

**NOTE: This handout is available on [www.handtherapyhub.com](http://www.handtherapyhub.com) under the tab Wisconsin Hand Experience 24**

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## **Tips, Tricks, Pearls, Ideas**

### **Finger**

#### Finger gutter with belly

- Polyform non perforated 1/16"
- Small piece of 50/50 silicone for belly on volar aspect of PIP joint
- Highlighter pen
- 7/8" Surgitube to cover highlighter
- Pattern. Mark location of PIP joint
- Mold over highlighter with 50/50 bump
- Contour radial and ulnar sides just before it fully cures
- Silicone corn protector dots (mini) to mitigate pressure on dorsal PIP joint. Slip it onto the 1/2" strap material
- Open toe for splint so there is room as PIP joint extends

#### Custom light compression finger tube

- Pattern
  - Paper towel to exact circumference of finger, exact shape of finger.
    - Pinch paper material around finger
    - At top of finger, fold to one side, finger press, fold to the other side, finger press. Cut along fold lines. Check pattern. It should cover the shape of the finger, no extra.
  - Use pattern to cut out piece of Spandex using a rotary cutter. Scissors are tough to use on Spandex.
  - Sew a 1/4" seam allowance and...it works! (For all you sewists, I know, there was no seam allowance in my pattern. But, this is how near perfect compression is achieved! Trust!
    - If you do not have a straight stitch option for your throat plate, I recommend moving the needle to the right to bring it close to one side of the needle hole and close to the right side of the presser foot. Spandex has a tendency to be drawn down into the machine.
    - Avoid starting the seam at the very edge of the material. Start in a bit.
  - Can sew a second seam if it is not tight enough
  - Trim excess with rotary cutter
- Tip! Make a Spandex tube OVER a belly gutter splint! A fantastic way to gently coax out a PIP flexion contracture.

## Buddy Tubes

- Pattern
  - Paper towel to exact circumference of finger, exact shape of finger
  - Cut out of spandex using a rotary cutter. Scissors do not cut spandex well
- Sew two together down the center longitudinally. Right sides together. Sometimes hard to tell which is right side. Don't worry. Doesn't really matter.
- Close each of the two tubes with a ¼" seam (see above Finger Tube for helpful hints)
- Sew another seam if increased tightness is needed

## Pulley Ring

- Velcro brand cord ties. ONE-WRAP Thin Ties. 8" x ½". 50 Ties per package.
- Apply to finger proximal phalanx
- Closure on the dorsal side of the finger
- Mark mid point on volar side
- Apply a strip of 1/16" polyform all the way around the tie at the level of the mid point mark you just made.
- The width of this "reinforcement area" should be slightly narrower than the finger's width
- Create a slight bend in the polyform piece to follow the contour of the finger
- Trim excess of cord tie
  - Dealer's choice whether to wrap around one more time or just cut it just distal to the loop through closure. I generally do not wrap it around again. It gets a bit bulky.

## Index Finger RCL Challenge

- Often ask for a radial gutter. Often hand based, include index and middle, IPs free, MPs in slight flexion
- This is a challenge because the very act of molding it pushes the MP joint ulnarly
- Consider making a volar hand based splint using 1/8" polyform
  - Using a thumb hole instead of a tab helps improve splint mechanics for this one.
  - Mold splint in 2 steps
    - Palm and thumb and volar up to the IP joints (which are free). Leave the radial and ulnar edges FLAT. Totally flat. No edge from MP joint level distal.
      - Apply straps. Usually (1) a loop through strap from the thumb ring, under the pisiform and around to the volar ulnar border; (2) a dorsal strap at the MP joint level; Third strap later.
    - Put splint on. Apply 2 straps. Position index and middle fingers in perfect alignment (maybe even a touch of persuasion radially) Draw a line radial to the index finger along the proximal phalanx. Dip the radial border into the water to exactly that line. No further. Bend up that radial edge exactly at the line. Trim the height of that radial wall to the correct height. Trim the ulnar edge of the splint that is just ulnar to the proximal phalanx of the middle finger just a tiny bit narrower. This way, the strap that attaches there and crosses dorsally over the proximal phalanges of index and middle will snugly hold the two finger against the precisely placed radial edge that you just made.
- This geometry is precise because you are stably holding the index and middle fingers in a precise position relative to the base portion of the splint.

