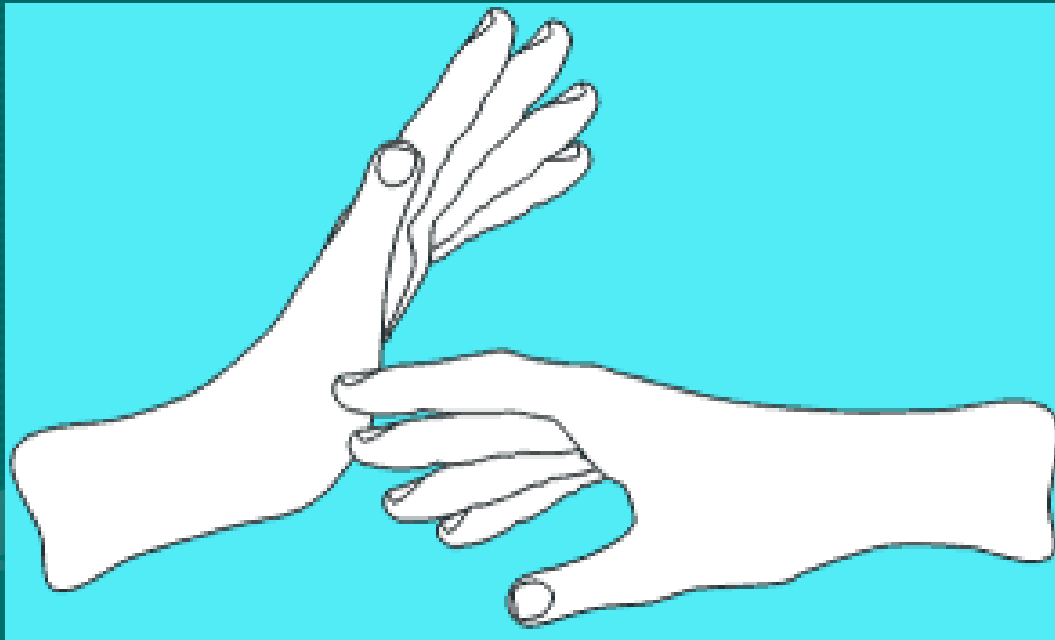


Principles of Hand Rehabilitation



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Senior Occupational Therapist in Hand Therapy

Overview

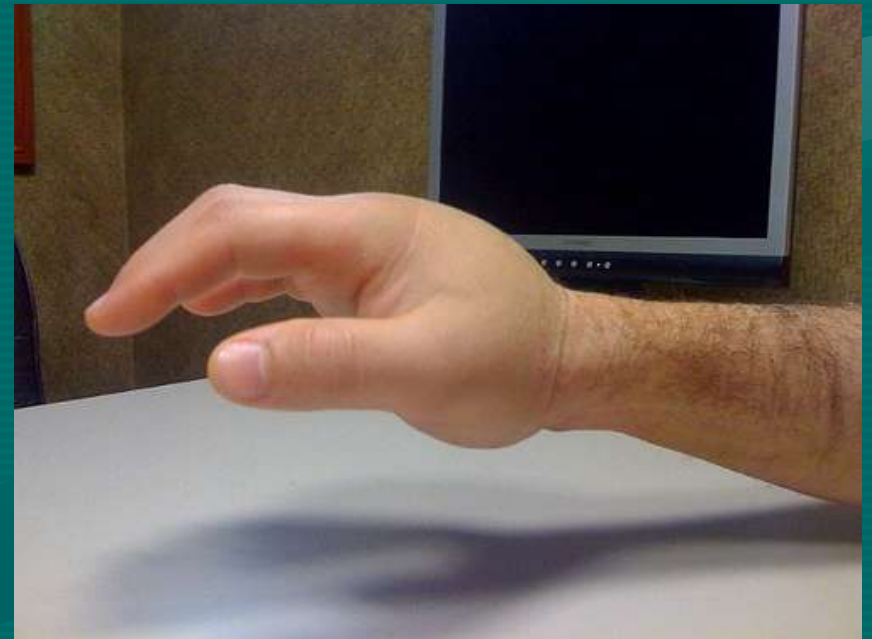
- General hand therapy
 - Oedema management
 - Protection/Immobilisation
 - Splinting
 - Mobilisation
 - Strengthening
 - Scar management
 - Common hand trauma rehab
 - Fractures
 - Flexor tendon
 - Extensor tendon
 - An example of severe multi hand trauma
 - Rehab following fasciectomy
- 
- A faint, stylized background image of two hands shaking, rendered in a light teal color against the dark teal background. The hands are positioned in the lower half of the slide, with one hand reaching up from the bottom left and the other reaching down from the top right.

