



**2023 World Symposium on
Congenital Malformations
of the Hand and Upper Limb**

**Golden Nuggets in the Assessment and Treatment of
Children with Radial Longitudinal Deficiency
May 17th, 2023**

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Shriners Children's Twin Cities



Shriners
Children's™



2023 World Symposium on
Congenital Malformations
of the Hand and Upper Limb

Wendy A. Tomhave OTR/L

This speaker has no financial relationships with commercial interest.

Benefits of Multidisciplinary Collaboration

We each bring our own unique background and perspective

Be proactive in sharing your ideas to improve patient care and outcomes



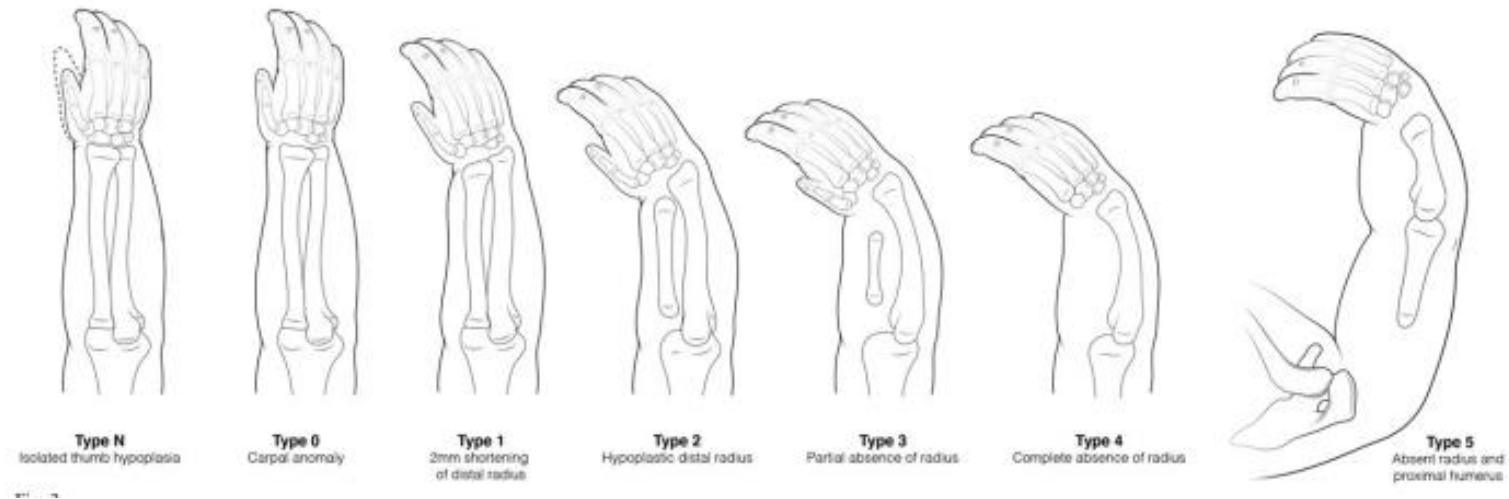
Make learning a constant part of your practice

- Don't rely on your old skill set
- Identify best practice



Therapist and Patient/Family Team

- Educate the family about the diagnosis
- Major characteristics
- Functional limitations
- Recommended therapies



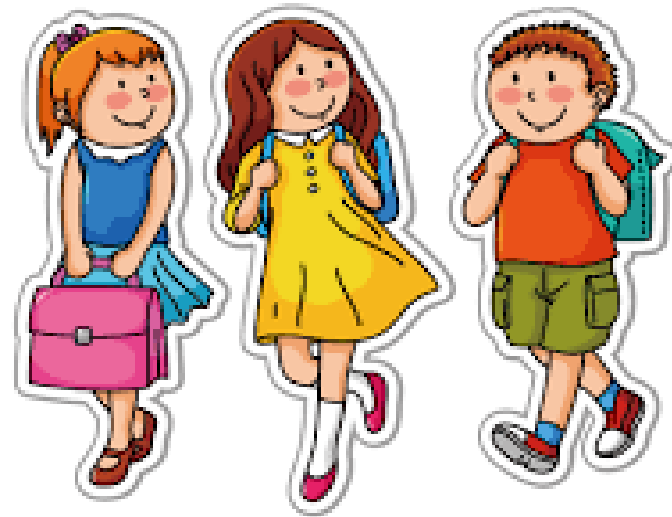
Saint Louis protocols: Hand and Upper Extremity Therapy. Charles Goldfarb, MD 2011

Forman M, Canizares MF, Bohn D, James MA, Samora J, Steinman S, Wall LB, Bauer AS; CoULD Study Group. Association of Radial Longitudinal Deficiency and Thumb Hypoplasia: An Update Using the CoULD Registry. J Bone Joint Surg Am. 2020 Oct 21;102(20):1815-1822. doi: 10.2106/JBJS.20.00281. PMID: 33086350.

Have a Conversation with the Child and Family About Their Hand Difference

Children should be able to explain why their hand is the way it is by age 4

Encourage parents to help them have an answer





A New Online Resource *for parents of children with a* **Congenital Hand Difference (CHD)**

Congenital hand differences occur when a child is born with arms and or hands that look a little different than expected. Children with a CHD will do all of the things they want to do and need to do. This website is here to help!



