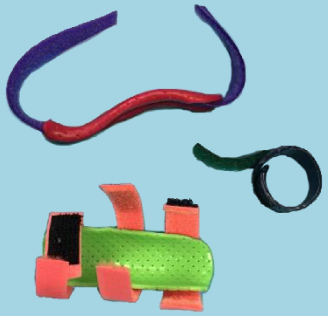
The Prince of Wales Hospital

Hand Therapy

Flexor Tendon Protocols 2020

1. Splint Options
2. Protocols overview
    a. Splints
    b. Progressions
    c. Decision making criteria
3. Zones of injury considerations
4. Protocols
    a. Early Active
    b. Passive
    c. Immobilisation
    d. Manchester

Finger Flexors	Thumb Flexors (FPL)	Isolated Wrist Flexors	Combined Wrist and Fingers	Full House
 Wrist 0-20° extension and MCP's 30-60°	 Wrist 0-20° flexion, thumb in mid opposition with web in comfortable stretch and IP extension. Ensure finger flexion is not blocked by thumb.	 Wrist Flexed 20°and MCP's and IP's free. Cast or splint. May require POP Slabs until wounds ready to cast	 Wrist flexed 20° and MCP's 30-60°	 Wrist flexed 20°, MCP's 30-60° Thumb neutral with IP extended & palmar abduction. Ensure finger flexion is not blocked by thumb position
Manchester Splint (Zone 2)	**Flexor Pollicus Brevis**	**Partial repair Zone 1-2 One digit**	**Accessory Splints**	**FTR Zones**
 MCP's 30° Wrist extension block 45° but free to flex	 Thumb in mid opposition with web in comfortable stretch and IP extension. Ensure finger flexion is not blocked by thumb position. Wrist free	 Relative motion splint with 20-30° relative flexion to unload the weaker tendon using the quadria effect	 Contoured palmar strap IP night extension splint Pulley ring	

PROTOCOLS Overview

Protocol Overview	Splint (s)	Progress	Decision Making Criteria
Early Active Motion Protocol /Controlled Active Motion (CAM)	Dorsal Blocking Splint to block stretch of the affected tissues and limit functional use of the hand	Commence passive and active flexion exercises from day 3-5 Commence splint wean at 6/52 with light use and intermittent day splint for further 2/52. No composite stretch or strengthening until 8/52 Unrestricted use at 12/52.	Good 4 strand repair that will tolerate early movement. Able to commence within 7 days of surgery (preferably day 3-5). Patient able to participate in a strict rehabilitation protocol including regular Hand Therapy attendance for wound management and exercise program monitoring. Manchester Protocol if zone II and one to two digits only.
Passive Protocol/ Controlled Passive Motion (CPM)		Commence passive flexion exercises from day 3-5 Commence active flexion at 4/52 Commence splint wean at 6/52 with intermittent day splint for further 2/52. No composite stretch or strengthening until 8/52 Unrestricted use at 12/52	Weak repair that will not tolerate active movement. Repairs at the musculotendinous junction Commence within 7 days of surgery (preferably day 3-5). Default protocol if there has been immobilisation of repair for > 8 days. Patient able to participate in a strict rehabilitation protocol including regular Hand Therapy attendance for wound management and exercise program monitoring.
Immobilisation Protocol	Protective cast (or Splint). May require slab immobilisation until wounds ready to cast	Remove cast at 6 weeks and commence AROM +\- serial extension splinting. No stretch or strength until 8/52 and unrestricted use at 12/52	Very weak repair or Patient unable to participate in strict rehabilitation protocol for example in the presence of disordered thinking or impaired cognitive function. Isolated intra-muscular repair immobilise for 4 weeks only
Partial Repairs	Relative Motion Orthosis	Commence AROM and light use of hand Wean splint at 6 weeks Unrestricted use at 12/52	Partial repair of 1 digit 30%-50% or in consultation with surgeon. Relative motion splint with 30^{o} relative flexion to unload the tendon using quadria effect
Two Stage Repair Stage 1	Post op slab for comfort/ oedema management	Commence wound and oedema management and passive flexion exercises. Monitor for flexion contracture and night splint digital extension as indicated. Aim for full passive flexion and active extension and mobile scar	Staged tendon re-construction with a silicon tendon rod to support the fibro-osseous tunnel +/- Pulley reconstruction. Passive tendon rods provide minimal stress to pulley reconstructions. Second stage as per primary repair protocols

ZONES of injury considerations

Zone 1

All protocols	Zone 1 flexor tendons are relatively avascular Special consideration must be given to DIP passive and active glide. Caution with submersion in water in the presence of a tie-over nail button due to potential infection risk

Zone 2 & Thumb 2-3

All protocols	Tendons travel within fibro-osseous tunnels and are prone to adhesions so require close supervision and monitoring for early digital contractures Pulley repairs may benefit from support with rigid tape or pulley ring for 8 weeks

Zone 3-4

All protocols	Tendons out of the pulleys but may have concurrent intrinsic muscle injury's which can contribute to pain with exercises.