Aims of Rehabilitation

- Effective oedema management
- Suitable protection/prevention of contractures
- Maintain soft tissue mobility and good scar management
- Achieve maximal range of movement
- Achieve maximal strength
- Return to work/protection from re-injury

Oedema Management

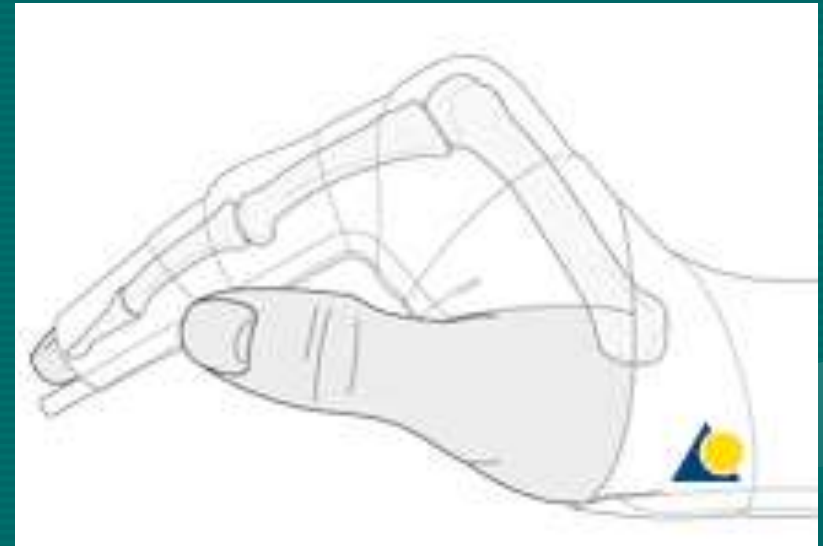
- Oedema can splint the hand in an unsatisfactory position – Wrist flexed, MCPJ extended, IP joints 30°-40° flexion
- Extreme cases 'claw' hand
- Increases pain and decreases ROM, flexion deformities occur, can lead to fibrosis



- Treatment can include:
 - Elevation
 - Active exercise
 - Retrograde massage
 - Cryotherapy
 - Contrast bathing
 - Splinting
 - External compression therapy i.e. coban tape / digi-sleeve / isotoner glove / oedema glove / made to measure garment



- Position of safe immobilisation (intrinsic plus position) for rest in the oedematous hand



- Digi sleeve
- Compression tape
- Oedema glove

Protection

- Dependent on injury severity and level of protection required
- Immobilise with cast/POP/splint
- Thermoplastic splinting - can offer early active mobilisation
- Light-weight moulded thermoplastic splinting for return to work protection/to allow function

Why Splint?

- Immobilisation
- Pain relief
- Support
- Protection
- Function
- Correction of deformity/restoration of ROM
- Oedema control
- Scar remodelling
- Fracture/ORIF
- Fracture/soft tissue injury
- Ligament injury
- Tendon repair
- Nerve palsy
- Nerve palsy/FFD
- Burn
- Burn scar

