Effects of Surgeon Experience on Post-Operative Complication Rates for Tibial Plafond Fractures

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INTRODUCTION:

The purpose of the current study was to 1) identify complication rates across surgeons based on years into practice and case volume, and 2) identify differences in their approach to managing pilon fractures.

METHODS:

Following institutional review board approval, operatively treated tibial plafond fractures at a regional level 1 trauma center between 2001 and 2022 were identified from an electronic data warehouse using Current Procedural Terminology codes (CPT), 27827, or 27828. Surgeon experience was measured in two ways at the time of each case – as case volume and years of surgeon practice. A time-to-event survival analysis was used to examine differences in deep infection, non-union, secondary surgery, and hardware removal, by both continuous case volume and years in practice separately and in combination.

RESULTS:

A total of 425 patients were included in the study, 151 (35.5%) were treated by surgeons with less than 5 years, 203 (47.8%) by surgeons with 5-15 years, and 71 (16.7%) by surgeons with more than 15 years of experience. There were no differences in demographics, mechanism of injury, or fracture characteristics between groups. Surgeons >15 years waited longer (9.59 days) to surgery than surgeons 5-15 years (6.34) and surgeons <5 years (5.91, p=0.037). Surgeons <5 years also had longer operation time (231.53 minutes) in comparison to 5-15 and >15-year surgeons (191.79, 211 minutes respectively, p=0.016). >15-year surgeons used dual incisions (54.9%) more often than 5-15 (42.9%) and <5-year surgeons (31.8%, p=0.003). Surgeons < 5 years had higher rates of wound dehiscence (10.7%) and post-traumatic osteoarthritis (PTOA) (46.6%) in comparison to 5-15 (4%, 29.4%) and >15 (7%, 38.2% p=0.050, 0.004) year surgeons. There were no differences in surgical approach, infection, reoperation rate, malunion rate, hardware removal, or post-operative grading of reduction.

DISCUSSION AND CONCLUSION:

After 5 years of practice, surgeons are likely to prolong time to tibial plafond surgery and use more incisions but decrease operative time and rates of wound dehiscence. While anatomic reduction did not differ between different levels of surgeons' experiences, PTOA rates were lower after 5 years of practice. In total, tibial plafond fractures remain a challenging fracture for orthopedic surgeons, and this study emphasizes the importance of surgical experience.

Table 1. Demographics by Years Into Practice (n=425)

	<5 years (151)	5-15 years (203)	>15 years (71)	p-value
Age (sd)	43.4 (15.47)	42.11 (14.78)	44.03 (15.79)	0.567
Male (%)	108 (71.5%)	148 (72.9%)	48 (67.6%)	0.696
Follow-up Time (months) (sd)	21.25 (21.71)	21.71 (29.16)	13.44 (8.98)	.063
Left (%)	68 (45.3%)	93 (45.8%)	29 (40.8%)	0.759
BMI (sd)	28.00 (5.94)	30.22 (18.35)	28.76 (6.94)	0.374
ASA (sd)	2.03 (.680)	2.00 (.728)	1.96 (.775)	0.783
Smoking (%)	40 (27.8%)	44 (23.9%)	14 (20%)	0.443
Alcohol (%)	62 (46%)	74 (46.3%)	33 (50.8%)	0.805
Diabetic (%)	11 (7.6%)	18 (9.8%)	8 (11.4%)	0.638
Mechanism of injury (%)				0.278
Motor Vehicle Crash	22 (15%)	30 (15.3%)	7 (10%)	
Motor Vehicle Accident	4 (2.7%)	6 (3.1%)	3 (4.3%)	
Motorcycle Crash	14 (9.5%)	10 (5.1%)	9 (12.9%)	
Ped v auto	2 (1.4%)	2 (1%)	3 (4.3%)	
Ground level fall	5 (3.4%)	15 (7.7%)	6 (8.6%)	
Gunshot	1 (0.7%)	0	1 (1.4%)	
Fall from height	76 (51.7%)	101 (51.5%)	28 (40%)	
Crush	7 (4.8%)	3 (1.5%)	2 (2.9%)	
Skiing	10 (6.8%)	20 (10.2%)	8 (11.4%)	
Other	6 (4.1%)	9 (4.6%)	3 (4.3%)	
Compartment Syndrome (%)	2 (1.4%)	3 (1.5%)	2 (2.9%)	0.691
Gustilo Anderson (GA) Classification				0.748
Closed	111 (8.2%)	167 (83.5%)	54 (79.4%)	
GA 1	5 (3.5%)	8 (4.0%)	3 (4.4%)	
GA 2	21 (14.8%)	17 (8.5%)	8 (11.8%)	
GA 3	5 (3.5%)	8 (4.0%)	3 (4.4%)	
OTA Classification				0.992
43-A	5 (3.5%)	6 (3.1%)	3 (4.4%)	
43-B	55 (38.5%)	75 (39.1%)	26 (38.2%)	
43-C	83 (58.0%)	111 (57.8%)	39 (57.4%)	

