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Risk Factors For Failure Of Cast Immobilization In Pediatric Scaphoid Fracture Presenting Greater Than 28 Days After Injury

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INTRODUCTION

Introduction

- Indications for cast immobilization of pediatric scaphoid fractures presenting in a delayed manner (> 28 days after injury) are not well described.

Purpose

- The purpose of this study was to elucidate risk factors for failure of cast immobilization.

Hypothesis

- In pediatric patients who sustain a scaphoid fracture, cast immobilization will result in successful union at a lower rate in delayed presentation (> 28 days following injury) of displaced fractures with cystic change than acute, nondisplaced fractures without cystic change after 12 weeks of casting.

METHODS

- A retrospective analysis of 255 scaphoid fractures treated at a single pediatric hospital between 2010-2020 was performed to characterize: demographic factors, fracture characteristics, amount of cystic change, treatment method, and rate of healing.
- The primary outcome measure was the rate of healing of scaphoid fractures presenting > 28 days from injury with cast immobilization and compared with those treated surgically.
- Demographic factors and fracture characteristics were compared using Fisher's exact tests.

Risk Factors for Failure of Cast Immobilization in Pediatric Scaphoid Fracture Presenting Greater than 28 Days After Injury.

Table 1. Demographics and Fracture Characteristics of the Delayed Presentation Group					
	Initially casted (N=19)	Initial Surgery (N=27)	Total (N=46)	Percent Diff. (95% CI)	Fisher's exact test
Sex					
Female	2 (10.5%)	5 (18.5%)	7 (15.2%)	-7.99 (-28.12, 12.13)	0.682
Male	17 (89.5%)	22 (81.5%)	39 (84.8%)	7.99 (-12.13, 28.12)	0.682
Race					
Non-White	9 (47.4%)	6 (22.2%)	15 (32.6%)	25.15 (-2.24, 52.53)	0.111
White	10 (52.6%)	21 (77.8%)	31 (67.4%)	-25.15 (-52.53, 2.24)	0.111
Which hand injured					
Dominant	8 (42.1%)	11 (40.7%)	19 (41.3%)	1.36 (-27.56, 30.28)	0.999
Non-dominant	8 (42.1%)	12 (44.4%)	20 (43.5%)	-2.34 (-31.39, 26.72)	0.999
Ambidextrous	0 (0.0%)	1 (3.7%)	1 (2.2%)	-3.70 (-10.83, 3.42)	0.999
