

Children's Mercy Kansas City

SHARE @ Children's Mercy

Research Days

GME Research Days 2023

May 11th, 11:30 AM - 1:30 PM

Indications for Early Surgical Intervention in Adolescents with Salter-Harris II Distal Radius Fractures

Cyrus Etebari

University of Missouri - Kansas City

Jonathan R. Warren

Children's Mercy Kansas City

Olivia Pruss

University of Kansas Medical Center

Sricharan Yadali

University of Kansas Medical Center

Vincent Staggs

Children's Mercy Kansas City

~~See next page for additional authors~~

Let us know how access to this publication benefits you

Follow this and additional works at: <https://scholarlyexchange.childrensmercy.org/researchdays>



Part of the [Orthopedics Commons](#), and the [Pediatrics Commons](#)

Etebari, Cyrus; Warren, Jonathan R.; Pruss, Olivia; Yadali, Sricharan; Staggs, Vincent; and Sinclair, Micah K., "Indications for Early Surgical Intervention in Adolescents with Salter-Harris II Distal Radius Fractures" (2023). *Research Days*. 13.

https://scholarlyexchange.childrensmercy.org/researchdays/GME_Research_Days_2023/ResearchDay4/13

This Abstract is brought to you for free and open access by the Conferences and Events at SHARE @ Children's Mercy. It has been accepted for inclusion in Research Days by an authorized administrator of SHARE @ Children's Mercy. For more information, please contact hlsteel@cmh.edu.

Submitting/Presenting Author

Cyrus Etebari, Jonathan R. Warren, Olivia Pruss, Sricharan Yadali, Vincent Staggs, and Micah K. Sinclair

Indications for Early Surgical Intervention in Adolescents with Salter-Harris II Distal Radius Fractures

Cyrus Etebari, M.D.,¹ Jonathan R. Warren, M.D.,² Olivia Pruss, B.S.,³ Sricharan Yadali, B.S.,³ Vincent Staggs, PhD.,² Micah K. Sinclair, M.D.²

¹University of Missouri-Kansas City, Department of Orthopaedic Surgery

²Children's Mercy Kansas City, Department of Orthopaedic Surgery

³University of Kansas Medical Center

Introduction:

Currently, there is little information regarding risk factors for failure of nonoperative treatment in Salter-Harris II distal radius fractures (SHII-DRF). Our purpose is to identify predictors of which patients will require acute surgery and which will develop late malunion based on degree of deformity and skeletal maturity.

Methods:

This was a review of SHII-DRFs in patients 9 to 18 years of age, from 2017-2020. Demographics, initial displacement, displacement post-reduction, and displacement after cast removal were evaluated. Skeletal maturity was determined using Sander's classification. These values were compared between patients who underwent casting alone, underwent acute surgery, or required late malunion correction. Classification and Regression Tree (CART) models were also fit to identify predictors of surgical intervention and late malunion.

Results:

271 (70% male) SHII-DRFs were identified, of which 34 cases (13%) underwent surgical intervention with CRPP or ORIF. Twenty-two (65%) surgical cases were acute (median 9.5 days, IQR 3.2-14 days) and 12 (35%) cases were performed to correct late malunion (median 459.5 days, IQR 325.5-542 days). No patients who underwent acute surgery developed malunion. As shown in Table 1, the late malunion group tended to be older and have greater tilt in the dorsal direction post-cast removal. The CART model (Figure 1) correctly classified 94% of acute surgery patients with a sensitivity of 55% and specificity of 97%. A second CART model (not shown) identified greater degree of dorsal tilt post-cast removal as the strongest predictor of malunion (misclassification 4%, sensitivity 42%, specificity 97%).

Conclusion:

In SHII distal radius fractures, persistent dorsal angulation after casting was associated with late malunion. Increased Sander's class and magnitude of deformity in all planes following closed reduction and casting was associated with acute surgery. These cutoff values for degree of deformity and skeletal maturity can be used to predict need for acute surgery.

Table 1: Comparison Between Treatment Groups

Variable	Cast-only (n=237)	Acute surgery (n=22)	Cast- only vs. acute	Malunion surgery (n=12)	Cast-only vs. malunion
Categorical variables	N (column %)	N (column %)	p ¹	N (column %)	p ¹
Female	71 (30%)	6 (27%)	0.816	3 (25%)	0.764
Quantitative variables	Median (IQR) [min-max]	Median (IQR) [min-max]	p ²	Median (IQR) [min-max]	p ²
Age at injury	12.2 (10.7, 14) [9.1, 17.9]	14.6 (14.2, 15.5) [12, 17.9]	<0.001	13.7 (12.5, 14.5) [10.5, 16.7]	0.038
Sander's class	3 (3, 5) [1, 7]	6 (4.2, 7) [3, 8]	<0.001	3 (3, 5) [3, 7]	0.461
Initial measurements					
Sagittal translation %	40 (27, 60) [0, 100]	63.5 (51, 90) [24, 100]	<0.001	42.5 (34.2, 66) [21, 100]	0.406
Radial height	6 (2, 8) [-20, 15]	3.5 (0, 6) [-5, 9]	0.003	7 (0.8, 8.2) [-16, 10]	0.796
Radial inclination	14 (6, 19) [-28, 161]	8 (0, 13) [-10, 16]	<0.001	14.5 (3, 19.8) [-15, 24]	0.777
Tilt % in volar direction	0 (0, 0) [0, 29]	0 (0, 6) [0, 21]	0.692	0 (0, 0) [0, 13]	0.081
Tilt % in dorsal direction	17 (0, 26) [0, 53]	19.5 (2.2, 34.2) [0, 42]	0.325	25 (19.8, 28) [0, 34]	0.028
Post-reduction measurements					
Coronal translation %	0 (0, 0) [0, 36]	13 (0, 24.5) [0, 61]	<0.001	0 (0, 11.2) [0, 22]	0.225
Sagittal translation %	0 (0, 14.5) [0, 61]	30 (5.2, 39.2) [0, 100]	<0.001	18 (0, 27.2) [0, 41]	0.084
Tilt % in dorsal direction	0 (0, 7) [0, 33]	7.5 (0, 16) [0, 41]	0.025	7.2 (0, 12.2) [0, 35]	0.088
Post-cast removal measurements					
Coronal translation %	0 (0, 0) [0, 36]	0 (0, 17) [0, 61]	0.044	0 (0, 0) [0, 19]	0.509
Sagittal translation %	0 (0, 11) [0, 54]	28 (14, 38) [0, 100]	<0.001	14 (0, 38) [0, 58]	0.104
Tilt % in dorsal direction	0 (0, 9.2) [0, 30]	0 (0, 13) [0, 41]	0.448	19 (0, 22.5) [0, 25]	0.040

¹ Permutation test p-value. ² Brunner-Munzel test p-value.

Figure 1: Salter Harris II Distal Radius Classification and Regression Tree