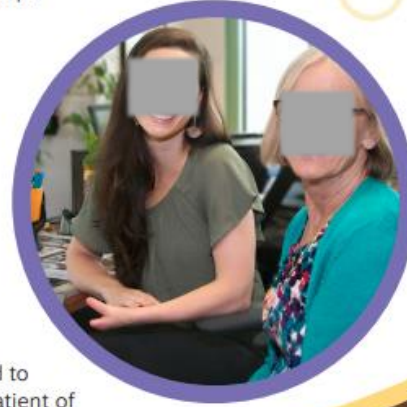
Visit:

shrinerschildrens.org/handdifferences

Topics featured include:

- Parent Experience
- Child Experience
- Personal Experiences
- School Resources
- Additional Resources
- Pediatric Hand Team

Working in partnership with Michelle James, M.D., chief of orthopaedics, Sarah Tuberty developed the new web page as a capstone project for her Doctorate of Occupational Therapy. Born with Congenital Hand Difference (CHD), Sarah was referred to Shriners Hospital for care at a very young age and is a former patient of Dr. James who helped her develop this website.



Shriners Hospitals
for Children®—Northern California

For more information:

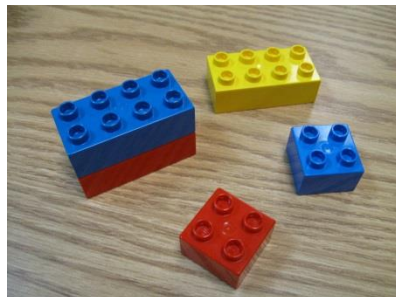
Parents with questions, comments or concerns regarding Congenital Hand Difference (CHD) are encouraged to contact the Northern California hand team. Please email us at ncl.chd@shrinenet.org



Shriners
Children's™
Twin Cities

Use of Toy Kits

- Make your session playful
- Bimanual interesting toys
- Allow young children to explore while you interview the parent
- Observe functional use patterns and bimanual coordination



Develop a Consistent Assessment Protocol: Organized for Follow Up Review (Three Ring Binder)

Thumb Function Assessment

Patient Name	Date
--------------	------

Hand Dominance: L ___ R ___ Affected Hand: L ___ R ___ Both ___

Thumb MP Joint is Unstable: Left Yes No Right Yes No

Thumb Position at Rest: Left Flexed (inside palm) Extended (outside palm) Normal

Right Flexed (inside palm) Extended (outside palm) Normal

Joint Flexion Creases

	Left		Right	
	Present	Absent	Present	Absent
Thumb MP				
Thumb IP				

STRENGTH (3 trials)

Left			Right		
			Grip		
			Key (Lateral Pinch)		
			Tripod Pinch		

Box and Block Test

	# of Blocks in 60 seconds
Left	
Right	

9-Hole Peg Test

	Time
Left	
Right	

Range Of Motion

Left		Right	
Active	Passive	Active	Passive
		Wrist ulnar deviation	
		T-ARC 0-90° 0°=extension 90°=flexion	
		CMC Radial Abduction	
		Thumb MP Flex/Ext	
		Gross Finger Flexion Lag	

Thumb Function Assessment

Kapandji Opposition Test

Thumb to:	Left Hand	Right Hand
1. Lateral Side Second Phalanx Index		
2. Lateral Side of Third Phalanx Index		
3. Index Fingertip		
4. Middle Fingertip		
5. Ring Fingertip		
6. Small Fingertip		
7. Small Finger DIP Crease		
8. Small Finger PIP Crease		
9. Small Finger Proximal Crease - MCP		
10. Distal Volar Crease		

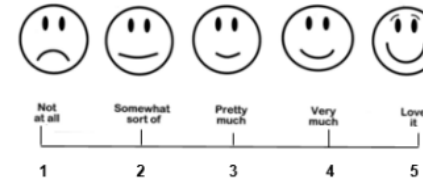
FACES QUESTIONNAIRE

1. Point to the face that shows how happy you are with the way your thumb **looks**.

Parent: Left: _____ Right: _____ Patient: Left: _____ Right: _____

2. Point to the face that shows how happy you are with the way your thumb **works**.

Parent: Left: _____ Right: _____ Patient: Left: _____ Right: _____



Activities of Daily Living

Are there any activities you are unable to complete because of your hand difference? _____

T-GAP Total Score: Left _____ Right _____ Abilihands completed? Yes No

Range of Motion Testing

T-Arc (Thumb Arc) to Measure of Thumb Circumduction

Extension = 0



Flexion = 90 degrees



Kollitz KM, Tomhave WA, Van Heest AE, Moran SL. A New, Direct Measure of Thumb Use in Children After Index Pollicization for Congenital Thumb Hypoplasia. J Hand Surg Am. 2018 Nov;43(11):978-986.e1. doi: 10.1016/j.jhsa.2018.02.025. Epub 2018 Mar 28. PMID: 29605519.