Splint Types

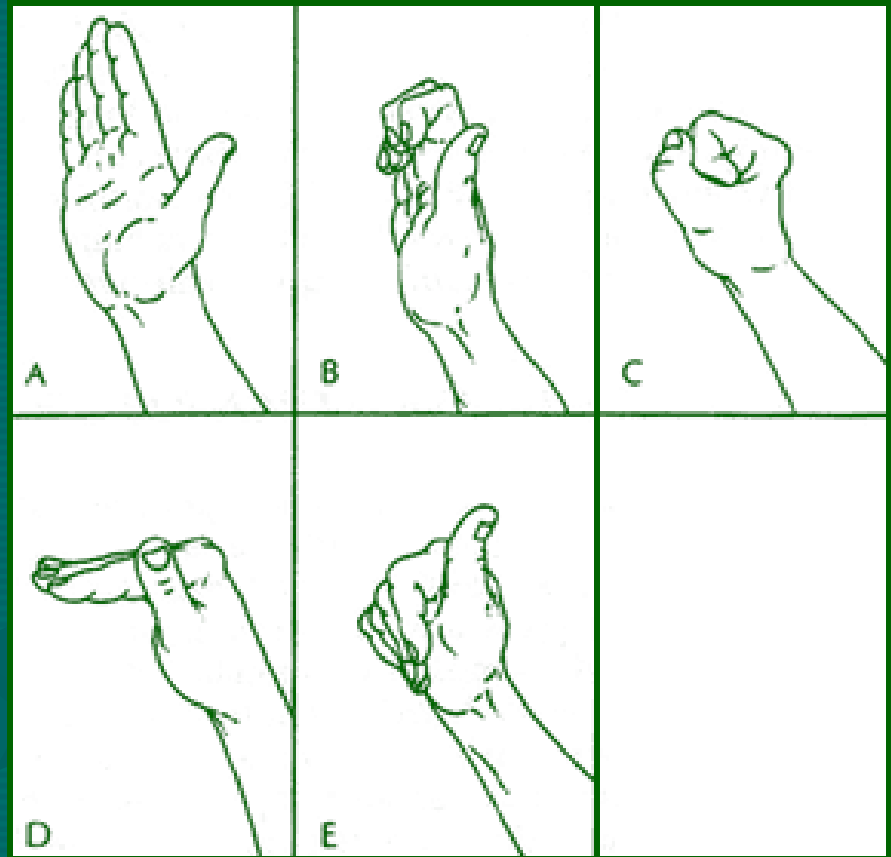
- Static – hold body part still
- Serial Static – holds joint immobilised with regular remoulds to increase movement
- Static Progressive – promote low load prolonged stretch with non elastic force
- Dynamic – elastic traction on tissues to promote gradual lengthening
- *Splint name/design – according to location and purpose – ie forearm based volar POSI*
 - Be specific with what you are wanting to achieve with the use of a splint

Splinting to assist with ROM

- Splinting can also be used to improve ROM
 - If poor extension - serial extension splinting (Dynamic/static/static progressive)
 - If poor flexion - dynamic flexion splinting (flexion cuff, IPJ flexion strap), static progressive splint to isolate MCPJ flexion
 - Dynamic wrist /forearm splinting to improve wrist flex/ext/sup/pron
 - Functional splints

Soft Tissue Mobility/ROM

- Essential for prevention of adhesions and to maintain ROM
- Tendon and nerve gliding exercises
- Tenodesis
- Movement of adjacent joints