### Index Finger RCL (Step by step can be found in slides)

- FabriFoam Figure 8 Strap (2" x 18" roll, cut in half lengthwise)
- Measure estimated length necessary
- Cut almost all the way across strip at mid point. Cut out a 30-40 degree wedge of material
- Bring edges of "dart" together, place while, non-skid side down on a piece of paper towel and sew a side zig zag stitch to approximate the two edges. Slightly lengthen stitch from standard default
- Place on patient. Determine where straps will criss cross each other at the level of the MP joint radially. Like a breast cancer ribbon. It will look like a diamond-ish shape. Carefully pin the position of that cross over.
- Apply a small dot of Elmer's School Glue to each corner of the diamond. Right at the very edge. Using a pressing cloth and a low temperature iron, dry the glue (this is quick).
- Using paper towel again between the feed dogs of the machine and the white non-skid of the fabriFoam, sew a seam along the box shape of the criss cross overlap. Stay inside of where the glue was placed. No good to sew through glue that might not be fully dry. Rip away paper towel.
- Place on patient. See where two straps need to be sewn together on the ulnar border of the hand. This line will be an oblique line across the strip. Get this right!! It is important for fit and control. Sew this seam.
- You can be done here. However, if you want to add a strap to keep the hand portion of the strap from slipping distally, you can add a thin strap that goes from volar palm, under thumb to dorsal palm. See picture.

### RA Ulnar Deviation Correction

- Challenging
- Consider using thermoplastic beads (Performance Health and North Coast)
- Soften a scant ½ cup of them.
  - Place beads in a piece of paper towel and lower into the water. Once they are in the water just a bit, they stick together and don't float apart all over the splint pan. Squeeze them into a ball and then a flat, thick pancake. Return to water to fully soften it.
- Initially mold to your hand.
  - Make the material about 2.5 inches wide (rectangle-ish) and about ½ inch thick
  - Widen your fingers apart
  - Lay the material from mid-palm to proximal to the PIP joints
  - Aggressively buckle the material up into the webspaces of your hand
    - You are creating distinct slivers of material at the webspaces at the bases of the fingers
  - Squeeze your fingers back together. Mold, mold, mold...adjust
  - There is PLENTY of time
  - You can trim easily where you see material that excessive
  - Before it is set, put it on your patient and get final mold from their fingers/hand
  - Use distal radius fracture traction finger traps to align properly. Good trick.
- Sew a neoprene sleeve with a simple hole for the thumb. Seam is on ulnar side. This will secure the molded piece to their hand.

### Soft Separators For Aligning Digits

- Use loop strap. North Coast Cushion Strap works well.
- Fold up about an inch of strap (becomes 1/2" high when folded) and stitch. Take care that "loop" side is on the inside of the fold. Important because you will be securing this soft piece to hook Velcro on the inside of the splint
- Repeat about 3/4" down the strap. 3/4" is an estimate of the width of the finger
- Repeat one more time to create 3 "loops"
- Tip: Measure the location of loops 2 and 3 on the patient. It is deceiving sometimes. If loops aren't in the right place, it does not work well.
- Tip: You can slip a small piece of 1/16" splint material in the loops to increase rigidity
- These soft separators are underpowered for severe deformities.