GRIP AND PINCH STRENGTH NORMS 3-5 YEAR OLDS

(Lee-Valkov 2003)

GRIP STRENGTH				
Age	Hand	Mean	SD	Range
3	R	6.53	2.70	3.8-9.2
	L	6.13	3.96	2.2-10.1
4	R	7.83	2.53	5.3-10.4
	L	7.63	2.69	4.9-10.3
5	R	10.75	3.40	7.4-14.2
	L	10.02	3.79	6.2-13.8

KEY PINCH				
Age	Hand	Mean	SD	Range
3	R	5.13	1.49	3.6-6.6
	L	5.07	1.24	3.8-6.3
4	R	5.83	1.39	4.4-7.2
	L	5.67	1.39	4.3-7.1
5	R	7.29	2.04	5.3-9.3
	L	7.34	2.24	5.1-9.6

TRIPOD PINCH				
Age	Hand	Mean	SD	Range
3	R	4.30	0.75	3.6-5.1
	L	4.17	1.14	3.0-5.3
4	R	4.96	1.57	3.4-6.5
	L	4.78	1.19	3.6-6.0
5	R	5.72	1.59	4.1-7.3
	L	5.42	1.51	3.9-6.9

AVERAGE PERFORMANCE FOR GRIP STRENGTH (Mathiowetz)

MALES					FEMALES				
Age	Hand	Mean	SD	Range	Age	Hand	Mean	SD	Range
5	R	19.2	6.8	12.4-26.0	5	R	16.3	4.3	12.0-16.6
	L	19.4	6.2	13.2-25.6		L	16.0	4.9	11.1-20.9
6	R	20.5	6.7	13.8-27.2	6	R	15.5	4.1	11.4-19.6
	L	20.9	6.5	14.4-27.5		L	15.4	4.9	10.5-20.3
7	R	23.1	6.7	16.4-29.8	7	R	18.9	5.7	14.3-24.6
	L	22.6	7.2	15.4-29.5		L	18.7	6.6	12.1-25.3
8	R	27.3	6.6	20.7-33.9	8	R	23.7	8.1	15.6-31.8
	L	27.8	8.3	19.5-36.1		L	23.8	7.9	15.9-31.7
9	R	30.4	7.9	22.5-38.3	9	R	27.9	6.2	21.7-34.1
	L	30.0	8.1	21.9-38.1		L	26.4	7.1	19.3-33.5
10	R	36.3	6.9	29.4-43.2	10	R	33.0	5.7	27.3-38.7
	L	36.3	8.6	27.7-44.9		L	31.7	5.6	26.1-37.3
11	R	44.7	9.5	35.2-54.2	11	R	36.5	9.4	27.1-45.9
	L	44.6	11.4	33.2-56.0		L	37.0	8.8	28.2-45.8
12	R	51.6	14.3	37.3-65.9	12	R	46.3	8.9	37.4-57.2
	L	51.4	13.0	38.4-64.4		L	48.6	10.1	38.5-58.7
13	R	58.7	15.5	43.2-74.2	13	R	58.6	10.6	48.0-69.2
	L	55.4	16.9	38.5-72.3		L	50.9	11.9	39.0-62.8
14-15	R	77.3	15.4	61.9-92.7	14-15	R	58.1	12.3	45.8-70.4
	L	64.4	14.9	49.5-79.2		L	49.3	11.9	37.4-61.2
16-17	R	94.0	19.4	74.6-113.4	16-17	R	67.3	16.5	50.8-83.8
	L	78.5	19.1	59.4-97.6		L	56.9	14.0	42.9-70.9
18-19	R	108.0	24.6	83.4-132.6	18-19	R	71.6	12.3	59.3-83.9
	L	93.0	27.8	65.2-120.8		L	61.7	12.5	49.2-74.2

AVERAGE PERFORMANCE FOR PALMAR PINCH (Ages 5-12; Mathiowetz 13-19)

MALES					FEMALES				
Age	Hand	Mean	SD	Range	Age	Hand	Mean	SD	Range
5	R	6.2	1.7	4.5-7.9	5	R	5.1	1.8	3.3-6.9
	L	6.0	2.2	3.8-8.2		L	4.9	2.1	2.8-7.0
6	R	7.2	3.2	4.0-10.4	6	R	5.5	2.4	3.1-7.9
	L	6.6	3.4	3.2-10.0		L	5.2	2.4	2.8-7.6
7	R	8.2	2.7	5.5-10.9	7	R	6.8	2.7	4.1-9.5
	L	7.8	2.4	5.4-10.2		L	6.2	2.5	3.7-8.7
8	R	10.7	3.8	6.9-14.5	8	R	9.5	3.2	6.3-12.7
	L	10.0	3.3	6.7-13.3		L	8.5	2.8	5.7-11.3
9	R	11.8	3.6	8.2-15.4	9	R	9.3	3.3	6.0-12.6
	L	11.8	3.9	7.9-15.7		L	9.2	3.3	5.9-12.5
10	R	13.2	3.0	10.2-16.2	10	R	12.5	3.2	9.3-15.7
	L	12.3	2.9	9.4-15.2		L	12.9	3.7	9.2-16.6
11	R	14.2	4.5	9.7-18.7	11	R	12.8	2.9	9.9-15.7
	L	14.2	3.9	10.3-18.1		L	12.4	3.3	9.1-15.7
12	R	15.0	4.4	10.6-19.4	12	R	15.0	4.4	10.6-19.4
	L	14.8	4.8	10.0-19.6		L	14.0	5.9	8.1-19.9
13	R	15.5	3.6	11.4-19.1	13	R	15.4	2.6	12.8-18.0
	L	15.1	4.1	11.0-19.2		L	14.2	2.8	11.4-17.0
14-15	R	19.2	4.2	15.0-23.4	14-15	R	15.6	3.3	12.3-18.9
	L	18.8	5.0	13.8-23.8		L	14.7	3.4	11.3-18.1
16-17	R	22.2	5.0	17.2-27.2	16-17	R	17.8	3.9	13.9-21.7
	L	20.3	4.1	16.2-24.4		L	16.6	3.9	12.7-20.5
18-19	R	23.8	4.3	19.5-28.1	18-19	R	20.2	3.3	16.9-23.5
	L	22.2	4.3	17.8-26.7		L	20.2	3.3	16.9-23.5