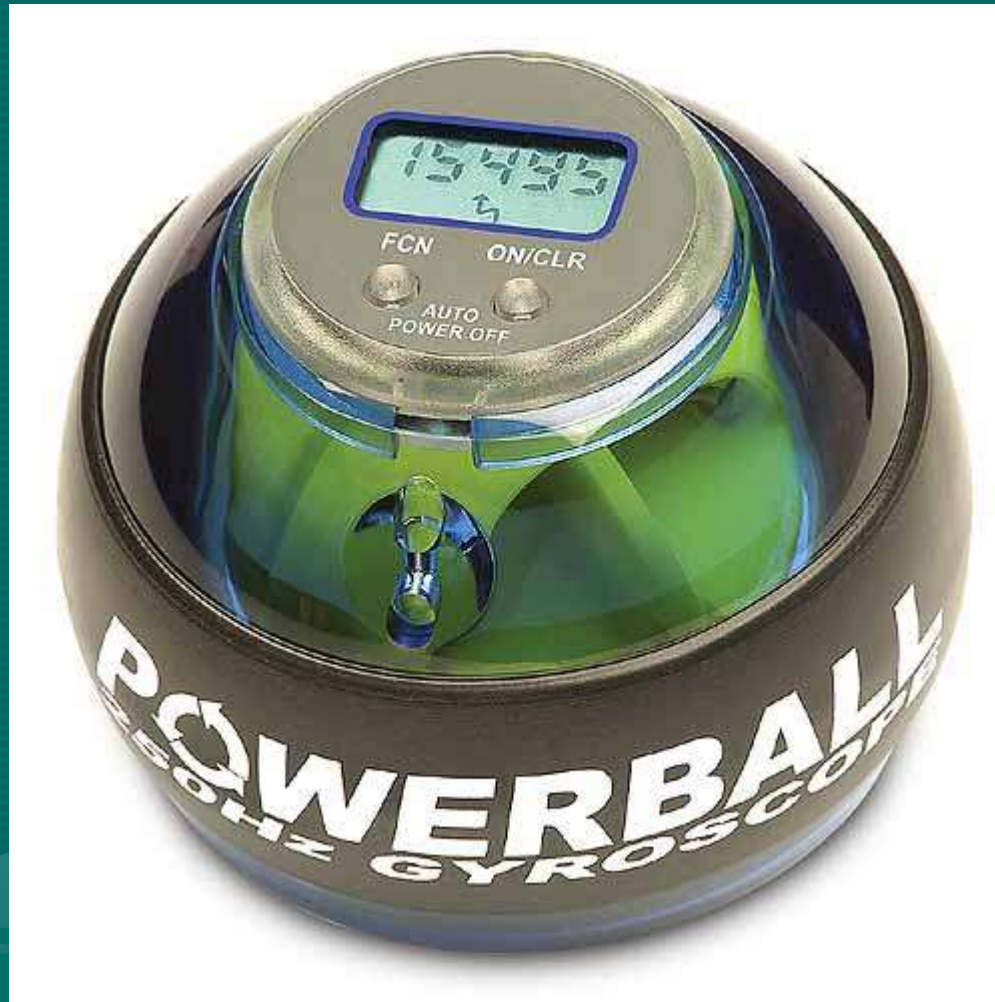
ROM Exercises

- Active ROM inc blocking exercises, tendon gliding etc
- Active assisted ROM
- Passive ROM
- Joint mobilisations



Strengthening

- Timing of resistive exercise is important
- The injury should be well healed, oedema controlled, near full ROM and pain free
- Progressive resisted exercises used
- Many strengthening modalities i.e. graded theraputty, theraband, powerball, functional activities – group setting



Excellent for wrist strengthening

Scar Management

Aims:

- To alter the physical and mechanical properties of scar tissue
- Promote tissue strength and gliding to minimise risk of adhesions
- Prevent contractures and stiffness
- Achieve a cosmetically acceptable result

Hypertrophic Scarring



Scar Management

- Massage
- Ultrasound
- Splinting
- Pressure Therapy
- Silicone
- Elastomers



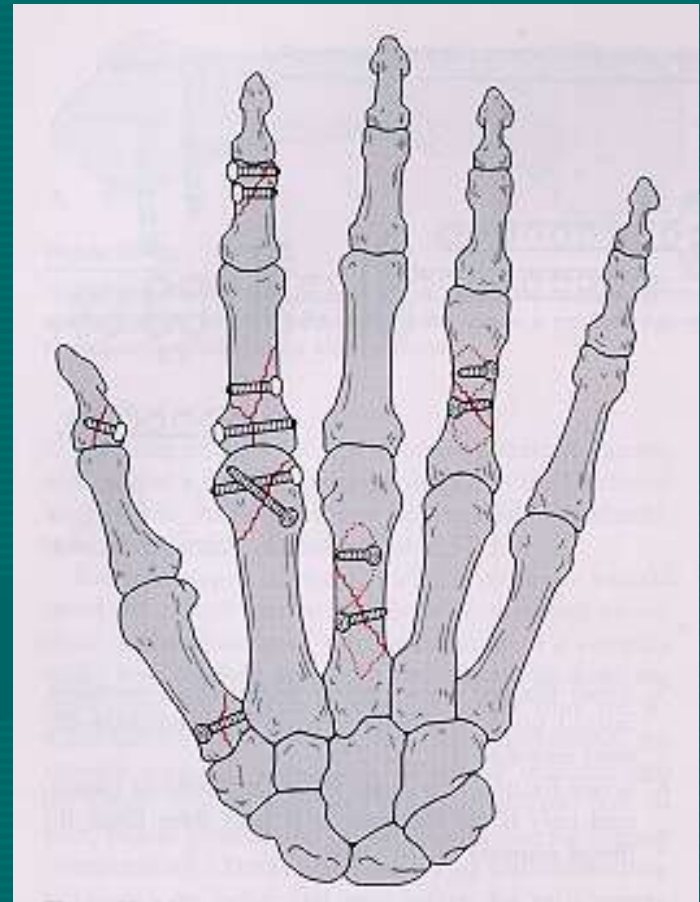
Common Hand Trauma

- Fractures
- Flexor tendon injury
- Extensor tendon injury
- Nerve damage
- Burns
- Dislocations
- Ligament sprains/ rupture



