

## Δρ. Χρήστος Κ. Γιαννακόπουλος

Ορθοπαιδικός Χειρουργός, Διδάκτωρ Πανεπιστημίου Αθηνών

Πύργος Αθηνών, Κτίριο Γ΄, 2<sup>ος</sup> όροφος, Λεωφ. Μεσογείων 2–4, Αθήνα 115 27 Τηλ.: 210 7712792 | Κινητό: 697 20 999 11 | E-mail: cky@orthosurgery.gr

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

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

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

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

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

## SHORT ARC MOTION (SAM) PROTOCOL

**ZONE V:** over the metacarpalphalangeal joint (MCP)

**ZONE VI:** over the metacarpal bone (MC).

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

#### CONTROLLED PASSIVE MOTION

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

#### EARLY ACTIVE MOTION PROTOCOL

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

#### 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.

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

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

# THUMB TI: over the IP joint IMMOBILIZATION PROTOCOL

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

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

## 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 <u>Operative</u> : 5-6 weeks continuously	time on	No flexion of IP joint. Remove splint daily for skin checks. No gripping or pinching, even in splint.		Issue 2 <sup>nd</sup> splint for showers. May also use McConnell tape to hold digit in place during splint changes.	
5-6 weeks	ex co ti	ay remove splint for kercise, otherwise ontinue splint at all mes for 2-4 more eeks.		Operative: AROM IP flexion in 20 degree increments per week, modifying progression if extensor lag develops. 10 repetitions/ hourly. <u>Non- operative</u> : No ROM at this time.		
8weeks	sp	radually wean from blint during day. ontinue splint at nigl	nt.	Operative: May start AAROM if needed, provided no extensor lag. <u>Non- operative</u> : 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

## IMMOBILIZATION PROTOCOL

WEEK	SPLINT	THER EX	PRECAUTION	S 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

