Outcomes of the Skin Graftless Dorsal Metacarpal Island VY Advancement Flap vs. Dorsal Rectangular Flap with Skin Grafting in Simple Syndactyly Reconstruction

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INTRODUCTION: Syndactyly is one of the most common congenital hand differences. Traditional reconstructive approaches utilize skin grafting; however, recent studies suggest that graftless techniques may mitigate postoperative complications and reduce operative time. We hypothesized that patients who underwent reconstruction with a skin graftless dorsal metacarpal island VY advancement flap (VY island; **Figure 1**) would have fewer postoperative complications compared to those released with a dorsal rectangular flap with skin grafts (rectangular).

METHODS:

Patients 0-17 years of age presenting for primary reconstruction of simple syndactyly from 2007-2022 were retrospectively analyzed at a large, tertiary referral pediatric hospital. Demographic and presentation data included age, race, ethnicity, sex, coexisting diagnoses, family history, syndactyly classification, laterality, and involved webspaces. Operative variables included surgeon initials, procedure time, and surgical technique as dictated by the operative note. Outcomes of interest included early 30-day postoperative complications such as infection, hematoma, seroma, wound healing issues, unplanned returns to the operating room, and digit loss. Mid- to long-term outcomes included web creep and development of pathologic scar formation.

Proportions were used to report cohort and group characteristics. Group comparisons were made with chi-square tests, Fisher's exact test, Mann-Whitney U tests, student t-tests, and multivariate regression analyses. Significance was determined with an alpha equal to or less than 0.05.

RESULTS:

In total, 213 syndactyly reconstructions (rectangular=94 webspaces, 58 patients; VY island=119 webspaces, 95 patients; **Table 1**) from 153 patients with a mean age of 1.1 ± 0.3 years were analyzed. The average postoperative follow-up intervals were 1.8 and 1.3 years for rectangular and VY island flap groups, respectively (p=0.26). Syndactyly reconstruction with the VY island flap required significantly less time than the rectangular technique with skin grafting (67.0 vs. 85.5 minutes, p=0.004, **Table 2**). The rectangular group had a significantly higher rate of 30-day postoperative complications including dehiscence and infection (**Table 2**). The rectangular group also had significantly higher incidences of web creep (19.3% vs. 1.8%, p<0.001) and hypertrophic scarring (19.1% vs. 5.9%, p=0.003). On regression analysis, the rectangular flap with skin grafting was the only variable predictive of web creep and hypertrophic scar formation (p<0.001 and p=0.004, respectively). Subgroup analyses of syndromic and nonsyndromic as well as incomplete and complete syndactyly cases mirrored overall cohort results.

DISCUSSION AND CONCLUSION:

We report a 15-year retrospective comparative study of two techniques for simple syndactyly reconstruction. This study suggests that a skin graftless dorsal metacarpal island VY advancement flap produces fewer postoperative complications compared to the dorsal rectangular approach with skin grafting. These findings were consistent in syndromic and nonsyndromic cases and in incomplete and complete cases, suggesting that the skin graftless approach is a safe and effective reconstructive technique for simple syndactyly. In addition to differences in overall complication profiles, we report that the graftless VY island flap results in a marked decrease in operating time, with most VY island flaps reducing operative time by 20% compared to techniques requiring skin grafting.

As there are many established techniques to reconstruct simple syndactyly, a single gold-standard is unlikely to arise. Hand surgeons should continue to consider principles of the patient's underlying bony and soft tissue presentation to create tailored patient solutions. Further prospective studies are needed to increase the quality of evidence available to hand surgeons managing syndactyly.

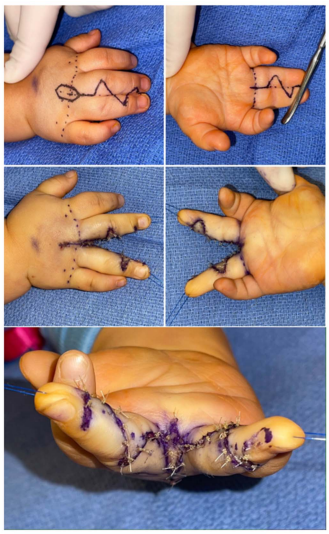

Table 1. Patient Demographics and Presentation Characteristics

	Combined Cohort	Rectangular Flap	VY Island Flap	*p*
Syndactyly Releases	213	94	119	-
Patients	153	58	95	-
Sex				
Male	143	67	76	0.16
Female	70	27	43	
Race				
White	135	57	78	0.07
Black	40	15	25	
Asian	7	3	4	
American Indian/ Alaskan Native	5	5	0	
Other or Unspecified	24	12	12	
Refused	2	2	0	
Ethnicity				
Hispanic	14	7	7	0.43
Syndactyly Type				
Incomplete	180	77	103	0.23
Complete	33	17	16	
Laterality				
Right-sided	102	52	50	*0.04
Left-sided	111	42	69	
Associated Syndrome				
Nonsyndromic	158	61	97	*0.01
Poland	20	11	9	
Amniotic Band	8	5	3	
Fraser	5	5	0	
Acrofacial Dysostosis	4	4	0	
Greig Cephalopolysyndactyly	4	0	4	
Down	3	2	1	
Turner	2	2	0	
Apert	2	2	0	
CHARGE	1	0	1	
Ehlers-Danlos	1	0	1	
CLOVES	1	1	0	
Baller-Gerold	1	0	1	
Pierre Robin Sequence	1	0	1	
Syndrome suspected but not yet identified	2	1	1	

Rectangular Flap = Dorsal rectangular flap with full-thickness skin grafting; VY Island Flap = Skin graftless dorsal metacarpal island VY advancement flap; * = significant

Table 2. Operative and Early Postoperative Data

	Cohort	Rectangular Flap	VY Island Flap	*p*
Age at Presentation (years)				
Median (SD)	0.20 (3.2)	0.20 (4.2)	0.20 (2.1)	0.86
Range	0.02-13.9	0.02-13.2	0.02-13.9	
Age at Surgery (years)				
Median (SD)	1.1 (3.2)	1.2 (4.0)	1.1 (2.4)	0.89
Range	0.50-14.0	0.50-13.8	0.52-14.0	
Operative Times (minutes)				
Median (SD)	72.0 (37.2)	87.5 (44.5)	67.0 (23.2)	*0.004
Range	32.0-247.0	32.0-247.0	38.5-145.0	
Early, 30 Day Complications				*0.04
Infection	2	2	0	0.19
Hematoma	0	0	0	-
Seroma	0	0	0	-
Dehiscence	3	3	0	0.08
Unplanned return to OR	2	2	0	0.19
Digit loss	1	1	0	0.44
Total number of surgeries				
Mean (SD)	1.1 (0.29)	1.1 (3.1)	1.0 (0.18)	0.09
Range	1-3	1-3	1-2	

Rectangular Flap= Dorsal rectangular flap with full-thickness skin grafting; VY Island Flap= Skin graftless dorsal metacarpal island VY advancement flap; OR = operating room; * = significant