

Introduction

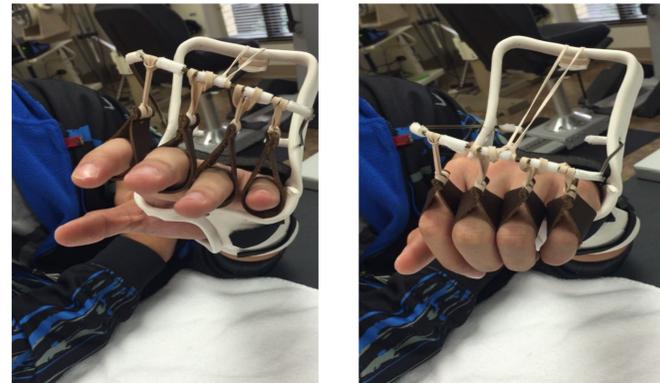
- Zone V flexor tendon injuries or spaghetti wrist injuries begin at the proximal border of the transverse carpal ligament and ends at the muscle tendon junction in the proximal forearm. Neurovascular injuries often coincide with tendon lacerations. Lacerations, knife wounds and suicide attempts are typical mechanisms of injury.¹
- Rehabilitation protocols include immobilization, early passive motion or early active motion.¹
- The positive effects of stress and movement on tendon healing has been well documented.²
- We believe that the use of a dynamic crane orthotic for initiation of early active motion leads to improvement in both subjective and objective outcomes

Methods

- A retrospective chart review of patients treated with early active range of motion protocol was completed.
- Specifically, the Duran protocol consisting of passive flexion and active extension of each joint while in a custom dorsal blocking orthotic was employed. Transitioned patients to a dynamic crane outrigger which is traditionally seen with hand replantation patients.³⁻⁴
- Injuries included damage to median or ulnar nerve and multiple zone V flexor tendons.
- QuickDASH (QDASH) and Global Rating of Change (GROC) scores as well as grip strength acquired to assess outcomes.
- Patients monitored for wound healing issues, sympathetic dystrophy, and tendon rupture.

Postoperative Rehabilitation Protocol

- Force is consistently applied via rubber bands throughout the range of motion and transmits tension through the repair stimulating the muscle spindle receptors found within muscle bellies of extrinsic flexor muscles. This allows for excursion of tendons, minimizing adhesions, and aiding in maintenance of cortical representation via input to the CNS about muscle length needed for motor tasks.⁶
- Orthotic was adjusted to maximize extension and maintain a 10 to 20 degree lag at metacarpal phalangeal (MCP) joints, and patient monitored for signs of hypoxia.



- Patients fitted with dorsal blocking orthotic (DBS) to allow for wound healing, control edema, and inflammation. Traditionally, the DBS is applied for up to 6 weeks.⁵
- Dynamic crane outrigger applied between weeks 2-3 to promote motion, decrease edema and minimize scar adhesions. Orthotic used for up to weeks 10 of treatment. Patients completed range of motion exercises, gross motor tasks (example: peg trapping, lacing), and graded motor imagery (GMI).

Week 1-2	Weeks 2-3	Weeks 4-5	Weeks 6-12
Dorsal Blocking Orthotic	Dynamic Crane Outrigger	Muscle Stimulation at 4 weeks	Corrective orthotic at 6 weeks
Duran PROM Protocol	AROM inside of orthotic	AROM outside of orthotic at 5 weeks	Strengthening at weeks 8 to 12

Data and Results

- Twenty nine total patients (10 Female, 19 Male)
- Insurance included: 19 Medicare/Medicaid, 6 Worker's Compensation, and 4 private insurance.
- Mechanism of injury included: glass or mirror lacerations due to falling or striking glass, and table saw lacerations
- Average age at time of injury 38
- Average number of follow up visits with occupational therapist was 21
- Average number of involved tendons in Zone V was 5.2, with a range of (2-9)
- All injuries involved the median nerve, ulnar nerve or both. 12 patients exhibited arterial injuries.

- The QDASH scale is (0-100) with elevated scores indicating higher levels of disability with daily activities.
- The GROC scale is (-7 to +7) with positive scores indicating improvement with symptoms and negative scores indicating worsening symptoms.
- Pre-intervention average QDASH score 76
- Post-intervention average QDASH score improved to 26
- Average QDASH percent change 66%
- Initial GROC rating average 5.2 with range of (3-7)
- Post-intervention GROC scores 6.2 with range of (5-7)
- Grip strength measured at discharge. Difference in grip strength when compared to contralateral hand 10.2% for males and 1.86% for females.

Conclusion and Future Work

- Early low-load and high excursion therapy protocol as described in hand replantation literature yields promising results in patients following repair of Zone V tendon, vessel, and nerve injuries.
- No tendon ruptures were encountered with use of this therapy protocol
- These results are encouraging in regard to the utility of employing the early active range of motion protocol for patients suffering from spaghetti wrist injuries.
- Comparison to a similar patient population subjected to traditional therapy protocols could indicate superiority of this rehabilitation method

References and Acknowledgements

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