BOX AND BLOCK TEST NORMS 3-10 YEAR OLDS

(Jongbloed-Pereboom, Nijhuis-van der Sanden, Steenberg)

Age	Dominant Hand			Nondominant Hand		
	Mean	SD	Range	Mean	SD	Range
3	24.2	7.4	15-39	22.8	6.6	12-35
4	35.7	7.3	16-45	34.1	8.8	11-49
5	40.6	6.7	27-56	38.7	5.8	21-47
6	44.7	7.0	28-57	44.2	6.6	30-53
7	50.3	5.2	41-64	48.7	4.4	42-58
8	55.4	7.0	39-67	53.9	6.3	41-71
9	56.4	6.8	45-71	55.5	5.8	46-71
10	56.4	6.5	42-68	56.2	5.5	41-64

BOX AND BLOCK TEST NORMS

Ages 6-19 years

(Mathiowetz)

MALES					FEMALES				
Age	Hand	Mean	SD	Range	Age	Hand	Mean	SD	Range
6-7	R	54.4	6.6	48-77	6-7	R	57.9	5.3	44-68
	L	50.7	6.3	36-67		L	54.2	5.6	43-67
8-9	R	63.4	4.3	55-78	8-9	R	62.8	5.1	53-78
	L	60.1	4.9	53-71		L	60.4	5.2	52-71
10-11	R	68.4	6.9	53-81	10-11	R	70.0	7.6	52-85
	L	65.9	6.8	52-82		L	67.6	8.6	54-91
12-13	R	74.6	8.3	57-92	12-13	R	73.6	8.1	57-89
	L	72.4	8.2	58-87		L	70.5	6.2	55-83
14-15	R	76.6	8.7	61-94	14-15	R	75.4	8.5	61-94
	L	74.6	7.9	57-86		L	72.1	7.6	58-88
16-17	R	80.3	8.7	62-101	16-17	R	77.0	9.0	50-92
	L	77.6	5.1	71-87		L	74.3	9.1	54-91
18-19	R	79.9	8.9	58-96	18-19	R	77.9	9.4	56-94
	L	79.2	8.8	60-93		L	76.0	8.5	51-90

Nine Hole Peg Test Norms Ages 3.5 years – 19 years

NINE HOLE PEG TEST NORMS AGES 3½-6½

(Ebrahim A 2008)

MALES & FEMALES				
Age	Hand	Mean	SD	Range
3.5	R	43.61	13.85	29.76-57.46
	L	49.87	14.0	35.87-63.87

NINE HOLE PEG TEST NORMS AGES 4-19

(Poole 2005)

MALES					FEMALES				
Age	Hand	Mean	SD	Range	Age	Hand	Mean	SD	Range
4-5	R	29.8	3.8	26.0-33.6	4-5	R	30.2	6.3	23.9-36.5
	L	34.5	5.9	28.6-40.4		L	33.2	6.2	27.0-39.4
6-7	R	25.5	6.0	19.5-31.5	6-7	R	22.5	2.3	20.2-24.8
	L	28.5	6.6	21.9-35.1		L	25.9	5.2	20.7-31.1
8-9	R	19.9	3.9	16.0-23.8	8-9	R	18.7	1.9	16.8-20.6
	L	21.7	4.3	17.4-26.0		L	21.2	3.2	18.0-24.4
10-11	R	18.9	4.1	14.8-23.0	10-11	R	16.7	3.4	13.3-20.1
	L	20.2	3.3	16.9-23.5		L	19.0	3.1	15.9-22.1
12-13	R	18.0	2.5	15.5-20.5	12-13	R	17.1	1.8	15.3-18.9
	L	18.4	2.6	15.8-11.0		L	18.1	2.2	15.9-20.3
14-15	R	18.0	2.7	15.3-20.7	14-15	R	16.8	2.4	14.4-19.2
	L	18.6	1.8	16.8-20.4		L	18.1	1.8	16.3-19.9
16-17	R	16.9	2.0	14.9-18.9	16-17	R	15.8	1.9	13.9-17.7
	L	17.1	2.4	14.7-19.5		L	17.1	1.8	15.3-18.9
18-19	R	16.1	1.6	14.5-17.7	18-19	R	16.1	2.1	14.0-18.2
	L	16.7	1.2	15.5-17.9		L	17.4	2.0	15.4-19.4

PROM and Splinting

- Start as early as possible
- Education and training for the parent
- Gentle but firm passive stretch
- Finger and elbow PROM if needed
- Radial gutter splint