### Static Progressive Finger Flexion (refer to pictures in slide presentation and demo that I brought)

- I have stopped attempting composite finger cuffs. Nothing against it. Fine to do. But I prefer managing deficits at each joint separately. And I am not too concerned about chasing DIP flexion as a primary offense.
- One cuff to manage MP flexion, one cuff to manage DIP flexion
- Base splint is a wrist splint
- Create a platform to allow for multiple holes for stringing cuffs
- Create leather cuffs with holes punch on either end
- Nymo cord with 2 loop throughs for the two holes
- Alternate strategy when multiple fingers are involved. See slides. Punch 4 small holes in leather cuff, longitudinally. 2 at the very ends of the cuff and 2 that are about 1/4" apart at the center for the cuff. Thread one piece of Nymo cord through the 4 holes starting outside to inside at one end and ending inside to outside at the other end. This technique simply reduced the number of threads when multiple finger and multiple joints (eg, DIP and MP) are involved
- Line connectors to connect thread of cuff
- Sticky back loop tabs
- Can thread the reins of the two cuffs of each finger through a pony bead to help control and organize the threads!
- Use bobbins to secure each reins for DIP and MP of each finger
- Extra bobbin for temporary "parking" if needed, as you progressively flex MP and PIP of each finger. What happens is the patient positions the MP joint, then the PIP joint and then the MP joint needs to be adjusted. The extra bobbin allows easier adjustments.

### RMO

- Flat coffee stirrer to hold extension/flexion differential. Can also use 2 long handled wooden cotton tipped applicators
- Material choices
  - Orficast tape. Two layers
  - 1/16" polyform, 1.5" length, fold over, cut lengthwise along open edge to create smooth edge
- Trick: Place the material as distally as you can (volar or dorsal depending on RME or RMF) on the finger you are trying to impact. This means as close to the PIP joint as you can.
- Trick: If helpful, add a small U-shaped trough to hold the isolated finger securely when making the RME splint

- Trick: If helpful, you do not need to fully complete the ring around the supporting digits. Sometimes this is helpful in the presence of large PIP joints.

## Thumb

### Judy Colditz Thumb CMC joint splint

- 1/8" Poly form. Non perforated vs perforated.
- Pattern (see article from Judy Colditz later in handout)

### Modifications of Comfort Cool Thumb Spicas

- Too tight thumb tube
  - Use Rotary Punch and punch holes in it. Many.
- Wrap around is too short
  - Add strip of neoprene
    - Use a Zig Zag stitch (set a bit wider than default and lengthen stitch length)
    - Butt the edges together and zig zag stitch goes from one side of seam to the other. Flush final product
    - Can add strip of non sticky back hook Velcro to new extension if needed. Best solution is to remove the existing one (use seam ripper to remove) and re sew to extension. The reason this is best is because if you don't move the existing one from its location, it will be exposed and will annoy the patient.
- Wrap around is too long
  - Add a strip of non sticky back hook Velcro right next to the existing one. You can leave the existing one.
- The "Plus" sizes (Small Plus, Medium Plus, Large Plus)
  - For some reason, without fail, there is too much material in the web space and it appears bunched and poorly fitting. Just cut a crescent shape of material away right at the webspace and it will fit perfectly.

### Modifications to Metagrip splint

- #12 scalpel for skiving and trimming
- Leather shears for cutting
- Heat gun for shaping. Takes a lot of heat
- Dremel tool with grinding attachment for smoothing

### Benik Radial Nerve Splints (701 and 703)

- Great splint, but loops around fingers can be improved
- Get rid of structure for finger loops that comes with the splint
- Find which end of the outrigger devices (4 of them) has more soft material at the end
- Punch a small hole in that soft material area
- Measure length needed to get around finger at level of the PIP joint and add a generous 1/2"
- Cut 1/2 inch width straps to that length (loop strap)
- Punch small hole in each end of the lengths of strap
- Attach loop of strap to end of outrigger device using a jiffy rivet (small size)
  - Two ends of strap overlap and go on the TOP, non hook Velcro side of the outrigger device. Rivet goes through outrigger and two layers of loop strap
  - Loop side to finger as it is softer!

- Additional tip. Place outrigger devices further distally than you might think. Bend them up a bit at a point just distal to where they adhere to the splint. Augments extension assist.

## Wrist

### Wristable Splint

- Visit exhibit
- Encourage sizing kit. Super helpful.

