Therapy Management PIPJ stiffness

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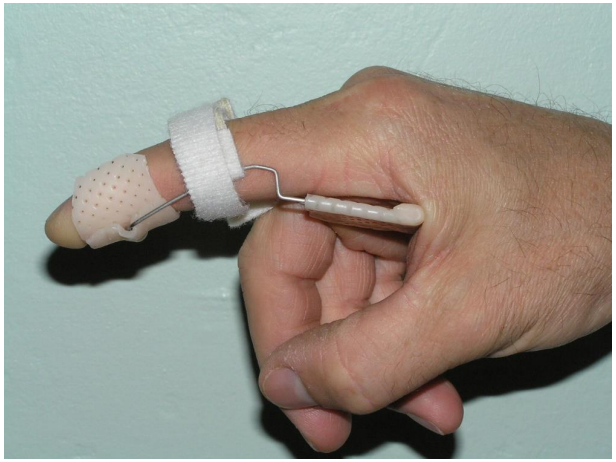
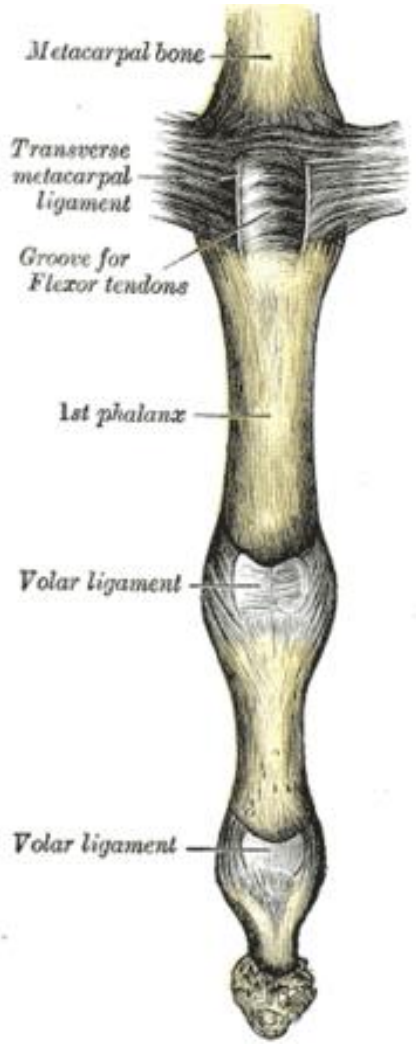




