

The Stiff Hand

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The Hand

“The hand is all about moving parts, All too often, injury and disease result in stiffness and contracture, thus depriving the hand of its fluid versatility”

A. Lee Osterman

Content

- Assessment
- Treatment options:
 - splinting
 - stretching: intrinsic, web space
 - CMMS

Risk factors for a stiff hand

- More tissue damage
- Multi trauma
- Immobilisation
- Age
- infection

Oedema

Prevention is better than cure



Figure 67-5 A bulky dressing may be used overnight or for a few days to provide prolonged but gentle compression for effective edema reduction.

Pathological Patterns of Movement

- Loss of wrist tenodesis
- Intrinsic plus pattern
 - Tight lumbricals, eg flexor tendon repair
- Intrinsic minus pattern
 - Extrinsic predominance
 - Capsular tightness ie: MC #
 - Extensor adherence

Stiffness Hand



Figure 67-24 A chronically stiff hand shows an absence of a normal tenodesis pattern and the resulting ineffectual pattern of motion when finger flexion is attempted.

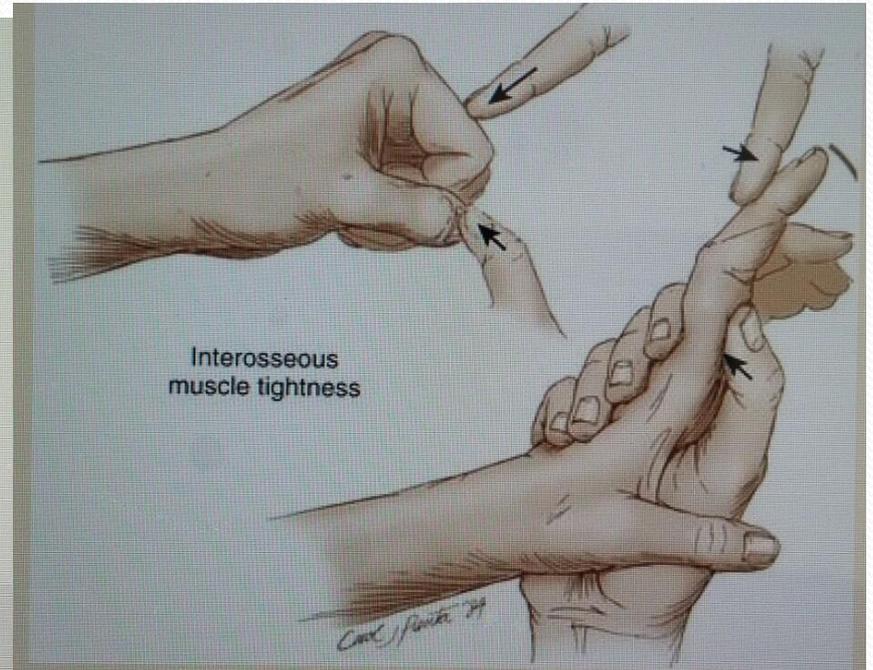


Figure 67-15 Interosseous muscle tightness is noted when PIP joint passive flexion is less when the MCP joint is extended (or hyperextended) than when it is flexed.

Evaluation and Treatment

- Joint tightness
- Muscle-tendon unit tightness
 - Extrinsic: do tenodesis
 - Intrinsic: fist then hook fist
- Skin and scar tightness
 - Linear scars: blanching
tethering
palpable tightness

Interosseous Tightness

- Passive **PIPJ** flexion and then **MP** hyperextended
- Stretch the interosseous with **MP** hyperextension and active or passive PIPJ flexion (not DIP)

Lumbricals Tightness

- Active IP flexion with MP flexed; then OBSERVE....DIPJ reciprocal extension (interosseous and joint tightness must be resolved)
- If the lumbricals fibrotic or contracted, the force of the FDP muscle contraction is transmitted to the lumbricals tendon rather than to the distal phalanx. (smith 1993)
- To stretch a tight lumbrical, actively flex the IPJs with the MP extended

Pearls of wisdom from Judy Colditz

- Consider Not starting MP flexion or composite flexion of the stiff hand with intrinsic tightness
- Concentrate on active flexion with MP blocked: hook and then roll into full flexion
- Remember: All stiff hands have interosseous tightness until proven otherwise

Human Tissue Response to Mechanical Force

- Elastic
 - Short duration
 - * Elongates but no change to collagen fibres
- Plastic
 - Low load
 - Prolonged
 - Promotes biological remodelling

