

# Zone IV-V: Flexor Tendon Repair

This protocol is intended to provide the clinician with a guideline for the postoperative rehabilitation course of a patient who has undergone *Flexor tendon repair zone IV-V*. General time frames are given for reference to the average, but individual patients will progress at different rates depending on their age, comorbidities, pre-surgical range of motion, strength, health/functional status, rehabilitation compliance, learning barriers and complications. Specific time frames, restrictions and precautions are given to protect healing tissues and surgical reconstruction.

Zone IV includes the flexor tendons within the carpal tunnel. Pure tendon injuries are rare in zone IV because of the protective effect of the flexor retinaculum. However, these injuries may also involve lacerations to the median or ulnar nerve. When 3 structures are injured in zone IV and one of the structures is the median nerve, this injury is usually referred to as spaghetti wrist.

Zone V is defined as the proximal border of the transverse carpal ligament and ends at the musculotendinous junction in the proximal part of the forearm. Zone V injuries usually occur concurrently with neurovascular injuries.

## Postoperative Guidelines

### Surgical Indication

### Return to Work

The timeline for returning to work can vary depending on the type of work performed, various accommodations that may be available within your work environment, and any postoperative complications. Your surgeon will discuss the timeline for returning to work after consideration of these factors.

## Zone IV-V: Flexor Tendon Repair

Phase I (3 to 5 days to 3 weeks after surgery)

Conservative

Early Active

Rehabilitation appointments	<ul style="list-style-type: none"> <li>Twice per week for the first 4-6 weeks</li> </ul>	<ul style="list-style-type: none"> <li>Twice per week for the first 4-6 weeks</li> </ul>
Rehabilitation goals and priorities	<ul style="list-style-type: none"> <li>Remove post op dressings and fabricate orthosis</li> <li>Activities of daily living (ADLs) per restrictions</li> <li>Wound care</li> <li>Edema management</li> <li>Protected ROM</li> </ul>	<ul style="list-style-type: none"> <li>Remove post op dressings and fabricate orthosis</li> <li>Activities of daily living (ADLs) per restrictions</li> <li>Wound care</li> <li>Edema management</li> <li>Protected ROM</li> </ul>
Suggested therapeutic exercises	<ul style="list-style-type: none"> <li>Passive digit flexion with active digit extension</li> <li>Passive MCP flexion with A/PROM IP extension</li> <li>Passive (or gravity assisted wrist flexion, followed by active extension to orthotic limits (tenodesis exercise)</li> <li>Isolated active FDS glide of unaffected fingers</li> </ul> <p>Exercises should be performed every 2 hours, 10-15 repetitions</p>	<ul style="list-style-type: none"> <li>Passive digit flexion with active digit extension</li> <li>Passive MCP flexion with A/PROM IP extension</li> <li>Passive (or gravity assisted wrist flexion, followed by active extension to orthotic limits (tenodesis exercise)</li> <li>Progressive active fistng starting with 1/3 fist. Each week for progress active fistng</li> <li>Isolated active FDS glide of unaffected fingers</li> </ul> <p>Exercises should be performed every 2 hours, 10-15 repetitions</p>
Precautions	<ul style="list-style-type: none"> <li>Wound precautions</li> <li>No passive wrist extension and composite finger extension</li> <li>No functional use of the involved upper extremity</li> </ul>	<ul style="list-style-type: none"> <li>Wound precautions</li> <li>No passive wrist extension and composite finger extension</li> <li>No functional use of the involved upper extremity</li> </ul>

