PROTECTIVE ACTION OF THE LUMBRICAL MUSCLE TO A HEALING FLEXOR TENDON REPAIR DURING ACTIVE FINGER EXTENSION

Original flexor tendon protocols such as Durran and Kleinert called for positioning the wrist, metacarpophalangeal (MP), and interphalangeal (IP) joints in flexion to diminish tension on the repaired flexor tendon/s. With this approach, IP joint flexion contractures often developed. As early active motion protocols evolved, therapists and surgeons realized flexing the wrist, MP, and IP joints created passive tension in the extrinsic extensor muscle-tendon units that generated more, rather than less, resistance across the repair during active finger flexion (1). Thus most active flexor tendon protocols now recommend a position of less wrist flexion and perhaps less MP joint flexion and they also encourage/allow full interphalangeal joint extension.

Even those who continue to position the wrist and MP joints in flexion typically allow full IP joint extension within the protective orthosis. Many remain concerned that full IP joint extension in combination with a position of relative greater wrist and MP joint extension does not adequately protect the healing repaired flexor tendon/s. Kursa and colleagues in 2006 confirmed the safety (2) and Dennerlein in 2005 recognized the safety and desirability (1) of a position of zero degrees extension of the wrist.

An infrequently mentioned explanation as to why it is safe to fully extend the fingers with the wrist at zero degrees extension is the protective action of the lumbrical muscle.

It is well known that the lumbrical muscle contracts during active finger extension pulling the flexor digitorum profundus (FDP) tendon distally because of its origin on the moving FDP. When the lumbrical muscle meets the resistance of the resting tone of the FDP muscle, the distal pull on the FDP stops and the lumbrical muscle contracts to contribute to IP joint extension. The lumbrical muscle therefore contributes to IP joint extension by decreasing the FDP tension; it is the only muscle able to diminish the tension of its own antagonist!! (3-6).

This distal movement of the FDP tendon by the lumbrical muscle thus reduces tension on a repair site distal to the lumbrical origin. It does not, however, provide any tension protection of a repair site proximal to the lumbrical muscle origin. Therefore, patients who have a zone 1, 2, or 3 FDP tendon repair and an intact lumbrical muscle have a built-in reduction in the tension of the FDP repair site during active finger extension. (NOTE: Not all zone 3 injuries qualify: the repair site of the FDP must be distal to the lumbrical origin.) This same protection does not exist during passive finger extension.

This protective mechanism is not limited just to IP joint extension, however. The same protection is present when the MP joint is also extended because, identical the IP joints, the MP joints are distal to the lumbrical muscle origin.

Although a position of MP joint flexion is considered desirable to prevent adaptive shortening of the MP joint collateral ligaments, significant MP
Joint flexion within a protective flexor tendon orthosis establishes an intrinsic plus pattern of finger flexion. This intrinsic plus position makes it problematic for the patient to initiate finger flexion with the extrinsic flexors, which is the core concept of early active motion protocols! Additionally, if an early active protocol is undertaken, the MP joints are moving through a range of motion which averts concerns about adaptive shortening of the MP joint collateral ligaments.

The knowledge that the lumbrical muscle contributes to the reduction of tension on the repaired FDP tendon in zone 1 through 3 during active finger extension of all three joints should allow therapists and surgeons using early active motion protocols to be comfortable allowing a position of relative extension of the MP and the wrist joints in the protective orthosis. Such a position allows the patient to more easily initiate active finger flexion with the extrinsic flexors.

It should not be construed that the lumbral muscle contraction is the only tension factor to consider. The strength of the flexor tendon repair, resistance within the flexor sheath, adherence, joint stiffness, and other variables also contribute to the tension placed on a healing flexor tendon during finger active extension.


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