Flowers Hierachy

Key Concepts

- Elastic recovery of ligamentous length follows stretch
- Trauma ad immobilization result in adaptive shortening and stiffness
- Gentle prolonged stress promotes tissue lengthening
- Tissue compliance or stiffness is predicted with the modified Weeks test
- Dosage of force application is determined with the splinting decision hierarchy
- Patient response is monitored to assess safety and effectiveness of splint program

Modified Weeks Test

1. 'Cold reading' taken
2. 20 minutes in a thermal modality with active exercise
3. Tolerable overpressure passive end range stretch for 10 minutes
4. "Preconditioned" reading taken
5. Gain in PROM indicates compliance or stiffness

Guideline for interpretation of the modified Weeks Test

PROM Increase	Splinting
~ 20 degrees	Exercise program
~ 15 degrees	Static splint
~ 10 degrees	Dynamic splint
~ 0-5 degrees	Static Progressive splint

Static Progressive Splints

- The use of inelastic components to apply torque to a joint in order to statically position is as close to end range as possible and thus increase PROM

(Karen Shultz-Johnson)

Static Progressive Splint

- “It takes growth and growth takes time”

Paul Brand

Static Progressive Splint



Figure 67-18 A and B, Static progressive orthosis applies flexion force to gain MCP joint flexion. C and D, Serial static orthosis gains end-range proximal IP joint extension, because volar piece is molded in a position of greater extension than is available to the joint.

(From Colditz JC. Efficient mechanics of PIP mobilisation splinting. Br J Hand Ther. 2000;5:65.)

Function of the PIP joint

- 85% of total encompassment of grip
 - Therefore the PIPJ is paramount to functional grip
- PIP extension is required for
 - Grasping large objects
 - Flat hand (pocket, washing face)
 - Broad area of pressure
 - *Pushing open a door
 - *Cleaning countertop

PIPJ splints

- Splint wire
- Counterforce
- Belly gutter splint
- Safety pin
- Joint jack
- Capner
- LMB
- POP cylinder



Web space contracture

- 1st webs often Have strong collagen reactions, contract+++
- When splinting:



Judy Colditz CMMS

- Casting Motion to Mobilises Stiffness
- Allows active movement by control of proximal joints that move preferentially

CMMS

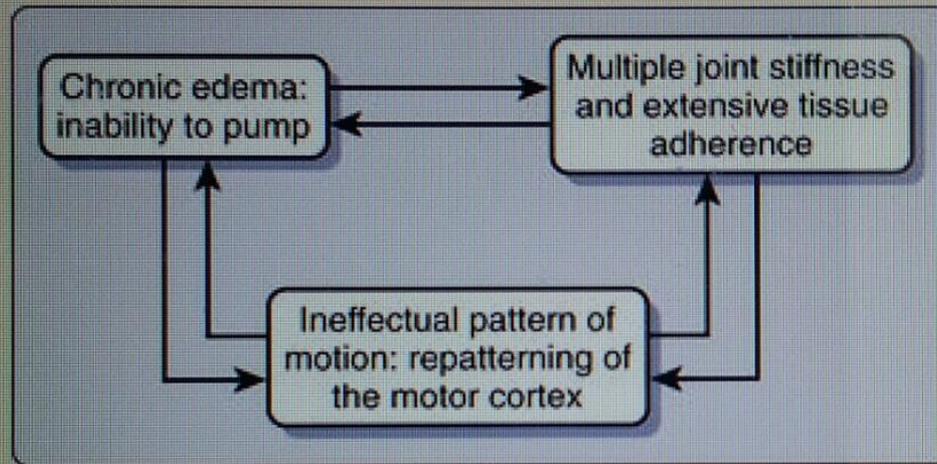


Figure 67-23 In the chronically stiff hand, three factors are interdependent, and effective mobilization requires that all factors are addressed simultaneously.

Table 67-1 A Comparison of the Disadvantages of Mobilization Orthotic Positioning with the Advantages of the CMMS Technique in the Chronically Stiff Hand

Disadvantages of Mobilization Orthotic Positioning	Advantages of CMMS
Mobilization of Stiff Joints	

4. Inflammatory response may be prolonged.	4. Diminished tissue inflammation is observable.
Repatterning of Motor Cortex	
1. Allows no active motion.	1. Desired active motion occurs.
2. Intermittent use allows pathologic motion to recur when orthosis is removed.	2. Nonremovable cast allows adequate time and repetitions for cortical repatterning.
3. No effort is directed toward regaining normal tenodesis motion.	3. Weaning proceeds only as patient can maintain normal tenodesis motion.

CMMS, Casting motion to mobilize stiffness.