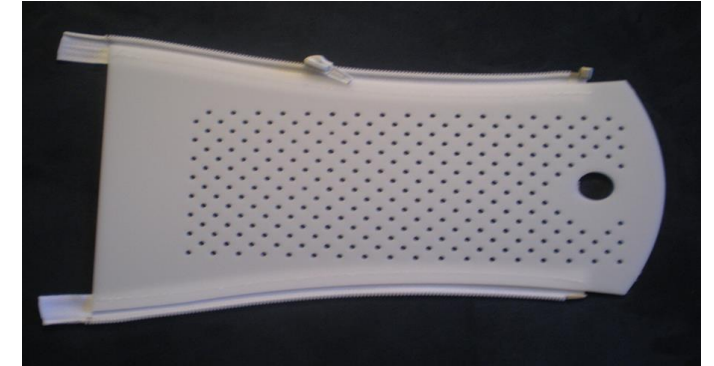
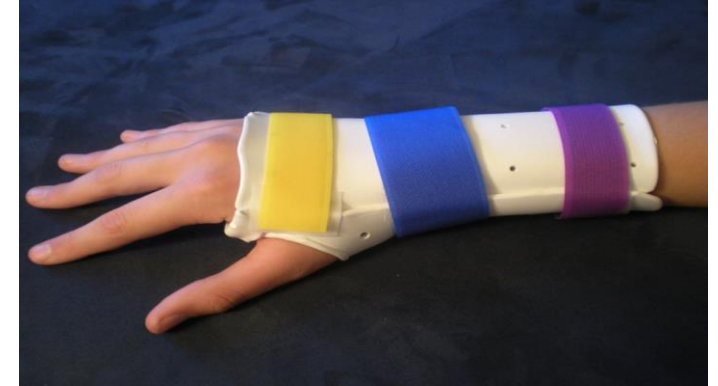
Elseviers Rehabilitation of the Hand and Upper Extremity: Book Chapter Congenital Hand Differences: Katherine Kollitz Jegapragasan MD, Wendy Tomhave ORT/L, Steven Moran MD

Lamb DW. The treatment of radial club hand. Absent radius, aplasia of the radius, hypoplasia of the radius, radial paraxial hemimelia. Hand. 1972 Feb;4(1):22-30. doi: 10.1016/0072-968x(72)90004-6. PMID: 5061371.

Centralization

Twin Cities Protocol

- Cast removal 4 weeks
- Clamshell or zipper splint 8 weeks, then night wear
- Early HEP: Remove splint 3-5 times a day
- Advance to A/PROM of fingers and elbow 8-10 weeks
- Progress to light resistive strengthening 10-12 weeks



Elsevier's Rehabilitation of the Hand and Upper Extremity. Book Chapter on Congenital Hand Differences: Katherine Kollitz MD, Wendy Tomhave ORT/L, Steven Moran MD

Centralization

Family Education: Review Current and Past Literature

i.e. Kotwal Study

- Non surgical correction (137)
- Centralization (205) or radialization (107) surgery.
 - 446 patients over 20 years – mean follow up 10.5 years
- Analyzed radiographs and functional outcomes
 - hand forearm angle of the wrist 12 vs 85 degrees
 - digital range of motion 157 vs 86 degrees
 - improved grip strength
- **Surgical treatment produced better outcomes than non surgical correction**



Bora FW Jr, Osterman AL, Kaneda RR, Esterhai J. Radial club-hand deformity. Long-term follow-up. J Bone Joint Surg Am. 1981 Jun;63(5):741-5. PMID: 7240297.

Kotwal PP, Varshney MK, Soral A. Comparison of surgical treatment and nonoperative management for radial longitudinal deficiency. J Hand Surg Eur Vol. 2012 Feb;37(2):161-9. doi: 10.1177/1753193411413070. Epub 2011 Jun 27. PMID: 21708841.

Centralization

Evaluating Activities of Daily Living

Children Hand Use Experience Questionnaire (CHEQ)

Abilihands

Patient Interview

- opening containers
- cutting foods
- handwriting
- personal hygiene
- tying shoelaces
- keyboarding
- donning socks
- starting zippers



Ekblom AG, Dahlin LB, Rosberg HE, Wiig M, Werner M, Arner M. Hand function in children with radial longitudinal deficiency. BMC Musculoskelet Disord. 2013 Mar 28;14:116. doi: 10.1186/1471-2474-14-116. PMID: 23537422; PMCID: PMC3636056.

The Loop Method for Tying Shoes

Setup:

1. Lace shoelaces through the top two holes and form two equal three inch loops on each side.
2. Tie a knot to secure each lace.



Tying Shoes:

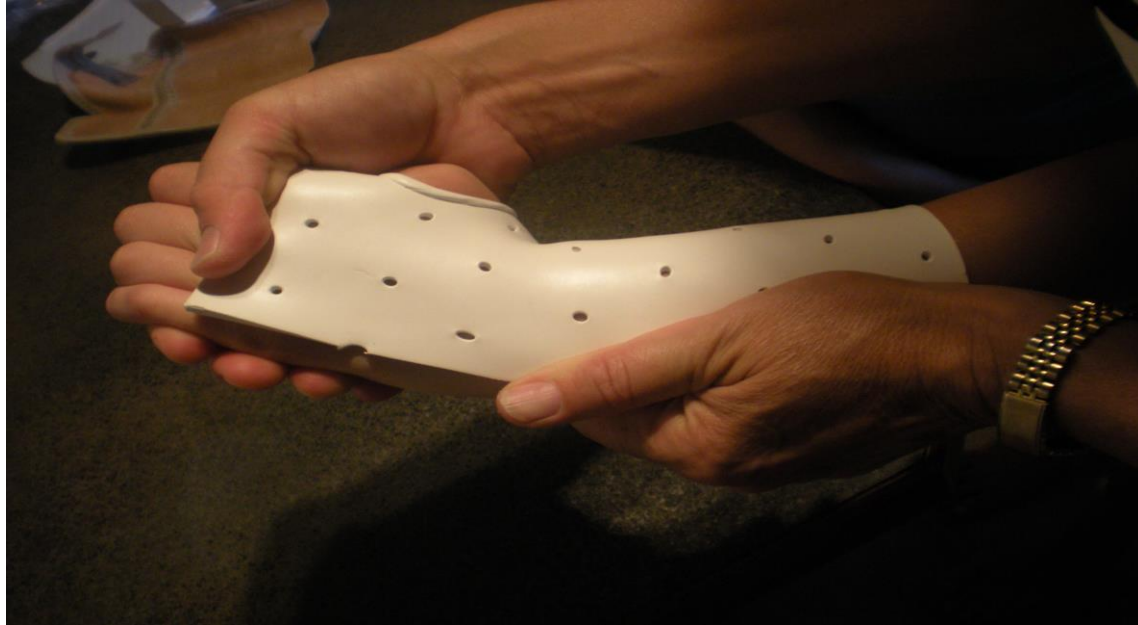
1. Make a knot using the two loops and pull tight!
2. Make a second knot to form a double knot.