Anatomy

- Hinge joint with arc of motion 90-100

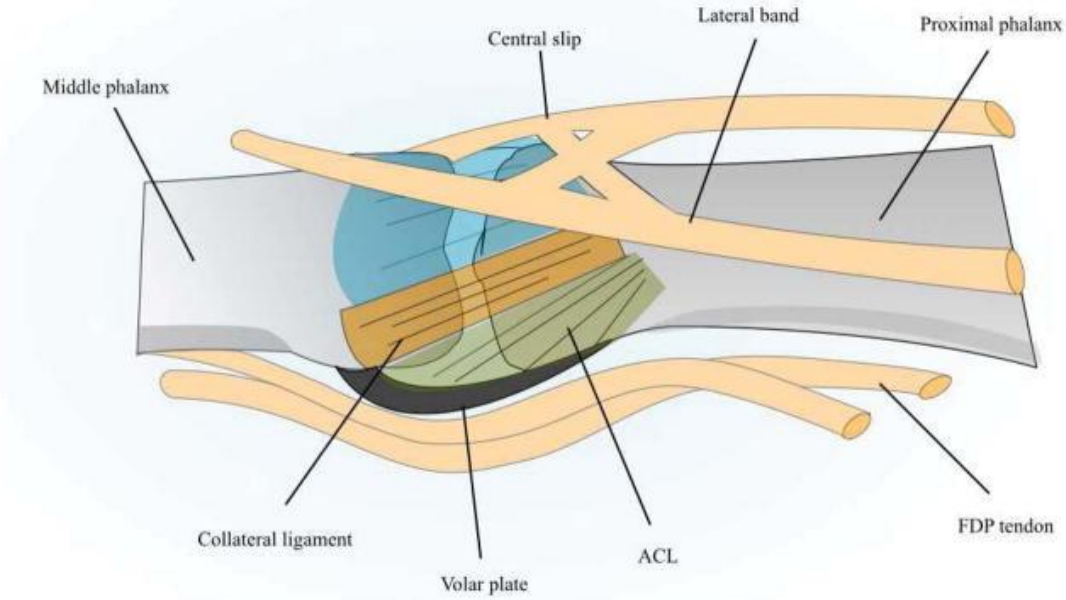
Surrounded and stabilised by

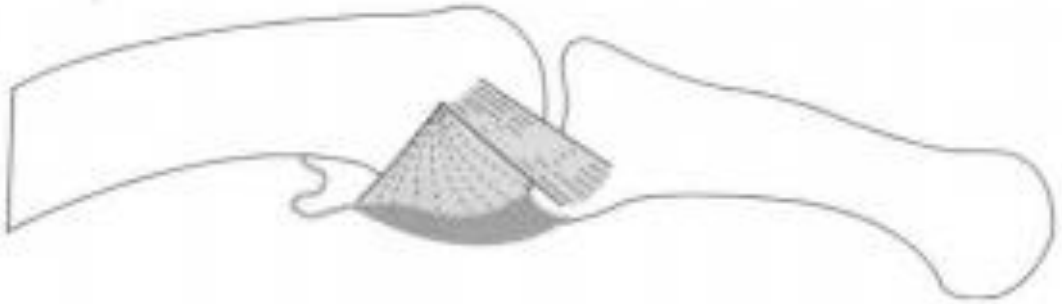
- Volar Plate
- Lateral and accessory collateral ligaments
- Extensor expansion
- Joint capsule and flexor sheath
- Flexor tendons

The “Box” of supporting soft tissues

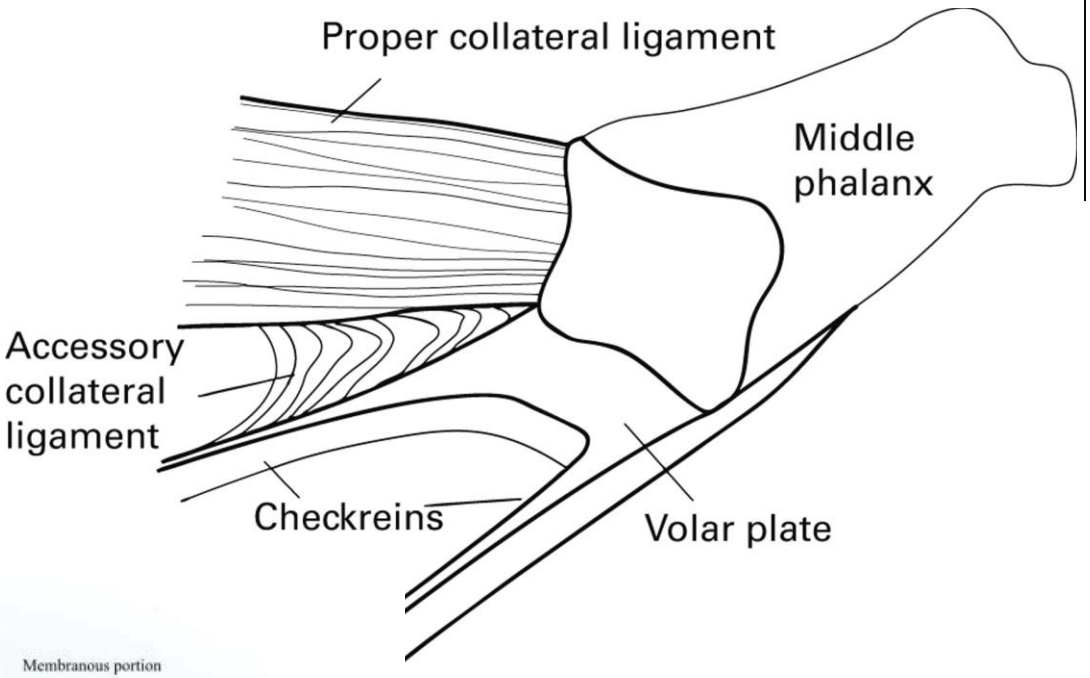
- Joint integrity is maintained by balance of the soft tissues
- Primarily the Volar plate, the lateral and accessory collateral ligaments
- The flexor and extensor tendons (dorsal expansion) provide secondary contributions to joint stability

