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Complex made Simple...clinically relevant education by Judy C. Colditz, OT/L, CHT, FAOTA

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ClinicalPearls

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REGAINING FLEXOR TENDON GLIDE WITHIN ZONE 2

What is your treatment approach if you have followed your preferred post-operative treatment for a Zone 2 flexor tendon repair or tenolysis and the range of flexion remains frustratingly limited? (NOTE: The discussion below assumes the patient is past the acute postoperative stage and it is safe for the patient to actively flex the finger.)

Two pertinent questions likely come to mind:

1. What position/s and exercise/s will maximize zone 2 flexor tendon excursion?
2. What are the lingering sources of resistance to flexor tendon excursion within zone 2 and how can they be minimized?

The good news is that the answer to both questions is likely the same!!

Assuming the patient is able to stabilize the wrist in some extension and that the flexor muscles are fully innervated, the following are the likely culprits (there can be others) limiting glide of the repaired flexor tendons within zone 2:

1. Adherence of the flexor digitorum profundus (FDP) and/or flexor digitorum superficialis (FDS) to the surrounding tissues and/or to each other.
2. Stiffness of the PIP and/or DIP joints
3. Interosseous muscle tightness
4. Lumbrical muscle tightness
5. Digital edema

Each of these factors is best remedied by one approach: active interphalangeal (IP) joint flexion and extension while the metacarpophalangeal (MP) joint is blocked in extension (active hook).

ADHERENCE OF FDP AND/OR FDS TO THE SURROUNDING TISSUES AND/OR TO EACH OTHER

Active MP joint flexion has no effect on the flexor tendon glide within zone 2. (1) Although the end goal for our patients is full finger flexion, if the resistance/adherence is in zone 2, full finger flexion will not produce maximum glide within zone 2. It is well documented that both the maximum excursion and maximum differential excursion of the FDP and the FDS within zone 2 occurs in the active hook position. Many therapists recommend tendon gliding exercises as developed by Wehbe (2,3) but one should realize these are intended for maximal differential glide of all flexor tendons across all joints. If resistance/adherence is present in zone 2, these exercises may not remediate the zone 2 adherence.

Placing the hand in a non-removable cast with the MP joints blocked in extension focuses all active motion on the one movement needed to regain maximum glide and differential glide within zone 2: active IP joint flexion. No other exercise will be as effective in regaining zone 2 glide. While other exercises will divert energy away from the targeted goal of IP flexion, time in the cast assures a precise and concentrated period of exercise.



Cast isolates active flexion and extension to interphalangeal joints; all tendon glide occurs within zone 2.

OTHER SOURCES OF RESISTANCE TO

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IP JOINT FLEXION

Remarkably, the blocked active hook exercise is also the maneuver which is most likely to resolve the other most common causes of resistance to finger flexion:

1. Stiffness of the proximal and/or distal interphalangeal (PIP and DIP) joints can be mobilized by active motion provided MP joint flexion is not allowed. Blocking the MP joint in extension directs all flexor force to the PIP and the DIP joints. If the MP joint flexes, the IP joints do not receive the maximum power of the extrinsic flexors.
2. Both the interosseous muscles and the lumbrical muscles are maximally elongated in the active hook position. (Note: the lumbrical muscle can only be elongated actively. The lumbrical muscle origin on the FDP must move proximally to maximally elongate the lumbrical muscle and this can only occur when the FDP is actively contracting.) If adaptively shortened, either/both the lumbrical and/or interosseous muscles can provide significant resistance to full finger flexion. With the MP joint blocked in extension, the active flexion of the interphalangeal joints elongates both of these muscles. This ironically removes the very resistance that makes full proximal flexor tendon excursion difficult within zone 2!
3. Even though digital edema may not appear to limit finger motion, it continues to provide resistance at the end range of flexion until fully resolved. Since the lymphatic system has no active pump, the best pumping mechanism is the compression that full IP joint flexion provides.

There are two important elements in successfully regaining zone 2 flexor excursion and minimizing resistance: 1) blocking the MP joint in extension and 2) creating sustained periods of exercise.

Blocking the MP joint in extension is important because the extensor digitorium communis is not strong enough- in the face of resistance- to hold the MP joint in extension. If the patient attempts an active hook without the MP joint blocked, invariably MP joint extension is lost when resistance is met. On some occasions it is useful to hold the MP joint in some hyperextension to regain the absolute maximum excursion/differential excursion within zone 2.

As therapists, we commonly ask patients to do multiple exercises to achieve maximum motion of all joints in all directions. Unfortunately, this often means that the unimpeded joints move the most and the stiffest joints move the least. When a specific impediment such as limited tendon glide within zone 2 is identified, the most efficient remedy is to repeatedly perform the optimal exercise until progress is attained. Doing other exercises only dilutes the time and attention available to resolve the primary impediment. A non-removable cast is the most efficient way to both ensure repeated performance of the needed exact exercise and prevent non-productive exercises.

1. *Cooney WP, Lin G-T, An K-N. Improved tendon excursion following flexor tendon repair. J Hand Ther 1989;2:102-6.*
2. *Wehbe MA, Hunter JM. Flexor tendon gliding in the hand. Part II: Differential gliding. Journal of Hand Surgery [Am] 1985;10:575-9.*
3. *Wehbe MA, Hunter JM. Flexor tendon gliding in the hand. Part I: In vivo excursions. J Hand Surg [Am] 1985;10A:570-4.*

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