Patient Name _____

Date _____

*Centralization
Recurrence of Radial Deviation
Night Splinting*



Index Pollicization: Twin Cities Protocol

4 weeks

- Cast removal, fit thumb spica splint – opposition and palmar abduction
- Gentle wrist, finger and thumb AROM
- Light grasp/release opposition activities

6-8 weeks

- Progress AROM
- Grasp/release variety of sized objects
- Fine motor and bimanual play
- Scar management

8-10 weeks

- Gentle AA/ROM of the pollicized digit
- Progress thumb strengthening activities
- Wean out of day splint ; night only
- Taping to optimize thumb position

10-12 weeks

- Discontinue night splint
- Initiate thumb extension exercises if thumb is in a flexed posture

Elseviers Rehab of the Hand: Book Chapter Congenital Hand Differences. Kollitz, Tomhave, Moran

Bassini L, Pate M: Pediatric Hand Therapy.

Fundamentals of Hand Therapy, St. Louis, 2007 Mosby



Index Pollicization

Family Education: Review of Literature

i.e. deKraker 2013

30 pollicized hands

Mean follow up 9.4 years

- Radial and palmar abduction closest to normal 61-95%
- Opposition weaker in severe cases
- Grip and pinch strength diminished 13% - 70%
- Overall ROM and strength were diminished compared to normative data , more pronounced in severe cases
- Patients/parents were very satisfied with function (7.5) and appearance (7.2) of the new thumb



de Kraker M, Selles RW, van Vooren J, Stam HJ, Hovius SE. Outcome after pollicization: comparison of patients with mild and severe longitudinal radial deficiency. *Plast Reconstr Surg.* 2013 Apr;131(4):544e-551e. doi: 10.1097/PRS.0b013e3182818c98. PMID: 23542272.

Index Pollicization Twin Cities Study

Does strength, ROM and dexterity change over time?

- 29 pollicized thumbs, followed an average 3.9 years

Results: Improvements with each year of age

- Kapandji opposition improved .26 points
- Grip strength improved 2,69 kg / year
- Tripod and key pinch .58 kg and .67 kg / year
- Box and blocks scores 4.11 blocks / year
- Nine hole peg test 3.83 seconds / year
- Proximal web space did not change with age

Change in Hand Function and Dexterity with Age after Index Pollicization for Congenital Thumb Hypoplasia

Kathleen M. Kollitz, M.D.
Wendy Tomhave, O.T.R./L.
Ann E. Van Heest, M.D.
Steven L. Moran, M.D.
Rochester and Minneapolis, Minn.



Background: Little is known about how performance on strength, range of motion, and dexterity measures changes as children with index finger pollicization mature. The authors reviewed performance in range of motion, strength, and dexterity over a 7-year period and report outcomes over time.

Methods: Data from children treated with index finger pollicization for congenital thumb hypoplasia from 2007 to 2014 were reviewed retrospectively. Children were followed for an average of 3.9 years (range, 1 to 7 years) during the study period. Standardized assessments included range of motion, grip, key pinch and tripod pinch strength, the Box and Block Test, the Nine Hole Peg Test, and the Functional Dexterity Test. Average score by age and average yearly change were calculated for each assessment, and scores were plotted against published age-matched scores of normal children when available.

Results: Twenty-three patients with 29 affected thumbs were included. Distal grasp span increased 0.17 inch and Kapandji opposition improved 0.26 point with each year of age; however, proximal web-space size did not increase over time. Grip strength improved an average of 2.69 kg/year, and tripod and key pinch improved 0.58 kg and 0.67 kg with each year of age. Box and Block Test scores improved an average of 4.11 blocks/year. Scores on the Nine Hole Peg Test improved 3.83 seconds/year, and scores on the Functional Dexterity Test improved 0.026 peg/second each year.

Conclusions: Children with pollicized thumbs improve in dexterity and strength with growth. Web-space size did not change with age; therefore, the thumb should be carefully positioned at the time of surgery. (*Plast. Reconstr. Surg.* 141: 691, 2018.)

CLINICAL QUESTION/LEVEL OF EVIDENCE: Therapeutic, IV.



Index pollicization for congenital deficiency of the thumb does not produce a “normal” hand.¹⁻⁹ Grip and pinch strength are typically reduced compared with age-matched unaffected children.^{2,3,6,9} Outcomes are strongly related to the degree to which a child is affected; children with more isolated cases of congenital thumb hypoplasia usually perform much better than children with forearm involvement and radial hypoplasia.^{3,4,6,8}

Various strategies have been used to judge outcomes in pollicization. Typically, assessments in congenital thumb hypoplasia combine objective measurements of bodily function, structure (range of motion, strength), and activity (dexterity tests) with subjective measures of patient- or parent-rated appearance and overall function.^{6,7,10}

Disclosure: The authors have no financial interest to declare in relation to the content of this article.