<p>Orthotic management</p>	<ul style="list-style-type: none"> <li>• Custom thermoplastic dorsal blocking WHFO with wrist in 20-30 degrees of flexion, MCPs at 60 degrees flexion, and IPs in full extension</li> <li>• Wear all the time</li> <li>• If the ulnar and/or median nerve is repaired, position wrist in 30 degrees of wrist flexion. Increase by 10 degrees of extension each week stopping at neutral wrist.</li> <li>• If the ulnar nerve is repaired block MCP joints of the ring and small finger from hyperextension.</li> <li>• If the median nerve is repaired, a night first webspacer is recommended</li> </ul>	<ul style="list-style-type: none"> <li>• Custom thermoplastic dorsal blocking WHFO with wrist in 20 -30 degrees of extension, MCPs at 30 degrees flexion, and IPs in full extension</li> <li>• Wear all the time</li> <li>• If the ulnar and/or median nerve is repaired, position wrist in 30 degrees of wrist flexion. Increase by 10 degrees of extension each week stopping at neutral wrist.</li> <li>• If the ulnar nerve is repaired block MCP joints of the ring and small finger from hyperextension.</li> <li>• If the median nerve is repaired, a night first webspacer is recommended</li> </ul>
<p>Progression criteria</p>	<ul style="list-style-type: none"> <li>• Strickland's percentage</li> </ul>	<ul style="list-style-type: none"> <li>• Strickland's percentage</li> <li>• Progress active exercises in a pain/tension-free manner</li> </ul>

## Zone IV-V: Flexor Tendon Repair

Phase II (3 weeks after surgery)

Conservative

Early Active

Rehabilitation appointments	<ul style="list-style-type: none"> <li>Twice per week or per therapist discretion</li> </ul>	<ul style="list-style-type: none"> <li>Twice per week or per therapist discretion</li> </ul>
Rehabilitation goals and priorities	<ul style="list-style-type: none"> <li>Activities of daily living (ADLs) per restrictions</li> <li>Edema management</li> <li>Scar management</li> <li>Initiated non-thermal US at 2-3 weeks</li> </ul>	<ul style="list-style-type: none"> <li>Activities of daily living (ADLs) per restrictions</li> <li>Edema management</li> <li>Scar management</li> <li>Initiated non-thermal US at 2-3 weeks</li> <li>NMES may be initiated to enhance excursion of long flexors</li> </ul>
Suggested therapeutic exercises	<ul style="list-style-type: none"> <li>Initiate active tendon glides</li> </ul>	<ul style="list-style-type: none"> <li>Active ¾ fist or full composite fist</li> <li>Initiated active tendon glides</li> <li>Initiated active full finger extension with tendon glides out of orthosis</li> <li>Initiated gentle IP blocking</li> <li>Initiated gentle wrist AROM out of orthosis with fingers relaxed</li> <li>If median and/or ulnar nerve is repair, limit active wrist extension to 30 degrees</li> <li>If needed, PROM wrist flexion</li> </ul>
Precautions	<ul style="list-style-type: none"> <li>No passive wrist extension and composite finger extension</li> <li>No functional use of the involved upper extremity</li> </ul>	<ul style="list-style-type: none"> <li>No passive wrist extension and composite finger extension</li> <li>No functional use of the involved upper extremity</li> </ul>
Orthotic management	<ul style="list-style-type: none"> <li>Modify orthosis to position the wrist in neutral or slight extension.</li> <li>Wear all the time except for bathing. Do not use the hand while bathing.</li> </ul>	<ul style="list-style-type: none"> <li>Wear all the time except for bathing and exercises. Do not use the hand while bathing</li> </ul>

Progression criteria	<ul style="list-style-type: none"><li>• Strickland's percentage</li><li>• Progress active exercises in a pain/tension-free manner</li></ul>	<ul style="list-style-type: none"><li>• Strickland's percentage</li><li>• Progress active exercises in a pain/tension-free manner</li></ul>
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## Zone IV-V: Flexor Tendon Repair

Phase III (4 weeks after surgery)