Unspecified	3 (15.8%)	3 (11.1%)	6 (13.0%)	4.68 (-15.55, 24.91)	0.680
Mechanism of injury					
Sports	11 (57.9%)	18 (66.7%)	29 (63.0%)	-8.77 (-37.22, 19.67)	0.757
Non-sports	8 (42.1%)	9 (33.3%)	17 (37.0%)	8.77 (-19.67, 37.22)	0.757
Sports Participation					
Football	7 (36.8%)	12 (44.4%)	19 (41.3%)	-7.60 (-36.27, 21.06)	0.763
Other sports	8 (42.1%)	9 (33.3%)	17 (37.0%)	8.77 (-19.67, 37.22)	0.757
Does not participate in sports	4 (21.1%)	6 (22.2%)	10 (21.7%)	-1.17 (-25.29, 22.95)	0.999
Physcal status					
Open	9 (47.4%)	11 (40.7%)	20 (43.5%)	6.63 (-22.48, 35.74)	0.766
Closed	10 (52.6%)	16 (59.3%)	26 (56.5%)	-6.63 (-35.74, 22.48)	0.766
Fracture pattern on x-ray					
Transverse	16 (84.2%)	21 (77.8%)	37 (80.4%)	6.43 (-16.26, 29.12)	0.716
Oblique	3 (15.8%)	6 (22.2%)	9 (19.6%)	-6.43 (-29.12, 16.26)	0.716
Fracture comminution present	1 (5.3%)	9 (33.3%)	10 (21.7%)	-28.07 (-48.49, -7.65)	0.031
Humpback Deformity Present	1 (5.3%)	9 (33.3%)	10 (21.7%)	-28.07 (-48.49, -7.65)	0.031
Fracture location on x-ray					
Proximal pole	4 (21.1%)	8 (29.6%)	12 (26.1%)	-8.58 (-33.73, 16.58)	0.735
Waist	11 (57.9%)	16 (59.3%)	27 (58.7%)	-1.36 (-30.28, 27.56)	0.999
Distal pole	2 (10.5%)	2 (7.4%)	4 (8.7%)	3.12 (-13.85, 20.09)	0.999
Tuberosity	2 (10.5%)	1 (3.7%)	3 (6.5%)	6.82 (-8.71, 22.35)	0.561
Degree of cystic change (Slade-Dodds classification)					
0	8 (42.1%)	1 (3.7%)	9 (19.6%)	38.40 (15.09, 61.72)	0.002
1	1 (5.3%)	0 (0.0%)	1 (2.2%)	5.26 (-4.78, 15.30)	0.413
2	0 (0.0%)	1 (3.7%)	1 (2.2%)	-3.70 (-10.83, 3.42)	0.999
3	3 (15.8%)	2 (7.4%)	5 (10.9%)	8.38 (-10.76, 27.52)	0.635
4	7 (36.8%)	11 (40.7%)	18 (39.1%)	-3.90 (-32.43, 24.63)	0.999
5	0 (0.0%)	6 (22.2%)	6 (13.0%)	-22.22 (-37.90, -6.54)	0.034
6	0 (0.0%)	6 (22.2%)	6 (13.0%)	-22.22 (-37.90, -6.54)	0.034
Displacement of fracture (mm)					
0	14 (73.7%)	3 (11.5%)	17 (37.8%)	62.15 (38.85, 85.44)	<0.0001
1	4 (21.1%)	5 (19.2%)	9 (20.0%)	1.82 (-21.96, 25.60)	0.999
2	1 (5.3%)	13 (50.0%)	14 (31.1%)	-44.74 (-66.42, -23.05)	0.003
3	0 (0.0%)	4 (15.4%)	4 (8.9%)	-15.38 (-29.25, -1.52)	0.126
4	0 (0.0%)	1 (3.8%)	1 (2.2%)	-3.85 (-11.24, 3.55)	1.000
Fracture healed with cast immobilization	15 (78.9%)	N/a			
Time from initial visit to healed fracture (days)	63 [53, 98]	135 [92, 181]			

