BRIGHAM AND WOMEN'S HOSPITAL
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Department of Rehabilitation Services
Physical Therapy

PRIMARY EXTENSOR TENDON REPAIR PROTOCOL
(EDC, EIP, EDQ, EPL, ECRL, ECRB, ECU)

The intent of this protocol is to provide the clinician with a guideline for the post-operative rehabilitation course of a patient that has undergone an extensor tendon repair. It is by no means intended to be a substitute for one's clinical decision-making regarding the progression of a patient's post-operative course based on their exam findings, individual progress, and/or presence of post-operative complications. If a clinician requires assistance in the progression of a post-operative patient, they should consult with the referring surgeon.

ZONE I: Over the distal phalangeal joint (DIP)-Mallet deformity
ZONE II: Over the middle phalanx

WEEK	SPLINT	THER EX	PRECAUTIONS	OTHER
1-6	DIP at 0-15 hyperextension (HE). Splint worn continuously. Provide 2 splints, 1 for showering.	A-AAROM of MP and PIP.	Daily skin checks while maintaining DIP in HE 10-15. No active DIP motion.	If swan-neck deformity develops, splint PIP at 30-45 flexion via dorsal block splint. Casting is an option, and may have better outcomes via constant circumferential positioning.
6-8 weeks	Remove splint for exercise, otherwise splint is worn continuously.	AROM of DIP flex/ext, 10 reps hourly. Start at 10 degrees flexion, progress in 10-20 degree increments per week, if no extensor lag develops.	If extensor lag develops > 10 degrees, resume continuous splinting (no ROM) for 1- 2 weeks and reassess.	
>8 weeks	Gradually wean from splint during day.Continue splint at night.	Can introduce AAROM as needed.		Prehension and coordination exercise should supplement ROM program.
10-12 weeks	D/C splint	PROM/PREs		

ZONE III: Over the proximal interphalangeal joint (PIP)-Boutonniere deformity
ZONE IV: Over the proximal phalanx *

IMMOBILIZATION PROTOCOL

WEEK	SPLINT	THER EX	PRECAUTIONS	OTHER
1-6 weeks	Volar digit static splint, PIP at absolute 0 degrees, or serial cast Lateral bands Repaired: include DIP at 0 degrees. If the lateral bands are not repaired the DIP is left free.	ROM may be initiated anytime during week 3 to 6, depending upon healing. Initiate AROM PIP flex to 30 degrees. If no extensor lag develops, progress in 10-20 degree increments each week. 10 repetitions hourly. If lateral bands are repaired, begin gliding at week 3, and at week 1 if lateral bands not injured.	No forceful flexion. No gripping. Splint remains on continuously between ROM sessions.	Serial cast may be chosen if there is a PIP joint flexion contracture, if there is a closed injury, or if the patient is unable to adhere to splinting program. Timing of initiating AROM is determined based on severity of laceration, strength of repair, and patient profile.
6-8 weeks	Gradually wean from splint during day. Continue splint at night.	AAROM or dynamic flexion splinting may be initiated, as well as combined flexion of the wrist and digits.		Light function out of splint.**
10-12 weeks	D/C splint	PROM/PREs		

* Because of the broad tendon-bone interface in zone IV and resultant scar adhesions, you may want to consider the short arc motion protocol. See next page.
** Light functional activities are manipulating activities no greater than 1-3 lbs. (i.e. turning pages, eating, folding light laundry, tying a shoe, buttoning, typing)

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ZONE III – IV: Over the PIP joint to proximal phalanx

SHORT ARC MOTION (SAM) PROTOCOL

WEEK	SPLINT	THER EX	PRECAUTIONS	OTHER
Week 1	Digit volar immobilization splint: PIP and DIP at 0 degrees. Splint worn at all times except during exercise. Two volar static exercise splints: **template 1** PIP 30 flex, DIP 20 flex **template 2** PIP 0, DIP free	Remove immobilization splint hourly for 10-20 reps of AROM PIP and DIP motion in both **template 1 & 2** splints. Wrist is held in 30 flexion, MP at 0. If lateral bands are repaired, limit DIP flexion to 30-35 in **template 2.** If not injured, fully flex and extend DIP.	PIP joint must be positioned at 0 degrees in immobilization splint to prevent extensor lag.	Patient is instructed in technique of controlled motion with minimal active tension.
Week 2	If no extensor lag: Progress **template 1** to PIP 40-50, DIP 30-40	If an extensor lag develops, flexion increments should be more modest and exercise should focus on extension.		If rupture is suspected, refer patient to MD for assessment.
Week 3	If no extensor lag: Progress **template 1** to PIP 50-60, DIP 40-50			
Week 4	If no extensor lag: Progress **template 1** to PIP 70-80, DIP 50-60			If PIP is stiff, splint intermittently into flexion, but continue static extension splinting into week 5 or 6.
Week 5	Begin splint weaning.	Composite flexion and gentle PREs.		Initiate light functional activities out of splint.
Week 6	D/C splint. Splint at night only PRN.	PROM & PREs, reverse putty scraping		

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ZONE V: over the metacarpalphalangeal joint (MCP)**.**
ZONE VI: over the metacarpal bone (MC).