Fractures

- Fixation/reduction drives the healing process
- Once stability achieved, protocols individualised to fracture type
- Fracture healing stability ↔ respect ↔ soft tissue mobility



Phases of rehabilitation

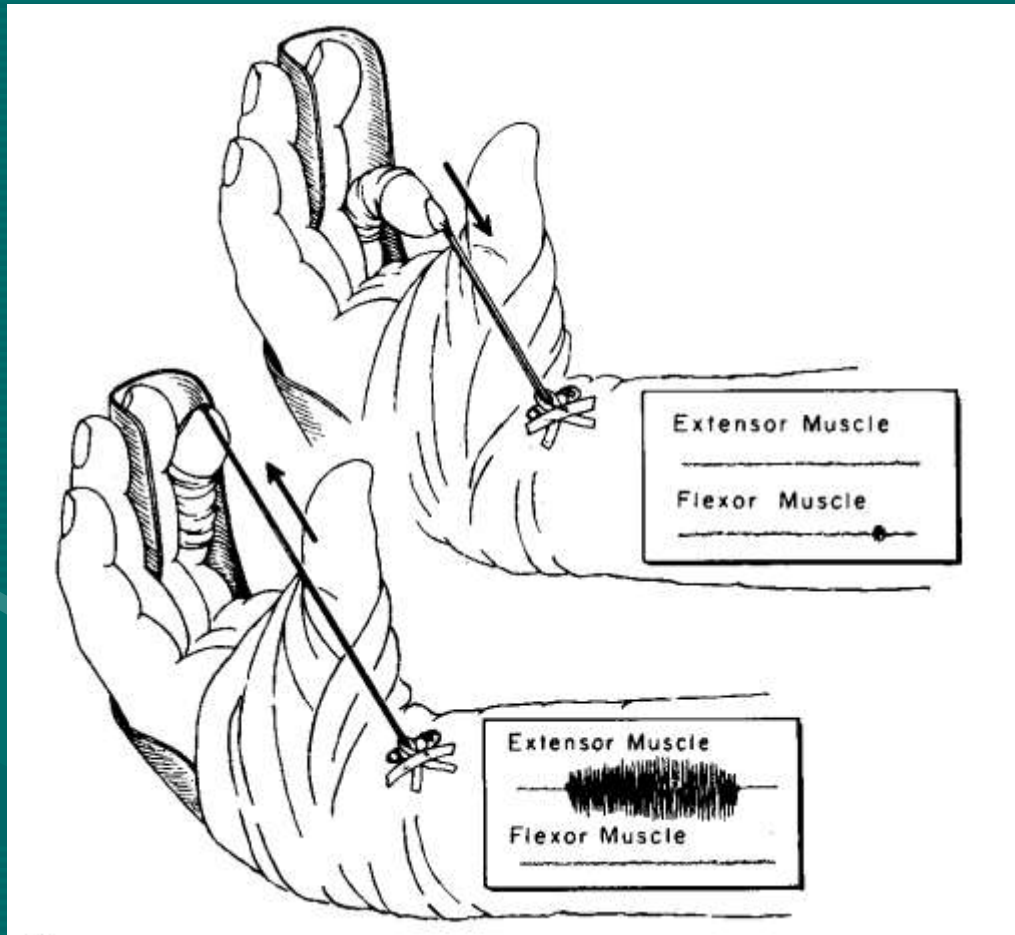
- **Phase 1** - protective splinting, oedema management, protected AROM and tendon gliding around # site, maintain unaffected joints
- **Phase 2** - protective splinting reduced, on going oedema management, AROM and gliding exercises, PROM if necessary, splint to increase ROM
- **Phase 3** - strengthening and address any ST issues
- **Phase 4** - unrestricted return to activity/sport

Flexor Tendon Rehabilitation

- Days of immobilisation long gone (except children)
- Passive Vs controlled active regimes
- Kleinert Regime and Early Active Mobilisation regime (Belfast)