Table 1. Summary of demographic factors, fracture characteristics, and outcome measures of the delayed presentation group.



Figure 1. An example PA radiograph of a skeletally immature patient with a scaphoid waist fracture demonstrating cystic change, mild displacement, and mild comminution.

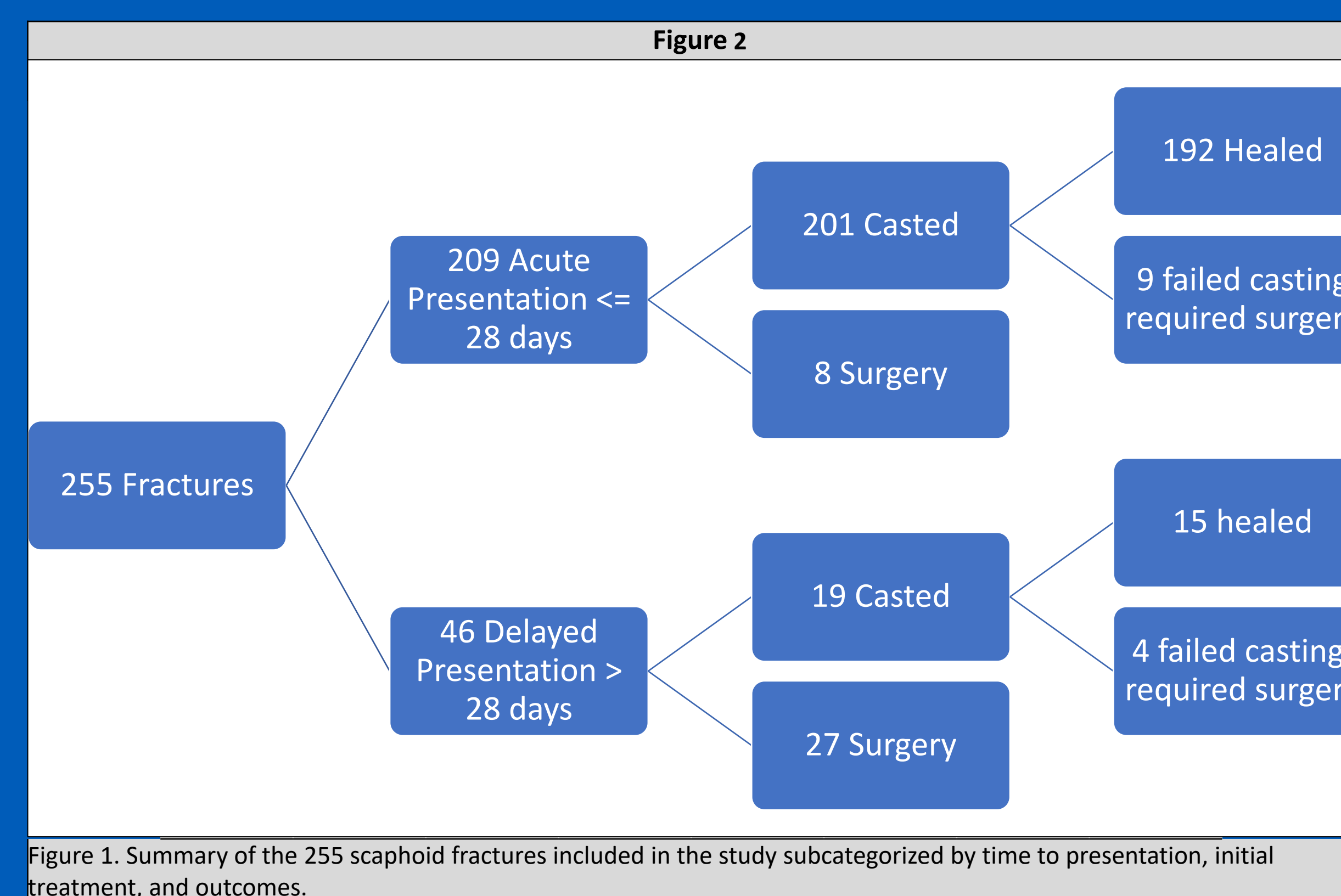


Figure 2. Summary of the 255 scaphoid fractures included in the study subcategorized by time to presentation, initial treatment, and outcomes.

RESULTS

Risk factors for delayed presentation

- Male, injured playing sports, football players, and closed physes.

Fracture characteristics of delayed group

- Increased incidence of transverse fracture pattern, proximal pole fracture, and > 1 mm of cystic change and fracture displacement.

Patients presenting in a delayed fashion

- 41.3% were treated with casting with a 78.9% union rate compared to 96.1% of acute fractures treated with casting resulting in a 95.5% union rate.
- Average duration of casting - 63 days.
- No significant demographic differences between treated with casting or surgery initially.
- Patients treated with casting less likely to have cystic change > 1 mm, fracture displacement, or fracture comminution.

CONCLUSIONS

- Casting for scaphoid fractures presenting > 28 days after injury results in union in patients with minimal displacement, < 1 mm cystic change, and no comminution or humpback deformity.
- Both acute and delayed groups treated with casting healed in an equivalent amount of time.
- Football participation is a risk factor of delayed presentation.
- Delayed presentation of a scaphoid fracture is not independently an indication for surgery in the pediatric and adolescent population.

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