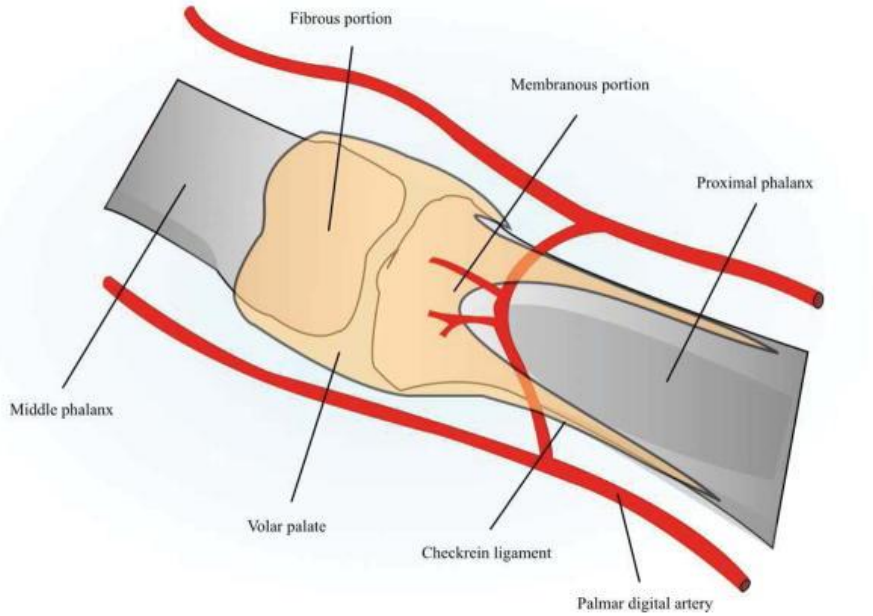
Anatomy


Central slip
Lateral band
Proximal phalanx
Middle phalanx
Collateral ligament
Volar plate
ACL
FDP tendon



Anatomy


Proper collateral ligament
Middle phalanx
Accessory collateral ligament
Checkreins
Volar plate


Fibrous portion
Membranous portion
Proximal phalanx
Middle phalanx
Volar palate
Checkrein ligament
Palmar digital artery

Injuries to the PIPJ

- Dislocations
- Avulsion injuries:
  - Volar plate injury
  - Central slip
  - Collateral ligaments
- PIPJ fractures
  - Fracture dislocations
  - Pilon fractures

Causes of PIPJ stiffness

Stiff Finger Classification:

- 1. Skin and Facia
- 2. Muscle and tendon injury
- 3. Capsule and ligament
- 4. Damage to articular bone

Yang et al (2014)

Flexion contracture PIPJ

- Common deformity seen at the PIPJ
- When a joint is unable to move the soft tissue structures around the joint shorten
- Adhesions may develop which limit the glide of the volar plate, accessory collateral ligaments and flexor shealth

Treatment options:

- Oedema control
- ROM/Exercise
- Joint mobilisations
- Mobilising splinting

Oedema

- Major and common complication
  $\rightarrow$ STIFFNESS

- Results in fibrosis and adhesion formation between skin/tendon/sheath/bone and joints