Kleinert Regime



Mobilisation Protocols

- Early active mobilisation
 - Believed that excursion with passive protocols is generally poor compared to that achieved with light active motion
 - Therefore fewer adhesions and improved outcome
 - Potential risk: tendon rupture
 - Published rupture rates similar to those with passive protocols
 - 4 and 6 strand repairs with strong epitendinous suture
 - Easier for patients to follow

Belfast Regime

- Week 0-4/6
 - Education re: rupture/oedema/wound/scar management
 - Dorsal hood splint fabricated with wrist neutral, MCPJ 60 degrees flexion + neutral IPJ's for cont wear
 - Exercises taught - 2 passive flexion then 2 active flexion exercises followed by active extension ex. to the splint 4 x daily
 - Flexible to reduce complications:-
 - blocked extension from 2/52
 - tenodesis ex. from 3/52
 - Modification of splint to reduce ext lag (tubigrip/strap across fingers)
 - Reps/freq of exercises modified as per patients progress

Belfast Regime

Passive flexion followed
by active extension



Active flexion followed
by active extension



Belfast Regime

- After 6 weeks
 - Splint at night and when out for two weeks
 - Active ROM exercises + tendon gliding
- After 8 weeks
 - Passive ROM exercises, correction of deformities – splinting
 - Gentle grip strengthening exercises
 - Driving
- After 12-14 weeks - Unrestricted activities
 - Return to contact/heavy sport 12-14 weeks

What we don't want to see!!



Resolution: massage, stretches, exercise, ultrasound, splinting

When things go wrong – serial splinting



Example of serial thermoplastic splinting

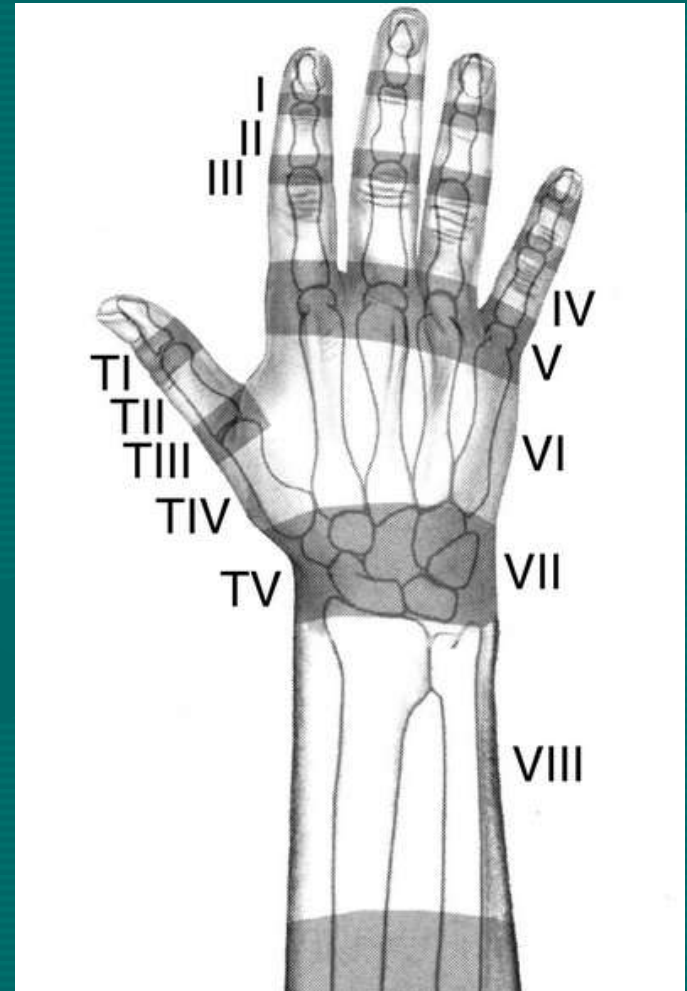
Plaster of Paris can also be used – requires excellent flexion

Example of dynamic outrigger splint used to correct tendon tightness and scar tissue contractures following flexor tendon injury



Extensor Tendon Rehabilitation

- Therapists need to be made aware of:
 - type of injury
 - strength of surgical repair
 - zone of repair/injury
 - any other structures involved



Zone I – II



Zone I – II



- Type 1a – closed trauma no bony injury
- Type 1b – closed trauma with small bony avulsion
- Type 2 – laceration at or proximal to DIPJ with loss of tendon continuity
- Type 3 – deep abrasion
- Type 4 – fracture subluxations (20-50% articular surface)

