tibial spine involvement	-1.7	0.02	0.01	0.905
Female Gender	-0.119	0.03	0.197	1.922
Open fracture	0.66	0.05	1.053	2.569
Fracture types	2.706	0.001	1.898	2.514
SMFA Index	0.41	0.02	1.035	1.727

Table 2: Logistic regression data.

Discussion

The operative fixation aims of TPF are joint stabilization, tibial articular surface reconstruction and promotion of early range of knee motion. Smoking and alcohol consumption are modifiable risk factors. Smoking has deleterious effects on fractures healings [10]. Smoking and alcohol intake are known to be linked to poor wound healing, infections and nonunion in fractures [11]. Spine surgery and lower-extremity fractures are common non-modifiable factors [12,13]. Recently, Konda, et al., developed a targeted algorithm for direct resource usage in the context of orthopedic injuries [14,15]. In this study, older age, obesity, severe comorbidity, tobacco smoking, alcoholism ingestion, high trauma energy, large postoperative depression, tibial spine

involvement, female sex, complicated open fracture, type C fracture and high SMFA score were predictive risk factors for poor outcomes. Although 10-point differences from the means of SMFA at (1 year) are reasonable thresholds for poorer outcomes [7-9], using greater thresholds (20-points) would provide greater specificity and PPV to differentiate cases with significant postoperative dysfunction.

Conclusion

The SMFA scores can be used to assess the risk of postoperative dysfunction. Older age, obesity, severe comorbidity, tobacco smoking, alcohol consumption, high trauma energy, large postoperative depression, tibial spine involvement, female sex, complicated open fracture, type C fracture and high SMFA score are predictive risk factors for poor outcomes.

Conflict of Interests

The authors declare that they have no conflict of interest in this paper.

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