- Requires early management

Exercises and Mobilisations

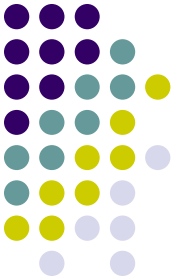
- **Early ROM Important.** Better to prevent stiffness

- Active and Assisted ROM
- Tendon glide exercises
- Isolated and composite joint exercises
- Passive ROM/Stretches
- Joint mobilisations

Mobilising splinting

- Mobilising splinting is a common technique used to restore passive motion to a stiff hand
- The joint is held by the splint at the end of available range at that joint
- The joint should be held under light tension for an extended period on time

Low Load Prolonged Stress (LLPS)



- Ensuring collagen fibres are held at their maximum length over a period of time
- Stimulates the tissue growth
- Encourages tissue lengthening and alignment of collagen fibres
- Leads to increase in PROM
- When tissue is over stretched will fail and break.

Brand (1999)

4 phases of soft tissue response to stress

- 1. Unfolding
- 2. Alignment
- 3. Stiffening
- 4. Failure

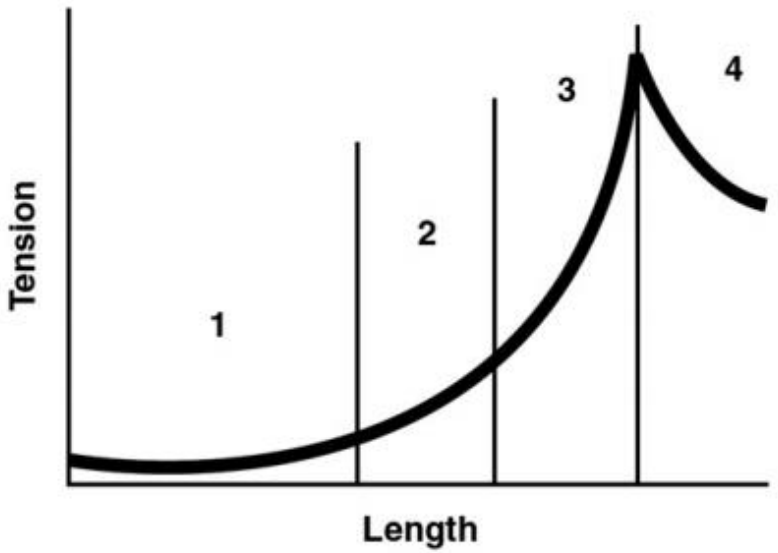


FIGURE 1. The four phases of the soft tissue response to stress. 1 = unfolding, 2 = alignment, 3 = stiffening, 4 = failure. Adapted from Wilton.[21]

J Wilton, Hand Splinting, WB Saunders (1997)

Total End Range Time (T.E.R.T)

Flowers and Lastayo (1994):

- Digital extension casts for PIPJ flexion contractures (15 patients with 20 contractures)
- PROM measures were assessed under a controlled torque before and after each cast period
- Group A (6 days casting) showed twice the improvement in PROM than Group B (3 days casting)

- **Concluded;** Increase in PROM of a stiff joint is proportionate to the amount of time the joint is held at its end range'

Total End Range Time (T.E.R.T)

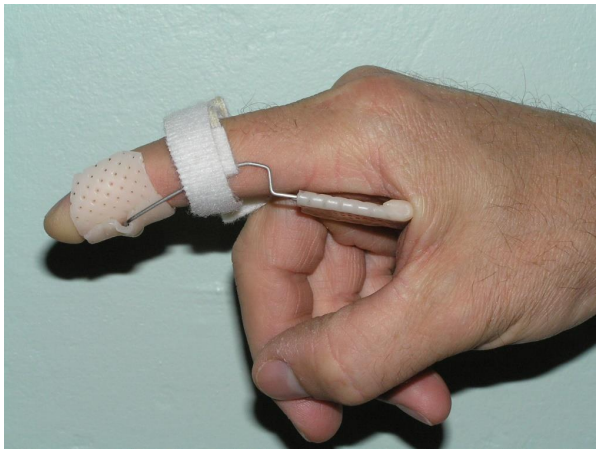
Glasgow, Wilton and Tooth (2003)