Zone I - II

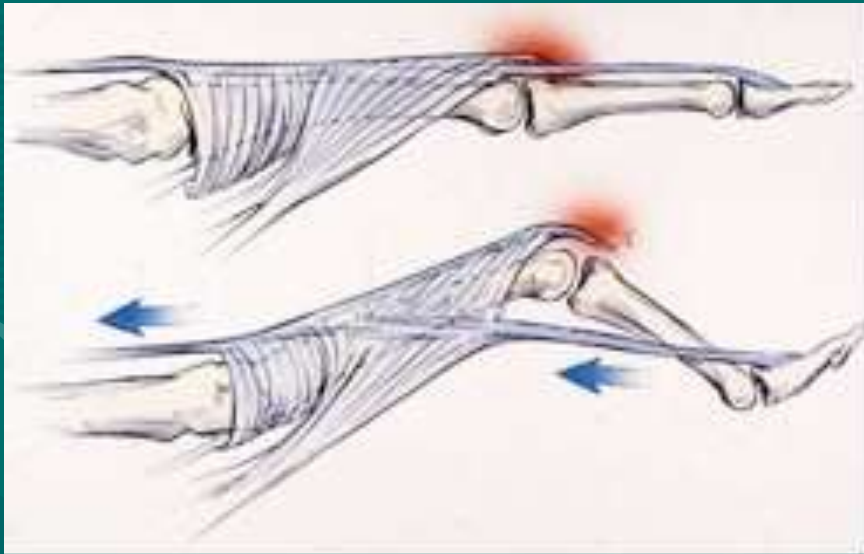


- Type 1a
 - Mallet splint (stax or custom made) with DIPJ in ext to slight hyperextension cont wear 0-6 weeks, mobilise unaffected joints, education re: removal and application of splint and hygiene taught
 - At week 6 check tendon integrity and gradually commence DIPJ flexion blocked with exercise board to 25 degrees initially then increase by 5-10 degrees each week - cont to wear splint between exs
 - At week 8 wean from splint during day and cont with night splinting if ext lag remains for further 2 weeks
 - At 10 weeks commence passive DIPJ flexion
 - At 12 weeks unrestricted activity
 - If lag remains - balance splint Vs exercises to minimise lag

Zone I - II

- Type 1b
 - As per 1a however immobilise for 4 weeks only
- Type 2-4
 - Custom mallet splint to be worn continuously for 6-8 weeks + maintain AROM unaffected joints
 - Scar/pin site care advice
 - After removal of k-wire continue as per type 1a

Zone III



Zone III

- Disruption of the central slip at the PIPJ + volar migration of the lateral bands
- Closed: delayed clinical diagnosis, x-ray, painful tender, swollen PIPJ, semi flexed finger.
 - Will only take on Boutonniere deformity after 3 weeks if left un-treated. Can be treated conservatively if diagnosed immediately or with a primary repair if delayed presentation. If large # fragment will need ORIF
- Open: primary repair

Zone III



- Week 0-3
 - Treated with immobilisation of PIPJ in full extension – $\frac{3}{4}$ cylinder splint for continuous wear
 - Taught DIPJ flex / ext, MCPJ flex / ext , full AROM of unaffected fingers x10 hourly
 - Advice and guidance regarding tendon injury + functional activities
 - Scar/wound/oedema management

Zone III



- Week 3-6
 - During day convert splint to capner splint and continue with $\frac{3}{4}$ cylinder overnight
 - Exercises continue as per week 1-3 however now commence isolated PIPJ flexion and composite fist with capner insitu
 - If good central slip function but poor ROM exts out of capner splint

Zone III

- Week 6 onwards
 - Gradual wean from capner splint during the day
 - Continue with night splinting if ext lag
- Week 8
 - Continue with exercises as previous + passive PIPJ flexion if necessary
 - Gradual strengthening
- Week 12
 - Unrestricted