Conservative

Early Active

Rehabilitation appointments	<ul style="list-style-type: none"> <li>Twice per week or per therapist discretion</li> </ul>	<ul style="list-style-type: none"> <li>Twice per week or per therapist discretion</li> </ul>
Rehabilitation goals and priorities	<ul style="list-style-type: none"> <li>Activities of daily living (ADLs) per restrictions</li> <li>Edema management</li> <li>Scar management</li> <li>Co</li> <li>NMES may be initiated to enhance excursion of long flexors</li> </ul>	<ul style="list-style-type: none"> <li>Activities of daily living (ADLs) per restrictions</li> <li>Edema management</li> <li>Scar management</li> <li>Initiate light functional activities with the hand</li> </ul>
Suggested therapeutic exercises	<ul style="list-style-type: none"> <li>Initiated active full finger extension with tendon glides out of orthosis</li> <li>Initiated gentle IP blocking</li> <li>Initiated gentle wrist AROM out of orthosis with fingers relaxed</li> <li>If median and/or ulnar nerve is repair, limit active wrist extension to 30 degrees</li> <li>If needed, PROM wrist flexion</li> </ul>	<ul style="list-style-type: none"> <li>If median/ulnar nerve, repair perform AROM wrist extension to 45 degrees with full flexion</li> </ul>
Precautions	<ul style="list-style-type: none"> <li>No passive wrist extension and composite finger extension</li> <li>No functional use of the involved upper extremity</li> </ul>	<ul style="list-style-type: none"> <li>No passive wrist extension and composite finger extension</li> <li>No lifting, pushing, or pulling more than 1-2 pounds with the involved upper extremity</li> </ul>
Orthotic management	<ul style="list-style-type: none"> <li>Wear all the time except for bathing and exercises. Do not use the hand while bathing.</li> </ul>	<ul style="list-style-type: none"> <li>Wear all the time except for bathing, exercises, and light activities.</li> <li>Initiate light activities that are thoughtful and safe within weight restriction.</li> </ul>
Progression criteria	<ul style="list-style-type: none"> <li>Strickland's percentage</li> </ul>	<ul style="list-style-type: none"> <li>Strickland's percentage</li> </ul>

	<ul style="list-style-type: none"> <li>Progress active exercises in a pain/tension-free manner</li> </ul>	<ul style="list-style-type: none"> <li>Progress active exercises in a pain/tension-free manner</li> </ul>
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## Zone IV-V: Flexor Tendon Repair

### Phase IV (5 weeks after surgery)

#### Conservative

#### Early Active

	Conservative	Early Active
Rehabilitation appointments	<ul style="list-style-type: none"> <li>Twice per week or per therapist discretion</li> </ul>	<ul style="list-style-type: none"> <li>Twice per week or per therapist discretion</li> </ul>
Rehabilitation goals and priorities	<ul style="list-style-type: none"> <li>Activities of daily living (ADLs) per restrictions</li> <li>Edema management</li> <li>Scar management</li> <li>NMES may be initiated to enhance excursion of long flexors</li> </ul>	<ul style="list-style-type: none"> <li>Activities of daily living (ADLs) per restrictions</li> <li>Edema management</li> <li>Scar management</li> <li>Continue light functional activities with the hand</li> </ul>
Suggested therapeutic exercises		<ul style="list-style-type: none"> <li>Initiated passive finger extension and wrist extension as needed</li> </ul>
Precautions	<ul style="list-style-type: none"> <li>No passive wrist extension and composite finger extension</li> <li>No functional use of the involved upper extremity</li> </ul>	<ul style="list-style-type: none"> <li>No lifting, pushing, or pulling more than 1-2 pounds with the involved upper extremity</li> </ul>
Orthotic management	<ul style="list-style-type: none"> <li>Wear all the time except for bathing and exercises. Do not use the hand while bathing.</li> </ul>	<ul style="list-style-type: none"> <li>Wear all the time except for bathing, exercises, and light activities.</li> <li>Continue to wean from orthosis and use of hand with light functional activities</li> </ul>
Progression criteria	<ul style="list-style-type: none"> <li>Strickland's percentage</li> <li>Progress active exercises in a pain/tension-free manner</li> </ul>	<ul style="list-style-type: none"> <li>Strickland's percentage</li> <li>Progress active/passive exercises in a pain/tension-free manner</li> </ul>