CONTROLLED PASSIVE MOTION

WEEK	SPLINT	THER EX	PRECAUTIONS	OTHER
1-3 days post-op through week 3	Forearm based dynamic digital extension splint Wrist 25-30 degrees ext, MP at 0, PIPs free Fabricate static forearm based Splint at night, wrist at 30-40 ext, MPs at 0, PIPs free.	AROM flexion: isolated joint and tendon gliding (hook and straight fist). Passive extension via elastic recoil of the dynamic splint. 10-20 reps hourly. Begin active MP flexion to 30-40 degrees (via flexion block on dynamic splint). Progress MP flexion as tolerated. Perform wrist and digit PROM in extension and tenodesis out of splint 10 repetitions hourly.	Full fisting may place too much stress on the repair. Assess on a case-by-case basis.	May consider option of total immobilization if necessary.
4-6 weeks	Come out of splint for exercise	Progress MP flexion to 40-60 (week 4), 70-80 (week 5). Initiate full fisting if not already done. Composite wrist and finger flexion. Active digital extension exercises out of splint.	No resistance until 6-8 weeks	Volar static digital IP extension splints can be made to facilitate MP excursion by immobilizing IP joint (splint placed in slings). Allows greater pull-through at MP joint.
6 weeks	D/C splint. Dynamic flexion splinting PRN.	AAROM, PREs, heat and stretch, reverse putty scraping		May initiate NMES, therapeutic heating via ultrasound if needed.

ZONE VII: at the level of the dorsal retinaculum in the wrist.

EARLY ACTIVE MOTION PROTOCOL

WEEK	SPLINT	THER EX	PRECAUTIONS	OTHER
1-3 days post-op through week 3	Static or dynamic splint*: Wrist 30 ext MPs at 0 If dynamic splint chosen, also fabricate static forearm based splint at night, wrist at 30 ext, MPs at 0, PIPs free.	If EDC is repaired, tenodesis from 40 ext to 10 ext. If wrist extensors are repaired, tenodesis from 40 ext to 20 ext. In both cases, allow active MP flexion to 30-40 degrees of flexion (via flexion block on splint) while the wrist is held in extension. If EDC is repaired, hook fisting only. If just wrist extensors repaired, hook, full and straight fisting . All exercises are 10 repetitions hourly.	No active wrist extension or resistive activity with the hand.	*Choice of static vs. dynamic splint is a clinical decision based on severity of injury, strength of repair, concomitant injuries and patient profile. See SOC for discussion on number of suture strands and strength (usually between 2 and 4); issues are strength vs. bulk. Communication with MD is necessary to determine Rx plan.
Weeks 4-5		Progress MP flexion to 40-60 (week 4), 70-80 (week 5). Can modify wrist to neutral in night splint. Begin AROM of wrist: isolated, and combined with 50% finger flexion.		Can begin light function in the splint.
Week 6	Wrist splint, gradually wean to protection only	Combined wrist and finger flex (full fist) AAROM in flexion		Gradually progress to moderate activity out of the splint.
Week 8	D/C splint	PREs		OK for resistive activities

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IMMEDIATE CONTROLLED ACTIVE MOTION (ICAM) PROTOCOL
ZONE IV – VII EXTENSOR TENDON REPAIR

This protocol has been modified from Howell JW. Merritt WH. Robinson SJ. Immediate Controlled Active Motion Following Zone 4-7 Extensor Tendon Repair. *J Hand Ther. 2005;18:182-190.* April/June of 2005.

Splint Design

2 Components

1. Wrist splint 20-25 degrees of wrist extension
2. Yoke splint* with involved MP joint in 15-20 degrees of more extension relative to the MP joints of the non-injured digits.

The yoke splint acts as a "dynamic assist" during finger extension to take tension off the repair site.

*Please refer to the article regarding the yoke splint fabrication.