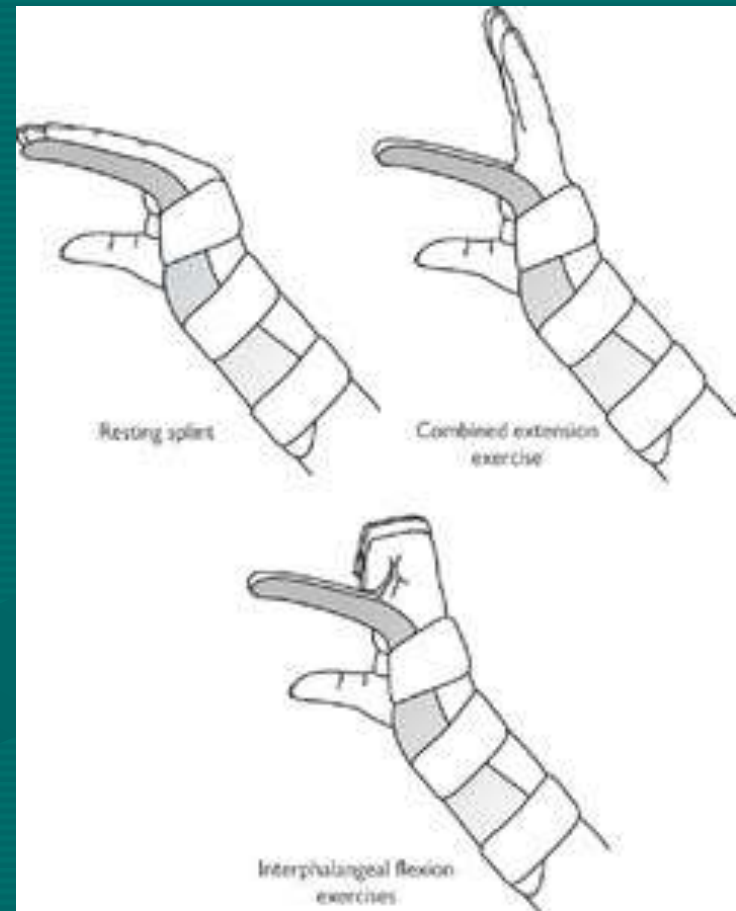
Zone IV – VIII



- Week 0-4
 - Volar splint fabricated with wrist 45 degrees ext, MCPJ's 60 degrees flexion + neutral IPJ to be worn continuously
 - Taught exercises as per Norwich regime - 4 passive MCPJ ext, 4 active MCPJ ext, 4 active hook fists with MCPJs in neutral (all with splint in situ) 4 x daily
 - Wound/scar/oedema management
 - Functional advice + education re tendon repair/rupture

Zone IV- VIII

- Norwich regime exs
 - Passive & active lift off
 - Hook



Zone IV - VIII

- Week 4-6
 - wean from splint if no lag >30 (splint outdoors and night for 2 weeks)
 - Commence full tendon gliding exercises + light ADLs
- Week 8
 - Commence passive mobilisation if necessary,
 - Resume driving
- Week 12
 - Unrestricted activities

Thumb Extensor Injuries

- Zone TI (IPJ) - manage as mallet finger
- Zone TII – treat as per zone IV in fingers with volar splint with wrist ext 45 degrees, MPJ and IPJ full extension in line with palm however no hook exercise due to risk of rupture
- Zone TIII - TIV- treat as per zone IV in fingers with volar splint with wrist ext 45 degrees, MPJ and IPJ full extension in line with palm – include hook exercise

Severe Multiple Hand Trauma



Severe Multiple Hand Trauma



Severe Multiple Hand Trauma



ROM Outcome



Rehab Following Fasciectomy

- As dupuytren's tissue is much like scar tissue - the aim of the hand therapist is to facilitate the maintenance of the length of scar tissue in the wound bed until collagen maturity is established
- Commence hand therapy after removal of bulky dressings (normally between 48 hours to one week)

Rehab Following Fasciectomy

- Therapy aims:
 - Maintain surgical gains in extension
 - Minimise effects of post op oedema
 - Minimise scarring and scar contracture
 - Restore AROM into flexion
 - Restore strength to hand

Rehab Following Fasciectomy

- Treatment media
 - Wound care
 - Splinting (static night ext splint up to 6/12 with serial remoulding)
 - AROM + PROM exercises
 - Scar care – massage/elastomer/silicone
 - Oedema management – massage/compression
 - Strengthening programmes
 - Functional advice re: activities

Conclusion



Hand therapy is time sensitive, early referral makes a big difference on recovery.

The longer the time between injury or surgery and hand therapy treatment the worse the prognosis for recovery

Thank you

