Increasing Severity of the Orthopaedic Trauma Association Open Fracture Classification (OTA-OFC) Correlates with Increasing Amputation Rate: A Prospective Multicenter Study

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Purpose: Open fractures are common and present unique challenges to orthopaedic surgeons. Most treatment decisions are based upon surgeon experience, estimated Gustilo-Anderson classification, and regional preferences. While widely used to describe open fractures in present practice, the Gustilo-Anderson system has demonstrated multiple flaws and was not originally described to be of prognostic use. The OTA Open Fracture Classification (OTA-OFC) represents a comprehensive classification system intended to be objectively obtained and of prognostic value. The OTA-OFC is a 3-level, 5-subclassification system that describes skin injury, muscle injury, arterial injury, bone loss, and contamination. The present study reports its utility in clinical practice and assesses its ability to guide treatment decisions and predict short-term outcomes at multiple centers.

Methods: After IRB approval, a prospective multicenter observational study was undertaken. Patient age, AO-OTA fracture classification, OTA-OFC, number of operative debridements, wound vac (vacuum-assisted closure) use, and antibiotic bead use were all recorded. Primary outcomes of amputation, infection requiring antibiotics, and wound healing were all recorded. A minimum of 90 days follow-up was required for study inclusion. Descriptive statistics were used to describe the study population. Logistic regression using forward conditional analysis was used to predict the impact of the OTA-OFC on short-term outcomes. All analysis was done using SPSS v21.

Results: 419 fractures in 373 patients across 10 trauma centers were enrolled in the study with minimum follow-up of 90 days. Of these fractures, 31 required amputation (7%), 101 developed infections necessitating IV antibiotics (24%) and excluding patients who went on to amputation for wound healing problems, 55 had not healed their wounds of compounding at the time of their 90-day follow-up appointment (13%). Logistic regression to predict amputation demonstrated that arterial and skin injury were statistically significant contributors to the prediction of amputation. Bone injury and muscle damage were significant contributors to the prediction of readmission for IV antibiotics. The OTA-OFC did not show correlation with wound healing at 90 days.

Conclusion: The OTA-OFC was designed as an objectively obtainable descriptive system that can be used at multiple locations with good interobserver reliability. It has been shown to have good prognostic value at one treatment center. The goal of this study was to determine its utility in clinical practice and to assess its ability to guide treatment decisions and predict short-term outcomes at multiple centers. The present data demonstrated that arterial and skin injury were statistically significant contributors to the prediction of amputation. Bone injury and muscle damage were significant contributors to the prediction of readmission

for IV antibiotics. The OTA-OFC did not show correlation with wound healing at 90 days. This study demonstrates the value of the OTA-OFC as a classification tool at multiple centers in modern practice, and is another step in the use of this system to guide open fracture management decisions.

		Skin			Total	
		1- edges approximate	2- edges do not approximate	3- extensive degloving		P Value
Amputation	No	274	45	34	353	
	Yes	2 (0.7%)	4 (8.2%)	25 (42.4%)	31	
Total		276	49	59	384	.000
		Muscle			Total	
		1- no necrosis	2-necrosis with intact unit	3- disruption of muscle-tendon unit		
Amputation	No	208	133	12	353	
	Yes	2 (1%)	12 (8.3%)	17 (58.6%)	31	
Total		210	145	29	384	.000
		Artery			Total	
		1- no major injury	2-injury with no ischemia	3- distal ischemia		
Amputation	No	332	15	6	353	
	Yes	9 (2.6%)	8 (34.8%)	14 (70%)	31	
Total		341	23	20	384	.000
		Contamination			Total	
		1- none	2- surface only	3- deep		
Amputation	No	233	83	37	353	
	Yes	7 (2.9%)	8 (8.8%)	16 (30.2%)	31	
Total		240	91	53	384	.000
		Bone Loss			Total	
		1- none	2- loss with cortical contact	3- segment loss		
Amputation	No	224	114	15	353	
	Yes	6 (2.6%)	10 (8.1%)	15 (50%)	31	
Total		230	124	30	384	.000
		Skin			Total	
		1	2	3		P value
Antibiotics	No	230	30	32	292	
	Yes	44 (16.1%)	19 (38.8%)	27 (45.8%)	90	
Total		274	49	59	382	.000
		Muscle			Total	
		1	2	3		
Antibiotics	No	185	89	18	292	
	Yes	24 (11.5%)	55 (38.2%)	11 (37.9%)	90	
Total		209	144	29	382	.000
		Artery			Total	
		1	2	3		
Antibiotics	No	267	12	13	292	
	Yes	72 (21.2%)	11 (47.8%)	7 (35%)	90	
Total		339	23	20	382	.007
		Contamination			Total	
		1	2	3		
Antibiotics	No	189	73	30	292	
	Yes	49 (20.6%)	18 (19.8%)	23 (43.4%)	90	
Total		238	91	53	382	.001
		Bone Loss			Total	
		1	2	3		
Antibiotics	No	199	75	18	292	
	Yes	29 (12.7%)	49 (39.5%)	12 (40%)	90	
Total		228	124	30	382	.000

See pages 47 - 108 for financial disclosure information.