## Zone IV-V: Flexor Tendon Repair

Phase V (6 weeks after surgery)

Conservative

Early Active

	Conservative	Early Active
Rehabilitation appointments	<ul style="list-style-type: none"> <li>1x/week or per therapist discretion</li> </ul>	<ul style="list-style-type: none"> <li>1x/week or per therapist discretion</li> </ul>
Rehabilitation goals and priorities	<ul style="list-style-type: none"> <li>Activities of daily living (ADLs) per restrictions</li> <li>Edema management</li> <li>Scar management</li> </ul>	<ul style="list-style-type: none"> <li>Activities of daily living (ADLs) per restrictions</li> <li>Edema management</li> <li>Scar management</li> </ul>
Suggested therapeutic exercises	<ul style="list-style-type: none"> <li>Initiated passive finger extension and wrist extension as needed</li> </ul>	<ul style="list-style-type: none"> <li>Initiate wrist isometrics</li> </ul>
Precautions	<ul style="list-style-type: none"> <li>No lifting, pushing, or pulling more than 1-2 pounds with the involved upper extremity</li> </ul>	<ul style="list-style-type: none"> <li>No lifting, pushing, or pulling more than 2-5 pounds with the involved upper extremity</li> </ul>
Orthotic management	<ul style="list-style-type: none"> <li>Wear all the time except for bathing, exercises, and light activities.</li> <li>Wean from orthosis and use of hand with light functional activities</li> </ul>	<ul style="list-style-type: none"> <li>Discontinue orthosis</li> <li>Can transition to wrist orthosis at night</li> <li>Continue median and/or ulnar nerve orthoses prn</li> </ul>
Progression criteria	<ul style="list-style-type: none"> <li>Per pain tolerance and ROM</li> </ul>	<ul style="list-style-type: none"> <li>Per pain tolerance and ROM</li> </ul>



## Zone IV-V: Flexor Tendon Repair

### Phase VI (7 weeks after surgery)

#### Conservative

#### Early Active

Rehabilitation appointments	<ul style="list-style-type: none"> <li>1x/week or per therapist discretion</li> </ul>	<ul style="list-style-type: none"> <li>1x/week or per therapist discretion</li> </ul>
Rehabilitation goals and priorities	<ul style="list-style-type: none"> <li>Activities of daily living (ADLs) per restrictions</li> <li>Edema management</li> <li>Scar management</li> </ul>	<ul style="list-style-type: none"> <li>Activities of daily living (ADLs) per restrictions</li> <li>Edema management</li> <li>Scar management</li> </ul>
Suggested therapeutic exercises	<ul style="list-style-type: none"> <li>Initiate wrist isometrics</li> </ul>	<ul style="list-style-type: none"> <li>Progressive strengthening of the hand and wrist</li> </ul>
Precautions	<ul style="list-style-type: none"> <li>No lifting, pushing, or pulling more than 1-2 pounds with the involved upper extremity</li> </ul>	<ul style="list-style-type: none"> <li>No lifting, pushing, or pulling more than 2-5 pounds with the involved upper extremity</li> </ul>
Orthotic management	<ul style="list-style-type: none"> <li>Wear all the time except for bathing, exercises, and light activities.</li> <li>Continue to wean from orthosis and use of hand with light functional activities</li> </ul>	
Progression criteria	<ul style="list-style-type: none"> <li>Per pain tolerance and ROM</li> </ul>	<ul style="list-style-type: none"> <li>Per pain tolerance and ROM</li> </ul>

## Zone IV-V: Flexor Tendon Repair

Phase VII (8 weeks after surgery)