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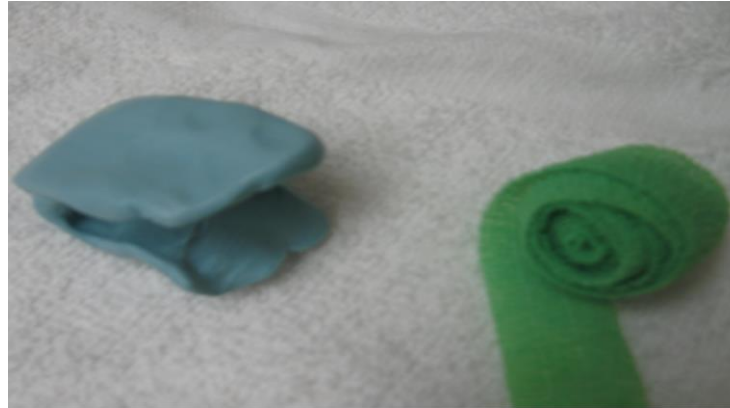
Received for publication November 8, 2016; accepted August 30, 2017.

Presented at the 71st Annual Meeting of the American Society for Surgery of the Hand, in Austin, Texas, September 29 through October 1, 2016.

Supplemental digital content is available for this article. A direct URL citation appears in the text; simply type the URL address into any Web browser to access this content. A clickable link to the material is provided in the HTML text of this article on the *Journal's* website

Index Pollicization: Elastomere for Small or Difficult Thumbs

- Use alone or combine in a splint
- Position the thumb
- Improve scar healing



Index Pollicization: Taping the Thumb to Position in Opposition

Hand and Upper Extremity Therapy
Saint Louis Protocols
Charles Goldfarb, MD 2011

I. Taping Instructions after Pollicization or Thumb Reconstruction

Purpose of taping: To help maintain thumb position for function while allowing use of the thumb. It is worn only when your child is awake. If the hand gets wet, the tape is reapplied after hand is dry.

- Use ½ inch cloth tape or Coban as instructed by therapist.

1. Tear off a 12 to 15 inch piece of tape

2. Begin at on the back side of the small finger side of wrist.

3. Bring the tape around to palm, towards and past thumb. Loop the piece of tape around the thumb. Make sure the tape is close to the joint where the thumb meets the hand. The lower on the thumb that the tape rests, the better. If the tape is too close to the thumbnail, it won't work as well.

4. As you loop the tape around the thumb, gently pull the tape to position the thumb in line with the 1st two fingers.

5. Place the tape along the wrist crease toward the small finger and continue to wrap it around the entire wrist past starting point and continue around, ending at your starting point.

6. Reapply 2nd piece to tape over the first for reinforcement. The thumb should be positioned above the 1st two fingers- the best position for thumb function.



Thumb Reconstruction: Twin Cities Protocol

4 weeks

- Cast removal; fit hand based palmar abduction splint; part time protection (75% range) to protect the transfer
 - Elastomere splint an option
- Remove 4-5 x daily; gentle grasp /release activities, opposition and abduction



6-8 weeks

- Wean out of day splint, protection only
- Progressive AROM and gentle PROM to promote muscle re-education
 - wrist flexion / extension, radial / ulnar deviation
 - thumb flexion / opposition / palmar abduction / active extension (avoid passive thumb radial abduction or extension)
- Opposition grasp/release activities
- Taping – position of palmar abduction
- Scar massage