### Clever clip on extension for extensor tendon/MP arthroplasty splint

- Base split is a forearm based splint, MP 0, IPs free (my preference is polyform 1/8")
- Aquaplast extension
  - Start "outside"
  - Fold to "inside"
  - Extend up
  - Create a trough that clips onto the end for night time use

## Elbow

### "In The Air" Posterior Elbow Shell

- Generally 1/8 perforated EZ form works well.
- Life saver for children and for painful acutely injured elbows
- Measurements (read carefully for the most efficient way..)
  - On posterior aspect of the arm, place the 0 of tape measure where you want the splint to start. Usually a touch below the level of the axilla. Hold tape there.
  - Pull tape to olecranon process (along the poster aspect of the upper arm), *note distance* in your head. CONTINUE pulling tape along the ulna to just proximal to the pinky MC head. *Note distance*. (Often something like 8" to olecranon, 22" to MC head)
  - Circumferences:
    - Measure the number of inches needed to cover the posterior aspect of the arm at the most proximal end of the splint. Many people do complex things like  $\frac{1}{2}$  the circumference or  $\frac{2}{3}$  the circumference. I think it is just easier to put the tape on the part of the arm to be covered and read the tape!!
    - No need to measure circumference at the level of the elbow.
    - Measure the number of inches needed to cover the ulnar aspect of the hand at the most distal end of the splint. I start the tape at the 3<sup>rd</sup> MC volarly and then read the number that shows when I come around dorsally to the 3<sup>rd</sup> MC.
    - Then...measure 5" proximally from the distal end of the splint (5<sup>th</sup> MC head). At that level, do one last measurement of the forearm. Again, the number of inches needed to cover the ulnar side at that level. (The amount of territory you want covered at that level) What? You say. Here is the rationale: At about 5" from the 5<sup>th</sup> MC head (+/- a tiny bit for size of human), the shape of the forearm changes from conical (dues to muscle mass) to pretty cylindrical. A measurement at this level helps us later when we draw the splint on the thermoplastic material.
    - One last very important measurement. You need to know the medial/lateral WIDTH of the elbow at the joint itself, when the elbow is bent to 90 degrees. Best way to do this is to look straight at the posterior elbow when it is bent to 90 degrees. Hold a *taut* tape measure (held between your two hands) up to the

posterior aspect of the distal humerus. Note the distance in inches where you see arm! You need to know how much space needs to be between the side walls of the splint at the level of the elbow. It is more than you would think. Like 4.5 or 5 inches!

- OK. Now you have 6 measurements
  - Prox edge to olecranon
  - Prox edge to 5<sup>th</sup> MP head
  - Width needed for splint coverage at prox edge
  - Width needed for splint coverage 5<sup>th</sup> MP level
  - Width needed for splint at level 5" proximal to MP level
  - Width needed between side wall of splint at the level of the elbow
- Get a slab of thermoplastic. Easiest is to cut a 24x18 slab in half length wise to get 9 x 24.
- Pretend your measurement are:
  - Prox edge to olecranon 9"
  - Prox edge to 5<sup>th</sup> MP head 22"
  - Width needed for splint coverage at prox edge 8"
  - Width needed for splint coverage 5<sup>th</sup> MP level 4"
  - Width needed for splint at level 5" proximal to MP level 5"
  - Width needed between side wall of splint at the level of the elbow 4.5"
- Draw a faintly visible line straight down the piece lengthwise in the middle (there will be 4.5 inches on either side of the line)
- Draw faintly visible lines across the piece at 9", 22" and 17" (22-5) from one end.
- At the top edge, place your tape measure with the 4" mark on the faint center, longitudinal line. Keeping it there, make a tick mark at the 0 and at the 8 of the tape. These tick marks will be ½ inch from each longitudinal edge of the material.
- At the 9" cross line, to the same thing. You are carrying the width measurement down from the top/proximal end.
- At the 17" cross line, place the 2.5" mark on the tape on the faint center line. Keeping it there, make a tick mark at the 0 and at the 5 of the tape. The splint is a centered 5" wide at this level.
- At the 22" cross line (the end of the splint), place the 2" mark on the tape on the faint center line. Keeping it there, make a tick mark at the 0 and at the 4 of the tape. The splint is a centered 4" wide at this level.
- Gently connect the width measurement "ticks" to define the area of the splint. Round the tip corners.
- Important. At the elbow level cross line, measure 4.5" centered at mid line. This is critical for keeping adequate width as you mold the splint. This is the "width needed" measurement for the elbow. Not the width of the splint, the width needed for the elbow to fit in!
- Soften the material. Cut out the splint shape.
- Cut into the splint, at the elbow level exactly to the outer ends of the 4.5" line you drew.
- Take a deep breath for the molding portion.
- Soften the material. Do not over heat.