- 43 patients with joint contractures (flexion and extension)
- Allocated into one of 2 splints groups (TERT less 6 hours or TERT 6-12 hours)
- Dynamic flexion assist splints and belly gutter splint
- **Conclusion;** Results supported a daily TERT of 6-12 hours

Splint types

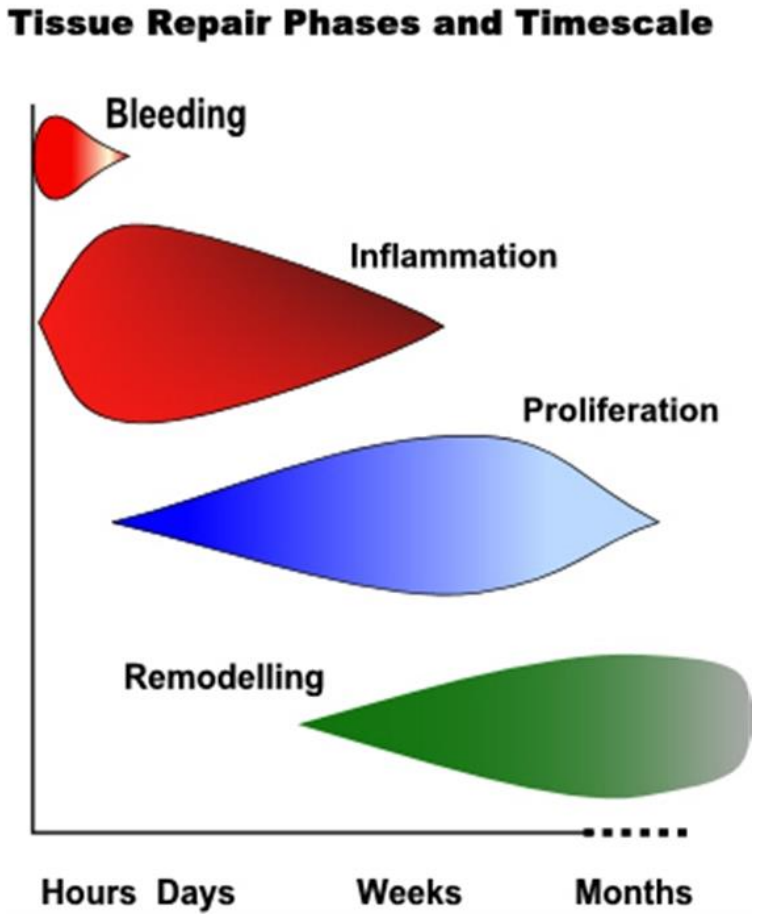
Three categories:

- Serial static splints
- Dynamic splints
- Static progressive splints

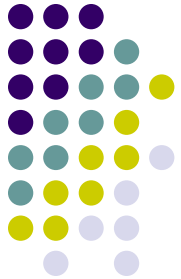


Stages of tissue repair:

- Inflammation
- Proliferation
- Remodelling

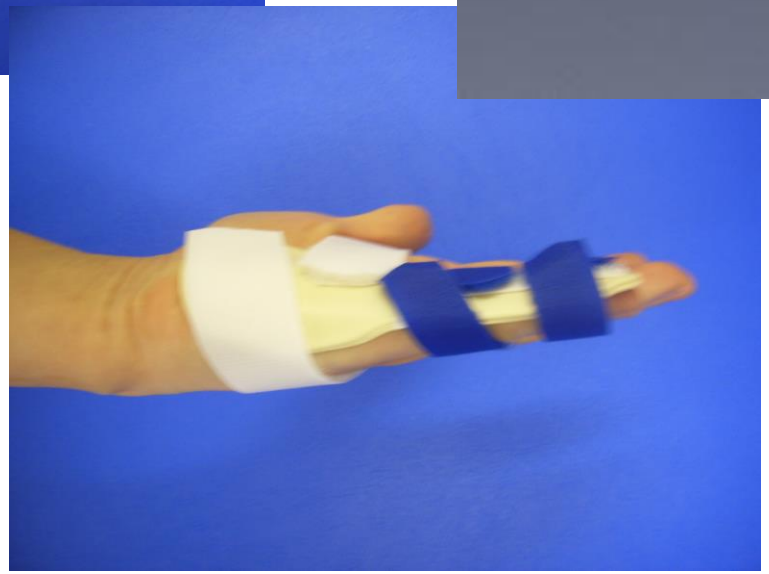


Serial static splints



- Suitable across all stages
- Splints that are moulded to hold the joint at the end of available passive ROM
- Remoulded over time as ROM improves
- PIPJ example: finger gutter splint used to treat a flexion deformity, POP cast

Finger Extension splint



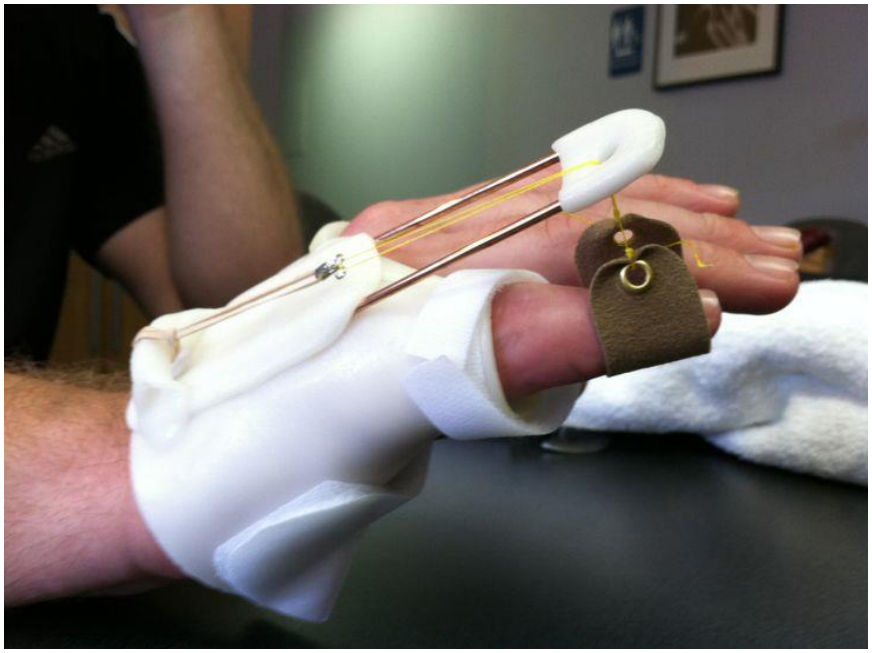
Serial casting

Dynamic splints

- Later 2 stages of healing
- Stable static base and a mobilising component
- Range of dynamic (elastic) materials may include elastic bands, springs or coils
- Examples: dynamic flexion splints or capeners