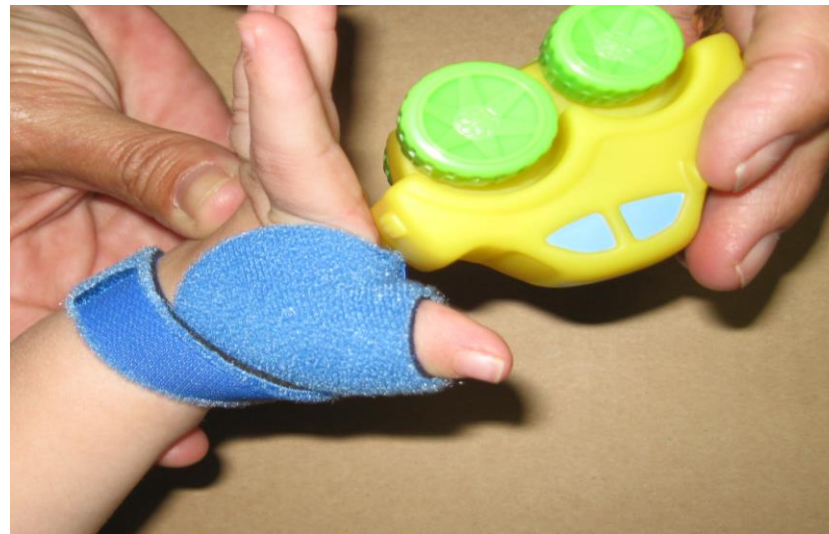


8-12 weeks

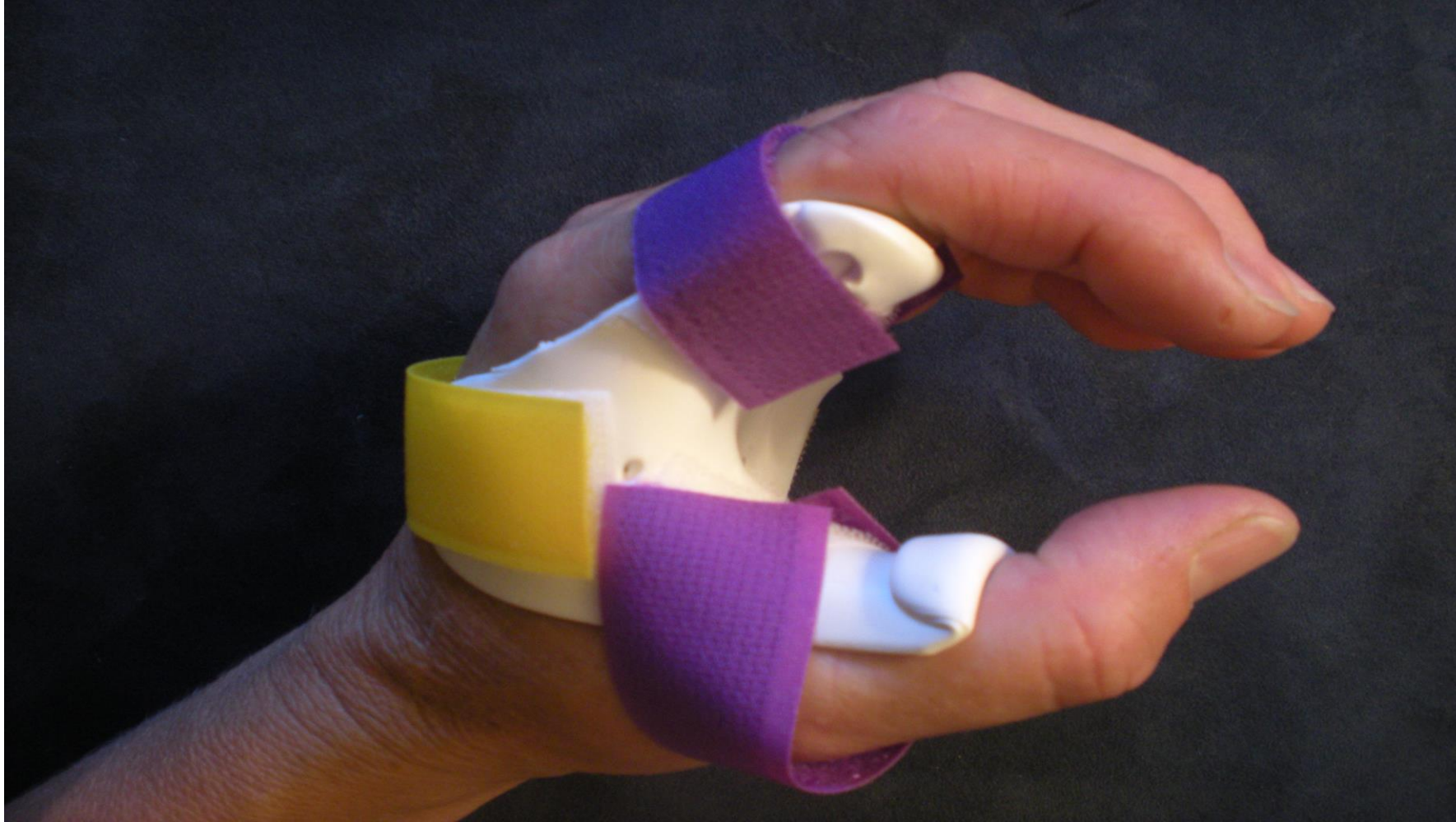
- Splint night wear only
- Progress strengthening exercises
 - palmar abduction, thumb opposition, grip and pinch
- Functional activities, ADLs



Thumb Reconstruction: Soft Abduction Splints



Thumb Reconstruction: C-Bar Splint



Books for Children with Limb Differences



Books for Children with Limb Differences (Younger)

- **Imagine...Amazing Me!** [Libbi Chilia](#)
- **The making of my special hand: Madison's Story** [Jamee Heelan](#)
- **Just Like Us: A Coloring Book Celebrating Children with Limb Differences** [Jennifer Lathan Robinson](#)
- **Uniquely Me!** [Trace Wilson](#)
- **Different is Awesome!** [Ryan Haack](#)
- **5 Fingers and 10 Toes** [Dawn Civitello](#)
- **Winter's Tail: How One Little Dolphin Learned to Swim Again** [Craig Hatkoff](#)
- **God Made Me Special, Just Like You!** [Nicki Olin](#)
- **Little Arm and Me** [Mutiya Vision](#)
- **Disabilities** [Mutiya Vision](#)
- **What's the Matter with Henry? The True Tale of a Three-legged Cat** [Cathy Conheim](#)

Books for Older Children with Limb Differences (Older)

- **Handbook for Dragon Slayers** [Memie Haskell](#)
(Fantasy book series where the main character has a limb difference)
- **One-Handed Catch** [MJ Auch](#)
- **One Foot On The Podium** [Don Elgin](#)
- **The Running Dream** [Wendelin Van Draanen](#)
- **Mermaid: A Memoir of Resilience** [Eileen Cronin](#)
- **In a Single Bound: Losing My Leg, Finding Myself, and Training for Life** [Sarah Reinertsen](#)

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