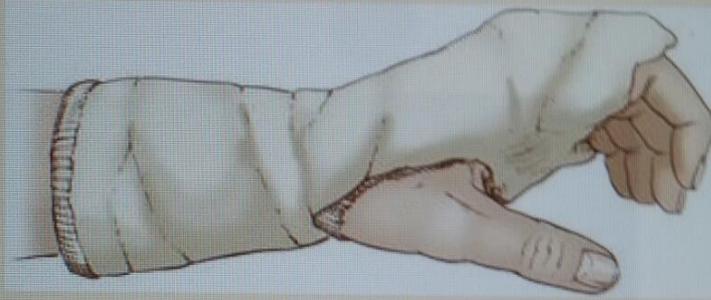


Figure 67-27 A cast positioning the MCP joints in slight flexion is desirable as a starting position if interosseous muscles are extremely tight and/or IP joint tightness is severe. This same cast position with slight MCP flexion is desirable when wanting to gain both flexion and extension of a stiff proximal IP joint.

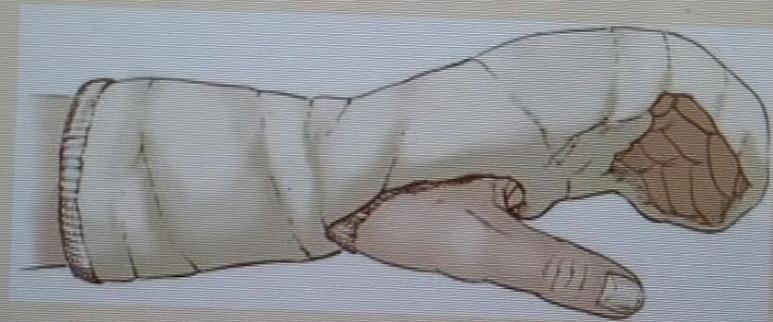


Figure 67-28 A dorsal hood made of plaster of Paris is positioned over the fingers so the DIP joints are in a starting position of relatively greater flexion than the PIP joints. This positioning facilitates initiation of finger flexion at the DIP joint(s).



Figure 67-28 A dorsal hood made of plaster of Paris is positioned over the fingers so the DIP joints are in a starting position of relatively greater flexion than the PIP joints. This positioning facilitates initiation of finger flexion at the DIP joint(s).

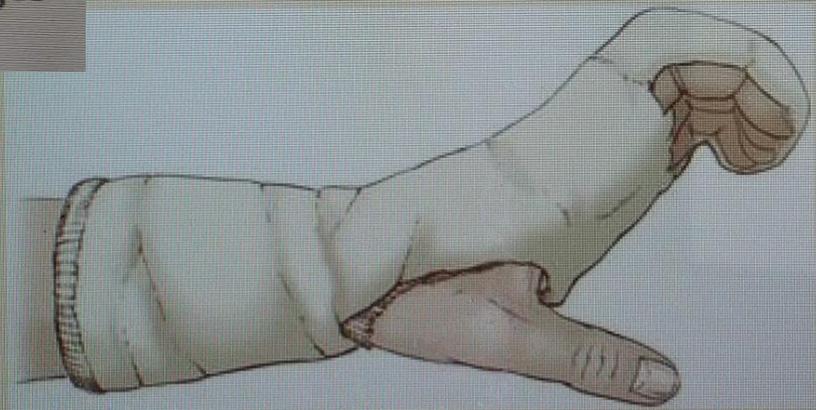


Figure 67-30 If the patient has had great difficulty isolating the extrinsic flexor muscles and regaining active IP joint flexion, it may be desirable to continue the hood as part of the cast used to elongate the intrinsic muscles.

Surgical principles to prevent stiffness

- Elevation
- Mild compression
- Eliminate pain
- Prevent haematoma
- Prevent infection
- Understand emotional factors

Patient selection

- 3 months plateau of conservative management
- Compliance with therapy
- Risks and rewards of lysis in view of the patients functional demands and needs

Lysis

- Tenolysis
- arthrolysis

Post op Tenolysis exercises

- AROM commenced immediately
 - * TGE
 - * Place and hold
- May commence week 2 post op
 - * blocking exercises: PIP , DIP
 - * active PIP extension with MP blocked in flexion
 - * isolated FDS glide
 - * composite wrist and finger flexion and extension

Post operative

- Oedema management
 - light compressive dressing 24-36hrs
- Pain management
- Wound care
- Exercise
 - Active and Passive
 - 10-15min, 1-2 hourly
- Splints
 - * rest
 - * maintain length gained
 - * increase ROM
- Scar management
- Motivation
- Modalities
 - * CPM * FES *U/S