Zone 5

All protocols	Isolated wrist flexors can be easily managed using an immobilisation protocol in a cast which allows good functional use of the hand during the immobilisation period.

Special Considerations

Muscle Belly Immobilisation protocol	Immobilisation protocol to avoid muscle contraction. Splint as indicated by anatomy to protect affected muscle from stretch or contraction Immobilise 4 weeks then removable wrist brace for 2 further weeks
Concurrent Nerve injuries	Splint as indicated by anatomy to protect affected nerve from stretch for 3 weeks if repaired under tension then default to best tendon protection position. All nerve repairs: Assess and advise about the risks of poor sensation. Median nerve: Assess functional need for thumb opposition splint on DBS wean Ulna nerve: Assess need for LF/RF IP extension with PROM +/- anti claw splint and night IP extension splints on DBS wean
'Full House'	Describes repair of multiple tendons and Median/Ulna nerves at zone 5. There is typically a prolonged rehab due to the nerve recovery time.
Splint or Cast	Casts or splints can be used to provide tendon repair protection. Casts can be circumferential and is preferred where there are concerns about splint wear compliance, the extra work to manage a splint, disordered thinking, or incarcerated patients who may have a splint removed from them for security reasons.

Prince of Wales Hospital Hand Therapy Protocols

Early Active Motion Protocol Flexor Tendon Repair

Good 4 strand repair of tendon(s) that will tolerate early movement.
Able to commence within 7 days of surgery (preferably day 3-5).
Patient able to participate in a strict rehabilitation protocol including regular Hand Therapy visits for wound management and exercise program monitoring.

Assess and Document

Wound

Movement:

Passive flexion distance to palm

Active IP extension distance to splint
(or joint AROM in safe position)

Tendon integrity demonstrated by active IP flexion

Oedema

Pain

Splint

As indicated to restrict stretch of repaired structures

Exercises with the goal of tendon gliding:

Fingers FDP/FDS:

Passive flexion to palm (DIP and PIP) and active extension to splint.
Active flexion and extension of fingers commencing at 1/3 flexion range or greater if there is minimal resistance to movement.

Thumb FPL repair:

Passive flexion to base LF and active extension to splint
Active IP thumb flexion to IF and active IP extension to splint.

Exercises : 10 reps 2 Hourly

Education and Patient Education handout

1. Tendon Healing timelines
2. Wear Splint continuously to protect repair
3. Do not use hand for any activities including driving
4. Elevate the hand at night and intermittently during the day
5. Wound care and optimal wound healing behaviours

Review Weekly

Exercises Progress weekly:

FDP/FDS with aim of active flexion to palm at week 4.
FPL progress weekly by finger to thumb to LF approximation by week 4.
Oedema management including elevation and compression (caution over nerve repairs for 3 weeks)
Wound and scar management: Commence scar massage at week 3 as indicated (5 minutes 3 x day)
Skin hygiene in Therapy as indicated by skin integrity. Patients can be instructed in how to safely wash hand at home after 3 weeks if they are confident and able to demonstrate safe handling during therapy.
Apply additional night digital extension splint(s) in the event of early loss of PIP extension

Week 6: Commence light use out of splint. Continue Splint at night and at risk.
Add Tenodesis exercises and avoid composite MCP and wrist extension.

Week 8: Wean dorsal blocking splint, commence gentle composite extension stretches and strengthening. Commence exercise splints if indicated. Return to driving

Week 12: Unrestricted use. May need to continue therapy to maximise ROM and function

Outcomes: TAM % contralateral digit (or 260^{o}): Excellent 100%; Good ≥75%; Fair ≥50%; Poor <50%.

References: Based on Pettengil, K, Van Strien, G, Postoperative management of Flexor Tendon injuries. Rehabilitation of the hand and upper extremity, 6th Ed. Chapter 36, Mosby Inc.

Prince of Wales Hospital Hand Therapy Protocols

Passive Protocol Flexor Tendon Repair

Weak repair that will not tolerate early active movement.
Commence within 7 days of surgery (preferably day 3-5). Default protocol if there has been immobilisation of repair for > 8 days.
Patient able to participate in a strict rehabilitation protocol including regular Hand Therapy visits for wound management and exercise program monitoring

Assess and Document
Wound
Movement:
Passive flexion distance to palm
Active IP extension distance to splint
(or joint extension AROM in safe position)
Oedema
Pain

Splint
As indicated to restrict stretch of repaired structures

Exercises with the goal of tendon gliding:
Fingers FDP/FDS:
Passive flexion to palm (DIP and PIP) and active extension to splint.