- Drawing side UP (so you can see it) place the forearm end of the splint on the table straight out in front of you. Lift the humeral end of the splint straight up off the table at a minimum of 90 degrees to the table. Curve the top flaps (formed by the cuts you made) inward and stick the cut edge of the flap down on the forearm portion. Important point: don't just stick it down facing straight ahead. This would seem right for a 90 degree bend. Curve them in even more. Like 30 degrees more. Then. Assertively pull up the flaps from the forearm side (up to now lying flat on the table) and lay them down on the outer side of the humerus portion of the splint. Draw them a bit up and back. If not done correctly, the splint will be messy and at an angle greater than 90 degrees.
- Once the flaps are secured and a 90 degree angle has been formed, flip the splint upside down and put your right fist into the elbow corner. While in this position, begin to shape the forearm gutter and the humeral gutter. The reason for this position is that gravity will create a slight curve in the uppermost portion of the splint which helps conformity in this area. Otherwise it flares out.
- Pinch little triangle (longitudinally oriented triangle at the base of the fold over. Cut them off using a curvilinear cut. This minimizes an annoying boxy corner.
- As the splint begins to harden. Flip it around, addressing the shape.
  - Maintain width at elbow level
  - Give forearm portion a very very slight persuasion into varus and into pronation. If not, the elbow will not fit comfortably. It is subtle.
- When splint is nearly formed, slip it on the patient to make sure it fits. Mark areas to attend to such as:
  - Where to create a slight bow out for the heel of the palm
- Next , dry heat and seal the medial and lateral overlaps at the elbow (inside and out, 4 episodes of heating and smooshing)
- Dip the elbow corner of the splint into the water. Not all the way, just the posterior part. Keep the lateral walls out of the water. You are creating an oval shaped area of soft material in the posterior aspect of the splint at the level of the elbow, over the olecranon.
- Once soft, cover your fist with a towel and push out a relief area in the splint where the material is soft. It is a scraping, pushing, punching motion.
- Once a good relief has been formed, quickly capture it by running it under cold water. It wants to return quickly!
- Add straps and Velcro as you would like. In general, two straps at humerus, one at the elbow (kind of oblique, like a seat belt), two on the forearm, one at the webspace of the thumb. Varies depending on diagnosis.

#### Comfort Cool Elbow Support Modification

- Sew a dart in the forearm side to improve conformity of sleeve

#### Use a half cast as a mold

- Create a plaster of Paris mold of an average elbow at various angles (90 and 110 are good)



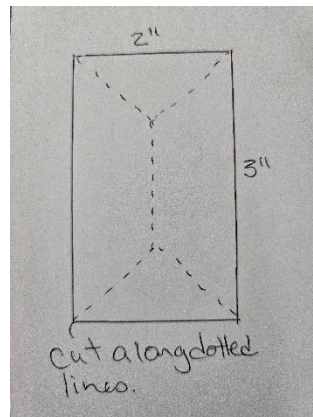
### Static Progressive Elbow Flexion Splint