Dynamic splints: flexion

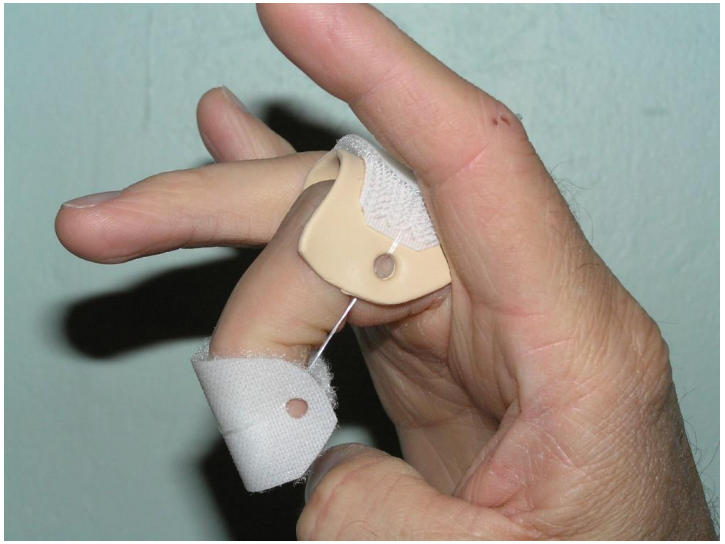
Dynamic splints: Extension



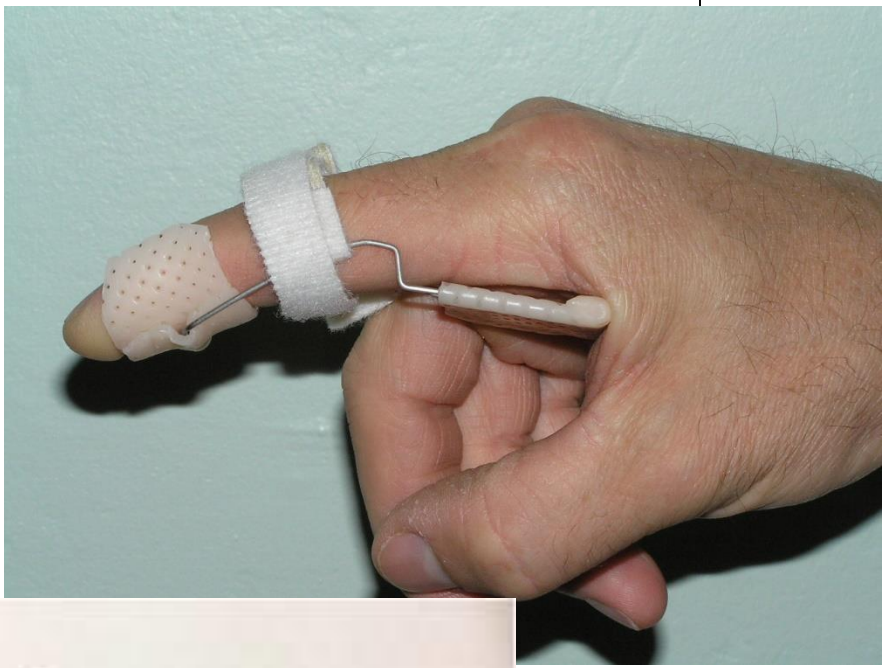
Static progressive splints

- Later 2 stages of healing
- Stable static base and a mobilising component
- Rigid inelastic material e.g. fishing line, cord, velcro
- Joint's with a 'hard end feel'
- Example: static progressive flexion splint, belly gutter splint

Static progressive splints: flexion



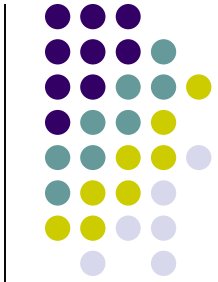
Static progressive splints: Extension



Proposed Hierarchy for Splinting

- **Modified weeks test (flowers 2002):**
- Objective system using pre-treatment joint stiffness to determine type of splint
- Change in PROM over 30 minute period
  - 20 degrees + = unlikely to require splinting
  - 15 degrees = serial static splint
  - 10 degrees = dynamic splint
  - 0-5 degrees = static progressive splint

Other factors influencing splint choice



Patient and therapist:

- Therapist splinting skills and tools available
- Previous experience and successes
- Patients values and preferences
- Work/recreational activities
- Need for self management or regular follow ups
- Cost
- Comfort
- Ease of application

Glasgow et al (2016) published BAHT journal

Contracture angle

- Two case scenarios (fixed flexion deformity 30 and 55 degrees)
- Preferred splinting choices and clinical reasoning

Results:

- Handmade (21.7) and prefabricated capener's (22.2) and static finger trough (21.1) were preferred less then 30 degrees
- Serial casts (60.9) preferred for contracture over 55 degrees