Table 2. Surgical Details Years Into Practice

	<5 years	5-15 years	>15 years	p-value
Time to Surgery (days) (sd)	5.91 (7.83)	6.34 (7.26)	9.59 (15.73)	0.037
Initial Ex-Fix (%)	99 (65.6%)	117 (57.9%)	38 (53.5%)	0.170
Bone Graft (%)	36 (23.8%)	29 (14.5%)	15 (21.1%)	0.076
Masquelet (%)	6 (4.0%)	3 (1.5%)	2 (2.8%)	0.352
Flap (%)	4 (2.7%)	9 (4.5%)	4 (5.7%)	0.514
Operation Time (minutes) (sd)	231.53 (84.21)	191.79 (105.56)	211.00 (78.73)	0.016
Tourniquet Time (minutes) (sd)	108.69 (44.78)	96.97 (54.68)	80.17 (50.16)	0.002
Blood Loss (cc) (sd)	148.62 (172.15)	139.64 (140.22)	194.52 (138.18)	0.067
Length of Stay (days) (sd)	5.08 (6.85)	4.04 (5.15)	3.77 (5.20)	0.167
Approach (%)				.262
Anterior	2 (2.1%)	8 (7.8%)	3 (12%)	
Anterolateral	28 (29.5%)	29 (28.4%)	6 (24%)	
Anteromedial	43 (45.3%)	37 (36.3%)	7 (28%)	
Posterolateral	5 (5.3%)	7 (6.9%)	3 (12%)	
Posteromedial	8 (8.4%)	5 (4.9%)	0	
Medial	7 (7.4%)	10 (9.8%)	4 (16%)	
Lateral	2 (2.1%)	6 (5.9%)	2 (8.0%)	
Incisions (%)				.003
Single Incision	95 (64.2%)	105 (55%)	27 (38%)	
Dual Incision	47 (31.8%)	82 (42.9%)	39 (54.9%)	
Triple Incision	6 (4.1%)	4 (2.1%)	5 (7.0%)	
Wound Dehiscence (%)	16 (10.7%)	8 (4.0%)	5 (7.0%)	.050
Superficial Infection (%)	8 (5.3%)	11 (5.4%)	1 (1.4%)	0.352
Deep Infection (%)	20 (13.2%)	22 (10.8%)	4 (5.6%)	0.235
PTOA (%)	69 (46.6%)	59 (29.4%)	26 (38.2%)	0.004
Reoperation rate (%)	68 (45.3%)	93 (45.8%)	32 (45.1%)	0.993
Malunion/Nonunion (%)	16 (11.3%)	17 (9.6%)	9 (14.8%)	0.530
Time to Union (months) (sd)	7.40 (7.39)	6.22 (5.54)	6.48 (3.88)	0.270
Hardware Removal (%)	52 (34.4%)	60 (29.7%)	16 (22.5%)	0.193

Table 3. Surgical Outcomes By Years Into Practice

	<5 years	5-15 years	>15 years	p-value
Wound Dehiscence (%)	16 (10.7%)	8 (4.0%)	5 (7.0%)	.050
Superficial Infection (%)	8 (5.3%)	11 (5.4%)	1 (1.4%)	0.352
Deep Infection (%)	20 (13.2%)	22 (10.8%)	4 (5.6%)	0.235
PTOA (%)	69 (46.6%)	59 (29.4%)	26 (38.2%)	0.004
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Time to Union (months) (sd)	7.40 (7.39)	6.22 (5.54)	6.48 (3.88)	0.270
Hardware Removal (%)	52 (34.4%)	60 (29.7%)	16 (22.5%)	0.193
Anterior Osteophyte Impingement (%)	9 (6.0%)	9 (4.5%)	3 (4.4%)	0.787
Ankle Fusion (%)	18 (11.9%)	23 (11.4%)	0	0.012
Time to Fusion (months) (sd)	18.35 (16.55)	28.14 (28.91)	0	0.210
Amputation (%)	1 (0.7%)	5 (2.5%)	1 (1.4%)	0.411
Time to Amputation (months)	43	7.40 (7.93)	15.00	0.037
Step Off (%)				0.131
<2mm	126 (91.3%)	177 (92.2%)	69 (98.6%)	
>2mm	12 (8.7%)	15 (7.8%)	1 (1.4%)	
Gapping				0.154
<2mm	124 (89.9%)	171 (89.5%)	66 (97.1%)	
>2mm	14 (10.1%)	20 (10.5%)	2 (2.9%)	