- See detailed instructions in separate handout

### Night Extension Splint with slight dynamic/static progressive component

- EZ Form: generally a width of 6 or 7 inches is fine
- Length: measure distance from location of proximal edge to antecubital fossa, then from antecubital fossa to location of distal edge. Measurement is usually around 15 inches and the upper arm measurement is usually 1 inch shorter than the forearm measurement.
- Draw splint measurements on material: do not need precision.
  - In general, upper arm (to antecubital fossa line) is 6 inches wide. From there it narrows to 4 inches wide at distal end. For very large or very small arms, minor changes may be needed. Keep it simple
  - At the level of the antecubital fossa, draw a rectangle right at the midline of the splint, measuring 2" wide x 3" long.
  - Within the rectangle, draw the design in picture (see below) and cut along the dotted lines
  - Trim 2 points and middle edges to make neat
  - Put entire splint in the water to soften
  - Draw back the two pointed triangles from the rectangle and touch the tips down above and below the rectangular area
  - Draw back the two longitudinal panels (trapezoid shape) and touch just the edges down to the sides of the splint.
  - Both of the above maneuvers involve a slight bit of "stretching" before tacking down. This makes it so the four corners of the rectangle are rounded, no right angle corners. Right angle corners are weak and prone to breaking. Also, when you simply tack down the tips of the triangles and the edges of the trapezoids, you create a slightly tube-like structure which is very strong.
  - Avoid a rectangle that is too big or too small
  - Molding
    - Position patient in supine with towel roll under distal humerus
    - Soften splint
    - Apply to anterior surface of arm. Forearm is in neutral rotation
    - It is critical that the "side bars" of the splint (the medial and lateral parts of the splint at the level of the elbow joint, the borders of the rectangle) are turned 90 degrees to the anterior surface of the arm/splint. Otherwise it doesn't work. This takes careful attention
    - Mold the splint with room under the splint. This is a challenging because you are guessing. Think that you are folding the splint in the shape the arm will be when it moves into more extension. You are NOT creating a bubble over the antecubital fossa. This does not work. You are lifting the middle part of the splint up. The greatest depth of space between the splint and the arm will be at the level of the antecubital fossa. Space diminishes as it goes proximally and distally.
- Use Velcro Brand Stretch Loop 2" width. North Coast NC12148 125
  - Cut a cross wise slit about 1.5" from one end of the strap
  - Starting about 2-3 inches from that slit, sew a piece of NON sticky back hook Velcro to the fuzzier side of the strap. Use a zig zag stitch, go slowly as you are sewing plastic.

- Loop this strap around the lateral bar of splint in such a way that the hook Velcro piece will end up facing away from the patient.
- Strap goes from this loop through attachment, posteriorly at the olecranon, threads INSIDE the medial bar of the splint, around the bar and back to secure on the piece of hook Velcro that you sewed to the strap!
- Respect wounds!
- Can also use a wide piece of 1/8" neoprene posteriorly (instead of above described strap) to hold elbow up into the splint. I reserve this for the challenging cases



IP Blocking Splint (see detailed handout) (see example that I brought here)

- MP in Extension, IPs free
- See in hand based exercise splint
- See in forearm based splint following MP arthroplasty
  - See clip on extension piece for night time positioning
    - Aquaplast

Easy DIP PIP strap

- 6" strip of 1" wide pajama elastic
- Mid point of strip to dorsal aspect of proximal phalanx
- Loop around flexed PIP and DIP with ends coming together on the dorsal aspect of distal phalanx
- Draw oblique line cross-wise at the perfect level for a slight stretch.
- Sew with straight stitch along line, creating a loop
- Leave some length on the tails beyond the seam line. This is a tab used to pull the loop on
- Be clever and sew a tiny curve in the seam where the tip of the finger can tuck in. Nice for comfort.

Delta Cast Splints

- Use of Delta Cast Conformable polyester cast tape to create a removable splint
- See two detailed handouts for lots of information and step by step instructions for commonly fabricated, work horse hand therapy splints

**Sewing**

- Do not sew through sticky back hook or loop or anything
- Do not sew where you have used glue
- When sewing Fabrifoam, white foam side goes down and use paper between white foam and feed dogs of the machine

- Change your needle fairly frequently. It is often forgotten
- Service your machine with some regularity

#### **Random Ideas**

- For PIP flexion contractures, use a plastic deli gloves (polyethylene gloves) over paraffin wax. Apply LMB spring splint and heat before treatment
- For PIP flexion contractures, use distal radius finger trap traction device to create traction at PIP joint. Direction of traction needs to be perpendicular to treatment plane (determined by concave of the joint (base of middle phalanx))