WEEK	SPLINT	THER EX	PRECAUTIONS	OTHER
Phase I: Week 0-3	Both wrist and yoke splint at all times.	AROM digit motion, including full fisting	Vigor of exercise is monitored to prevent inflammatory response. No resistive activity.	Edema control Scar management **Goal:** Full AROM digits prior to progressing to Phase II.
Phase II: Week 4-5	Yoke splint at all times. Yoke and wrist splint during mod-heavy activities.	Initiate AROM wrist with digits relaxed. If no extensor lag, progress to composite wrist flexion with fisting & composite wrist and digits ext.		**Goal:** Full wrist AROM prior to removing wrist splint for light activities.
Phase III: Week 6-7	D/C wrist splint Yoke splint or buddy strap worn during activity, wean as tolerated.			**Goal:** Full composite wrist and digit motion prior to removing yoke splint for activities and D/C from therapy.

ZONE VIII and MUSCLE BELLY REPAIR: below the level of the level of the retinaculum to the musculotendinous juncture.

Protocol is similar to Zone V-VII. Rehab can progress sooner: AROM at 3 weeks, AAROM at 4 weeks, PROM at 5 weeks, PREs at 6weeks. Splint according to anatomy (i.e. what structures repaired) with static volar splint.

THUMB TI: over the IP joint
IMMOBILIZATION PROTOCOL

WEEK	SPLINT	THER EX	PREC	OTHER
1-3 days post-op through week 3	Splint IP joint at 0 or slight hyperextension Non-operative: 8 weeks continuously Operative: 5-6 weeks continuously	None at this time	No flexion of IP joint. Remove splint daily for skin checks. No gripping or pinching, even in splint.	Issue 2nd splint for showers. May also use McConnell tape to hold digit in place during splint changes.
5-6 weeks	May remove splint for exercise, otherwise continue splint at all times for 2-4 more weeks.	Operative: AROM IP flexion in 20 degree increments per week, modifying progression if extensor lag develops. 10 repetitions/ hourly. Non-operative: No ROM at this time.		
8weeks	Gradually wean from splint during day. Continue splint at night.	Operative: May start AAROM if needed, provided no extensor lag. Non-operative: Initiate AROM IP flexion in 20 degree increments		
10-12 weeks	D/C splint	Operative: PROM and PREs (light gripping and pinching) Non-operative: AAROM, progress to PROM, PREs as tolerated		

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THUMB TII: over the proximal phalanx of the thumb

IMMOBILIZATION PROTOCOL

WEEK	SPLINT	THER EX	PRECAUTIONS	OTHER
Week 1	Hand based static splint (short opponens) MP and IP at 0 degrees, thumb in radial abduction.		No active motion at this time.	
Week 3		Initiate AROM flexion at each joint; progress in 25-30 degree increments each week.		The problems of tendon-to-bone adherence may become an issue in this zone.
Week 4 -5		AAROM flexion, isolated and combined joint		Light prehension ADL out of splint
Week 6	Begin to wean from splint. Dynamic flexion splinting PRN.			Moderate prehension ADL out of splint
Week 8	D/C splint	PREs		Full function

THUMB T III: over the metacarpophalangeal joint (MP)
THUMB T IV: over metacarpal bone

CONTROLLED PASSIVE MOTION PROTOCOL

WEEK	SPLINT	THER EX	PRECAUTIONS	OTHER
Week 1	Forearm based splint, static or dynamic, thumb MP joint at 0 (not HE) and slight abduction, wrist at 30 ext. If dynamic splint chosen, also fabricate static forearm based splint at night, wrist at 30 ext, MP at 0	Initiate AROM flexion in 20 degree increments per week. PROM extension (either via dynamic traction, or self-PROM to static splint limit).	No active extension. No gripping or pinching, even in splint.	Choices for exercise and splinting are based on MD preference, strength of repair, potential for scarring, and patient.
Week 2-4		Increase AROM flexion arc as tolerated. Place and hold extension may be initiated at 3 weeks.		
Week 4		AROM in extension		
Week 5-6	Initiate dynamic flexion splinting PRN.	Full AROM flexion, isolated and combined		
Week 6-8	D/C splint	PREs		

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THUMB T V: level of the retinaculum of the wrist

Week 1	Dynamic extension splinting as described in Zones III and IV.	As above		Dense adhesions may limit EPL excursions at the retinacular level. Proper wrist and thumb positioning are crucial.
Week 3		May initiate AAROM flexion		

REFERENCES

Evans, R. Clinical management of extensor tendon injuries. In: Hunter JM, Macklin EJ,Callahan AD,Skirven TM,Schneider LH,Osterman AL, eds. *Rehabilitation of the hand and upper extremity* St. Louis, Missouri; 2002:542-579.

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