Thumb FPL repair:
Passive flexion to base LF and active extension to splint

Exercises : 10 reps 2 Hourly

Education and Patient Education handout
1. Tendon Healing timelines
2. Wear Splint continuously to protect repair including
3. Do not use hand for any activities including driving
4. Elevate the hand at night and intermittently during the day
5. Wound care and optimal wound healing behaviours

Review Weekly
Exercises performance
Oedema management including elevation and compression (caution over nerve repairs for 3 weeks)
Wound and scar management: Commence scar massage at week 3 as indicated (5 minutes 3 x day)
Skin hygiene in Therapy as indicated by skin integrity. Patients can be instructed in how to safely wash hand at home after 3 weeks if they are confident and able to demonstrate safe handling during therapy.
Apply night digital extension splint(s) in the event of early loss of PIP extension

Week 4: Commence active flexion exercises in splint within range that provides minimal resistance to movement.

Week 6: Commence light use out of splint.
Add Tenodesis exercises and avoid composite MCP and wrist extension.

Week 8: Wean dorsal blocking splint, commence gentle composite extension stretches and strengthening. Commence exercise splints if indicated. Return to driving

Week 12: Unrestricted use. May need to continue therapy to maximise ROM and function

Outcomes: TAM % contralateral digit (or 260^{o}): Excellent 100%; Good ≥75%; Fair ≥50%; Poor <50%.

References: Based on Pettengil, K, Van Strien, G, Postoperative management of Flexor Tendon injuries. Rehabilitation of the hand and upper extremity, 6th Ed. Chapter 36, Mosby Inc.

Prince of Wales Hospital Hand Therapy Protocols

Immobilisation Protocol Flexor Tendon Repair

Very weak repair or Patient unable to participate in strict rehabilitation protocol for example in the presence of disordered thinking or impaired cognitive function.
Isolated wrist flexors.
Isolated intra-muscular repair, immobilise for 4 weeks only*

Assess	**Cast**	**Exercises**
Assess and Document *Wound* *Oedema* *Pain*	Full cast as wounds allow. May require volar/dorsal slabs until wounds closed	AROM elbow/shoulder/uninvolved joints **Advice** Cast care and Warnings Elevation for oedema management Signs of infection Light use of hand only in cast
Week 6*:	Cast off and +/- removable wrist brace Consider volar long stretcher splint if poor hand/wrist extension	**Exercises** Commence tendon gliding exercises Scar management and desensitisation Light use of hand out of splint **Advice** Avoid forced composite extension stretches, heavy lifting or weight bearing through arm

Week 8: Wean brace, commence gentle composite extension stretches and strengthening. Commence exercise splints if indicated. Return to driving

Outcomes: TAM % contralateral digit (or 260°): Excellent 100%; Good ≥75%; Fair ≥50%; Poor <50%.

References: Based on Pettengil, K, Van Strien, G, Postoperative management of Flexor Tendon injuries. Rehabilitation of the hand and upper extremity, 6th Ed. Chapter 36, Mosby Inc.

Prince of Wales Hospital Hand Therapy Protocols

Manchester Protocol

Adults with zone 2 flexor tendon injuries in one or two fingers only (single digital nerve injuries included) with a robust repair.
No complex injuries, associated fractures or revascularisations.
Patients with a demonstrated ability to understand their injuries and the importance of strict rehabilitation regimen. Able to comply with weekly attendance.

Day 4-5 Post-Op — Wound check and movement friendly dressings applied

Assess and Document

Wound
Passive flexion distance to palm
Active DIP flexion demonstrated (1/3 fist maximum)
Active extension to splint*

Review Weekly

Splint

MCP extension block 30^0
Wrist extension block 45^0

Exercises

1. Passive Flexion to palm (Prioritise)
2. Active extension to splint with wrist flexion
3. Active Flexion with wrist in 45^0 extension within 'safe zone' of minimal resistance
4. (approximately 1/3 fist initiated with DIP flexion to promote differential glide)

10 reps 2 Hourly

Oedema & Wound Management

Education

1. Wear Splint continuously
2. Tendon Healing timelines
3. 'Safe' functional use of hand such as uninvolved fingers with minimal pressure e.g. mobile phone
4. Discourage full active flexion ROM

*Apply night digital extension splint(s) in the event of early loss of PIP extension or joint injury

Week 6 — Remove splint except 'at risk'
Commence light functional use out of splint

Week 10-12 — Return to normal Activities

FH Peck, AE Roe, CY Ng, C Duff, DA McGrouther and VC Lees (2014) The Manchester short splint: A change to splinting practice in the rehabilitation of zone II flexor tendon repairs. Hand Therapy, Vol. 19(2) pp47–53
Peck, F. (2014). The Rehabilitation of Flexor Tendon Injuries in Zone 2. IFSSH Ezine – February 2014 pp32-37