Glasgow et al (2016) published BAHT journal

Brand and Hollister (1999)

“Restoring the balance, beauty and power to a damaged hand is an adventure. The stakes are high. The rewards are exciting. The penalties of failure are grievious…. Somewhere out there are patients who do not use their hands and who hide them out of view because of what we did or failed to do.
We should not forget these patients they should stand over our shoulders at surgery and be with us at therapy sessions, whispering reminders be gentle and warning to stop and think”

Summary

- PIPJ stiffness can be very challenging
- Prevention is better than cure!
- Movement, correct positioning and oedema management in the early stages can help reduce contractures
- High level of evidence for using mobilising splints in PIPJ joint contractures

Any Questions?

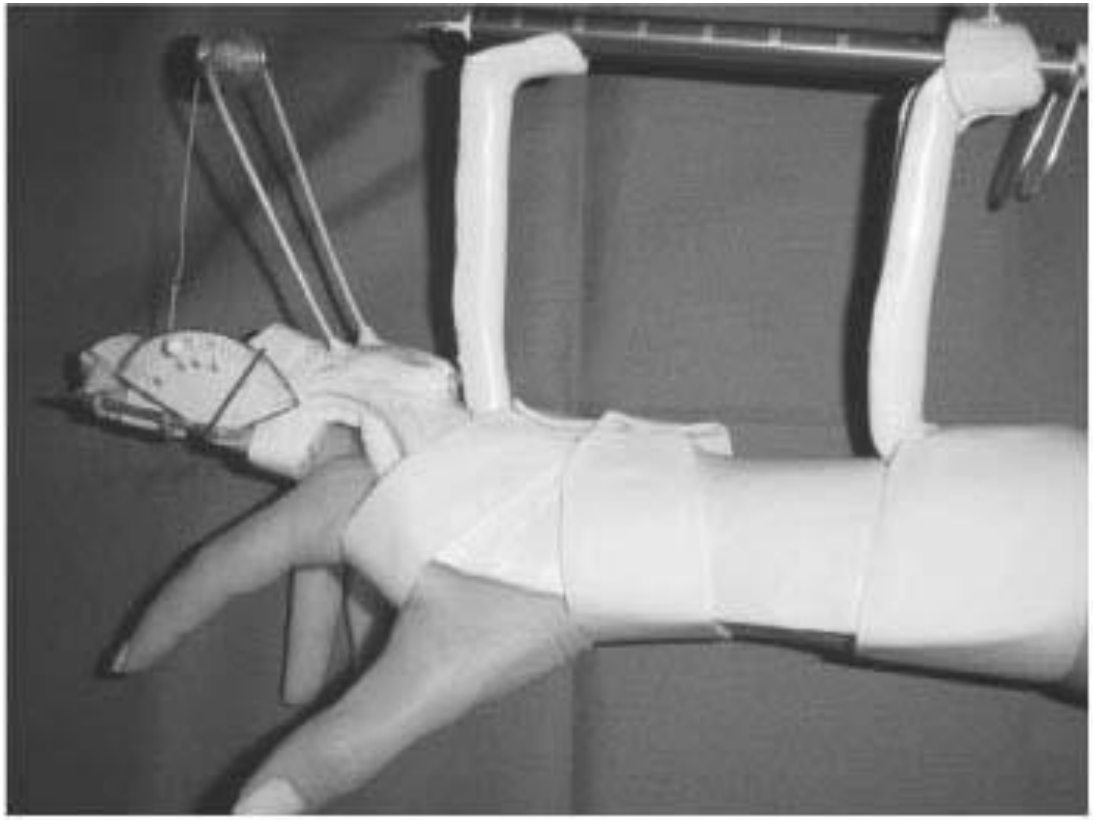


Figure 5 - Dynamic splint of thermoplastic material connected to a dynamometer and a goniometer with the proximal interphalangeal joint in extension (0°)

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