

Ankle Syndesmotic Screw vs. Tightrope Fixation in Adolescent Patients

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INTRODUCTION: Ankle fractures are the most common lower extremity injury in adolescents and require surgical management at a higher rate than other common fractures. Associated syndesmotic injury has been reported in 1% of adolescent ankle injuries. Recent literature has favored the use of suture button fixation in adult syndesmotic injury, but no comparable reports in adolescents have been published. The primary aim of this study is to compare complications of screw versus TightRope fixation of adolescent syndesmotic injuries.

METHODS:

In this retrospective study, patients <18 years-old who underwent syndesmotic injury fixation from 2012 to 2023 were identified from our pediatric Level 1 Trauma Center database using International Classification of Diseases 9 and 10 codes. Patients were stratified into screw and TightRope cohorts. We collected demographics, fracture characteristics (Tables 1-2), time to fixation, method of fixation, the size and number of screws/ropes, screw breakage on follow up, complications, need to return to the OR, and postoperative course. We utilized Fisher exact when appropriate. A multivariate LASSO Logistic Regression model was used to compare the two groups for the binary outcome of “need to return to the OR” and a Benjamini-Hochberg adjustment was utilized for selected features.

RESULTS:

A total of 80 patients met our inclusion criteria (39 Tightrope vs. 41 syndesmotic screw). Mean age was 16 (SD = 1.8), with 15 (19%) females, 65 (81%) males. BMI was 31 (SD = 7.3). The LASSO model identified a set of 7 variables with an AUC of 0.78, two of which were significantly different between patients who returned to the OR and those who did not. The type of syndesmotic fixation, rope or screw, and the number of ropes or screws were used in the model. Patients with a syndesmotic screw had an increased odds of return to OR (OR 15.98 P < 0.01, CI = [3.39, 75.25]) (Table 3). The various reasons for return to OR are represented in Table 4.

DISCUSSION AND CONCLUSION:

We found that adolescent syndesmotic injuries repaired with screws are more likely to return to the OR than those repaired with a TightRope. Future long-term and prospective studies could further elucidate optimal surgical strategies for pediatric syndesmotic injuries.

Demographic	Number of Patients
Gender	Male: 64 (80%) Female: 16 (20%)
Age at injury (years)	8-12: 4 (5%) 13-15: 27 (34%) 16-19: 49 (61%)
Race	White: 51 (64%) Black or African American: 24 (30%) Asian: 2 (2%) Unknown/Other: 1 (1%)
Tobacco use	Yes: 1 (1%) No: 79 (99%)
BMI (kg/m ²)	Normal: 18.5-24.9: 21 (26%) Overweight: 25-29.9: 21 (26%) Obese > 30: 38 (48%)
Admission	Yes: 56 (70%) No: 24 (30%)
Mode of presentation	Direct: 24 (30%) Transfer: 1 (1%) Inpatient: 1 (1%) Outpatient: 54 (68%)
Mechanism of injury	Sports: 42 (52%) Fall: 7 (9%) Skateboard/roller skating: 15 (19%) MVC: 2 (2%) Trampoline: 4 (5%) Other: 10 (13%)
Isolated injury	78 (98%)
Isolated fracture	1 (1%)
Previous fracture	0 (0%)
Closed fracture	79 (99%)
Open fracture	1 (1%)
Time from injury to surgery	24 hours: 3 (4%) 48 hours: 2 (2%) 72 hours: 2 (2%) One week: 25 (31%) > 1 week: 50 (62%)
Reduction in ER	Yes: 56 (70%) No: 24 (30%)
Total number of participants	80

Fracture Type	Number of Patients
Medial Malleolus	3 (4%)
Bimalleolar	13 (16%)
Trimalleolar	4 (5%)
Maisonneuve	6 (7.5%)
Weber A	0 (0%)
Weber B	27 (34%)
Weber C	28 (35%)
Dislocation	5 (6%)

	Return to OR	No Return	OR Ratio	Confidence Interval	p < 0.01
Fracture Type	Screw: 23 (56%)	22 (54%)	15.98	[3.39, 75.25]	
	Rope: 2 (5%)	37 (89%)			

Reason for Return to OR	Screw Returned	Rope Returned	Patients, OR
Patients/Family Preference	4	6	0
Physician Recommendation	7	6	0
Pain	2	2	0
Weightbearing Non-compliance	3	2	2
Other	3	3	1
Total patients	19/80	15/80	19/80