

OTA Classification is Highly Predictive of Acute Compartment Syndrome Following Tibia Fracture: A Cohort of 2885 Fractures

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Purpose: Our objective was to determine the correlation between the OTA classification of tibial plateau, shaft, and pilon fractures to the development of acute compartment syndrome (ACS).

Methods: After IRB approval, our institution's prospectively collected database was retrospectively reviewed for all tibial plateau, shaft, and pilon fractures over a 10-year period. 3606 fractures were initially identified. Only skeletally mature patients, patients undergoing plate or intramedullary fixation, and fractures managed from initial injury through definitive fixation at our institution were included, leaving 2885 fractures in 2778 patients for analysis. Patients undergoing prophylactic fasciotomy were excluded. The database and patient charts were reviewed for age, sex, injury details, injury pattern, concurrent injuries, fixation construct, fasciotomy, and subsequent procedures. Univariate analyses were conducted using independent *t* tests for continuous data and χ^2 tests of independence for categorical data. Bilateral injuries were analyzed independently with a bilateral variable. A simultaneous multivariate binary logistic regression was developed to identify variables significantly associated with ACS.

Results: The average age for all patients was 43.2 ± 17.6 years. 823 (28.5%) of fractures were open. 100 patients (3.6%) had bilateral fractures, while 7 (0.2%) had two discrete injuries at distinct time points. 954 fractures (33.1%) involved the proximal segment (OTA 41), 1270 (44.0%) involved the middle segment (OTA 42), and 811 (28.1%) involved the distal segment (OTA 43). 156 fractures (5.4%) were combined fractures of the same tibia. 1690 fractures (58.6%) underwent plate fixation alone, 1102 fractures (38.2%) underwent intramedullary fixation alone, and 91 (3.2%) underwent a combination of nail and plate fixation for combined injuries. 153 fractures (5.3%) occurred concurrently with femoral fractures, while 78 (2.7%) occurred in conjunction with a pelvic or acetabular injury. ACS was diagnosed in 136 patients (4.7%) with no patient developing a bilateral ACS. The average age of those developing ACS was 36.2 years versus 43.3 years in those without ($P < 0.001$). Distal segment injuries (OTA 43) had a significantly lower percentage developing ACS when compared to both middle (OTA 42) and proximal (OTA 41) segment injuries ($P \leq 0.007$) (Table 1). Type C fractures had a significantly higher rate of ACS when compared to types A or B ($P < 0.001$). Group 1 fractures had a significantly lower rate of developing ACS when compared to both groups 2 and 3 ($P \leq 0.044$). Open injury, bilateral tibial fractures, injuries involving

	Compartment Syndrome N = 136	No Compartment Syndrome N = 2,749	p-Value	Odds Ratio	95% CI Lower	95% CI Upper
Age (st. dev)	36.2 (14.9)	43.3 (18.1)	<0.001	0.971	0.959	0.982
Open Injury	34.60%	28.20%	0.888	1.03	0.683	1.554
Segmental Injury	7.40%	4.70%	0.085	0.446	0.177	1.119
Bilateral Injuries	3.70%	7.10%	0.17	1.73	0.79	3.787
Concurrent Fracture						
Femur	8.80%	5.10%	0.572	1.208	0.626	2.626
Pelvis	4.40%	2.60%	0.438	1.419	0.586	3.437
Type of Fixation						
Plate	39.70%	38.20%	N/A (Reference)			
Intramedullary Rod	57.40%	58.60%	0.64	1.178	0.593	2.341
Both	2.90%	3.20%	0.908	0.93	0.272	3.177
OTA Classification						
Bone Segment						
1 (Proximal)	46.30%	31.80%	0.197	1.584	0.788	3.186
2 (Middle)	44.90%	41.30%	N/A (Reference)			
3 (Distal)	8.80%	26.90%	0.012	0.339	0.146	0.785
Fracture Type						
A	18.40%	29.60%	N/A (Reference)			
B	28.70%	34.80%	0.216	1.404	0.82	2.405
C	52.90%	35.60%	<0.001	3.061	1.831	5.116
Group (Comminution/Articular Involvement)						
1	16.20%	28.60%	N/A (Reference)			
2	36.80%	32.10%	0.012	1.993	1.165	3.41
3	47.10%	39.30%	0.044	1.689	1.015	2.81

two bone segments, fixation type, nor concurrent pelvic or femoral fractures predicted the development of ACS.

Conclusion: In this large cohort of tibia fractures we found that the age, sex, and OTA classification were highly predictive for the development of acute ACS. These findings can help to guide clinical practice and patient counseling.

The FDA has stated that it is the responsibility of the physician to determine the FDA clearance status of each drug or medical device he or she wishes to use in clinical practice.