Unplanned 30-Day Readmission Rates in Open Tibia Fractures

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INTRODUCTION

- The Hospital Readmission Reduction program was instituted by the Centers for Medicare and Medicaid Services (CMS) in 2012, which penalizes hospitals up to 3% of Medicare payments for greater than expected readmission rates.
- There is a lack of data on the 30-day readmission risk for patients with open tibia fractures.
- The purpose of this study was to establish the 30-day readmission rate and risk factors associated with readmission for a large cohort of patients with open tibia fractures.

METHODS

- **Design**: Retrospective cohort study.
- **Setting**: Single Level 1 trauma center.
- **Inclusion criteria**: Patients who underwent operative debridement and fixation of an open tibia fracture (AO/OTA 41-43) between 2010-2018.
- **Exclusion criteria**: age <18 years, infection, tumor, periprosthetic fractures.
- **Primary outcome**: Unplanned 30-day readmission following debridement and fixation of an open tibia fracture. Wound-related readmissions were defined as those due to soft tissue infection, dehiscence, or osteomyelitis. Patients were stratified according to primary closure versus flap coverage (local or free flap).
- **Secondary outcome**: Risk factors associated with 30-day readmission.
- **Statistical Analysis**: Crude and risk-adjusted 30-day readmission rates (overall and wound-related) were calculated for the total cohort, and those with primary closure versus flap coverage.

RESULTS

Table 1. Patient characteristics

	No Flap (n=914)	Flap (n=121)	Overall (n=1035)	P Value
Age				
Mean (SD)	45.0 (18.0)	43.0 (16.1)	44.8 (17.8)	0.21
Sex				
Male	602 (65.9%)	89 (73.6%)	691 (66.8%)	0.09
Fracture Location				
Plateau	73 (8.0%)	15 (12.4%)	88 (8.5%)	<0.01
Shaft	479 (52.4%)	75 (62.0%)	554 (53.5%)	
Plafond	362 (39.6%)	31 (25.6%)	393 (38.0%)	
Wound Size				
Mean (SD)	6.76 (5.95)	234 (301)	66.8 (184)	<0.01
Mechanism				
Motor Vehicle Collision	267 (29.2%)	36 (29.8%)	303 (29.3%)	0.03
Motorcycle Collision	181 (19.8%)	33 (27.3%)	214 (20.7%)	
Pedestrian Struck	150 (16.4%)	26 (21.5%)	176 (17.0%)	
Ground Level Fall	104 (11.4%)	3 (2.5%)	107 (10.3%)	
Fall from Height	134 (14.7%)	12 (9.9%)	146 (14.1%)	
Crush/Blunt Injury	33 (3.6%)	7 (5.8%)	40 (3.9%)	
Gun Shot Wound	34 (3.7%)	4 (3.3%)	38 (3.7%)	
Bicycle Accident	6 (0.7%)	0 (0%)	6 (0.6%)	
Unknown	5 (0.5%)	0 (0%)	5 (0.5%)	
ASA				
1	68 (7.4%)	3 (2.5%)	71 (6.9%)	0.11
2	311 (34.0%)	35 (28.9%)	346 (33.4%)	
3	202 (22.1%)	33 (27.3%)	235 (22.7%)	
4	46 (5.0%)	6 (5.0%)	52 (5.0%)	
5	1 (0.1%)	1 (0.8%)	2 (0.2%)	
Missing	286 (31.2%)	43 (35.5%)	329 (31.7%)	
Comorbid Conditions				
Diabetes	76 (8.3%)	7 (5.8%)	83 (8.0%)	0.32
CAD	42 (4.6%)	3 (2.5%)	45 (4.3%)	0.28
HTN	219 (24.0%)	20 (16.5%)	239 (23.1%)	0.06
Smoker	318 (34.8%)	48 (39.7%)	366 (35.4%)	0.29
EtOH	498 (54.5%)	68 (56.2%)	566 (54.7%)	0.62
IVDA	73 (8.0%)	6 (5.0%)	79 (7.6%)	0.24

Table 2. 30-day readmission rates

		Crude 30-Day Readmission Rate, N, % (95% CI)	Risk-Adjusted 30-Day Readmission Rate, % (95% CI)*
All patients		122/1035 11.8% (10.0 – 13.9%)	11.8% (11.6 – 12.0%)
	Flap patients	19/121 15.7% (10.3 – 23.2%)	16.7% (15.2 – 18.1%)
	No flap patients	103/914 11.3% (9.4 – 13.5%)	11.2% (10.9 – 11.4%)

*Adjusted for patient age, sex, mechanism of injury, location of fracture, number of debridements, coronary artery disease, hypertension, diabetes, smoking status, alcohol abuse, and intravenous drug use.

Table 3. 30-day injury-related readmission rates.

		Crude 30-Day Injury-Related Readmission Rate, N, % (95% CI)	Risk-Adjusted 30-Day Injury-Related Readmission Rate, % (95% CI)*
All patients		82/1035 7.9% (6.4 – 9.7%)	8.0% (7.7 – 8.2%)
	Flap patients	16/121 13.2% (8.3 – 20.4%)	14.8% (12.2 – 17.4%)
	No flap patients	66/914 7.2% (5.7 – 9.1%)	7.2% (7.0 – 7.4%)

*Adjusted for patient age, sex, mechanism of injury, location of fracture, number of debridements, coronary artery disease, hypertension, diabetes, smoking status, alcohol abuse, and intravenous drug use.

Table 4. Association between number of debridements and 30-day readmission.

		Debridements, Median (IQR)	Crude Unit Odds Ratio, (95% CI)	Risk-Adjusted Unit Odds Ratio, (95% CI)*
All patients		1 (1 – 1)	1.18 (1.01 – 1.38) P=0.03	1.16 (0.94 – 1.40) P=0.14
	Flap patients	3 (2 – 3)	1.05 (0.80 – 1.31) P=0.70	1.17 (0.82 – 1.64) P=0.36
	No flap patients	1 (1 – 1)	1.49 (1.02 – 2.09) P=0.03	1.45 (1.00 – 2.06) P=0.04

IQR, interquartile range
*Adjusted for patient age, sex, mechanism of injury, location of fracture, coronary artery disease, hypertension, diabetes, smoking status, alcohol abuse, and intravenous drug use.

RESULTS SUMMARY:

- **All-cause, risk-adjusted 30-day readmission risk**:
  - Total cohort: 11.8%
  - Flap cohort: 16.7%
  - No flap cohort: 11.2%
- **Wound-related, risk-adjusted 30-day readmission risk**:
  - Total cohort: 8.0%
  - Flap cohort: 14.8%
  - No flap cohort: 7.2%
    - More than one debridement increased odds of readmission: OR, 1.45; P = 0.04
    - 80% required repeat debridement
    - 37.7% required subsequent flap

STRENGTHS/LIMITATIONS

Limitations: retrospective study design, incomplete data for certain variables.
Strengths: largest cohort of open tibia fractures assessing readmission risk.

DISCUSSION

- One in eight patients with open tibia fractures are readmitted within 30 days.
- Patients undergoing flap coverage have nearly double the risk of wound-related readmission.
- Patients without flap coverage have increased odds of readmission with increasing number of debridements during their index hospital stay.

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