Conservative

Early Active

Rehabilitation appointments	<ul style="list-style-type: none"> <li>1x/week or per therapist discretion</li> </ul>	<ul style="list-style-type: none"> <li>1x/week or per therapist discretion</li> </ul>
Rehabilitation goals and priorities	<ul style="list-style-type: none"> <li>Activities of daily living (ADLs) per restrictions</li> <li>Edema management</li> <li>Scar management</li> </ul>	<ul style="list-style-type: none"> <li>Activities of daily living (ADLs) per restrictions</li> <li>Edema management</li> <li>Scar management</li> </ul>
Suggested therapeutic exercises	<ul style="list-style-type: none"> <li>Progressive strengthening of the hand and wrist</li> </ul>	<ul style="list-style-type: none"> <li></li> </ul>
Precautions	<ul style="list-style-type: none"> <li>No lifting, pushing, or pulling more than 2-5 pounds with the involved upper extremity</li> </ul>	<ul style="list-style-type: none"> <li>No lifting, pushing, or pulling more than 2-5 pounds with the involved upper extremity</li> </ul>
Orthotic management	<ul style="list-style-type: none"> <li>Discontinue orthosis</li> <li>Can wear wrist orthosis at night</li> <li>Continue median and/or ulnar nerve orthoses prn</li> </ul>	
Progression criteria	<ul style="list-style-type: none"> <li>Per pain tolerance and ROM</li> </ul>	<ul style="list-style-type: none"> <li>Per pain tolerance and ROM</li> </ul>

## Zone IV-V: Flexor Tendon Repair

Phase VIII (10-12 weeks after surgery)

Conservative

Early Active

Rehabilitation appointments	<ul style="list-style-type: none"> <li>As needed</li> </ul>	<ul style="list-style-type: none"> <li>As needed</li> </ul>
Rehabilitation goals and priorities	<ul style="list-style-type: none"> <li>Return to all activities with the involved hand</li> <li>Progressively get back to heavy work and leisure activities</li> </ul>	<ul style="list-style-type: none"> <li>Return to all activities with the involved hand</li> <li>Progressively get back to heavy work and leisure activities</li> </ul>
Suggested therapeutic exercises	<ul style="list-style-type: none"> <li>Strengthening to address heavy work and/or leisure activities</li> </ul>	<ul style="list-style-type: none"> <li>Strengthening to address heavy work and/or leisure activities</li> </ul>
Precautions	<ul style="list-style-type: none"> <li>No restrictions</li> </ul>	<ul style="list-style-type: none"> <li>No restrictions</li> </ul>
Orthotic management	<ul style="list-style-type: none"> <li>Discontinue orthosis</li> <li>Continue median and/or ulnar nerve orthoses prn</li> </ul>	
Progression criteria	<ul style="list-style-type: none"> <li>Per pain tolerance and ROM</li> </ul>	<ul style="list-style-type: none"> <li>Per pain tolerance and ROM</li> </ul>

### **Additional Notes**

Scar management is very important in Zone IV-V. These zones have a high risk of scar adherence. Performing exercises every two hours or every hour is recommended as well as early scar management.

If nerve injury present:

\*If ulnar nerve is involved, when fabricating the orthosis, included MCPJ of ring and small finger blocked at 45 degrees of flexion.

\*If the median nerve is repair, a web spacer or C-bar orthosis should be worn at night until thenar function has returned. Initially a web spacer orthosis is not needed due to the thumb opponens orthosis positioning the thumb in abduction.

\*Sensory re-education is very important to perform early in the rehabilitation process. Mirror therapy has been shown to be a sensory re-education intervention. It can be performed early or late in sensory re-education phase. Functional sensory tasks and activities are important to implement to help the hand relearn functional tasks.

\*Due to poor sensory input, patient and therapist must monitor skin closely. Patient may develop pressure sores due to orthosis without knowing.

\*NMES is recommended to stimulate thenar muscles. Intrinsic muscles in the hand may not return and tendon transfers will need to be performed.

## References

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*These rehabilitation guidelines were developed collaboratively between UW Health and UnityPoint Health - Meriter Rehabilitation and the UW Health Orthopedic Surgeons.*

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