

## Application of VersaWrap to FPL Repair – Second Look

### Introduction

Penetrating trauma to the hand and wrist is common; 10% of Emergency Department visits are hand injuries, of which 82% are soft tissue [1]. Tendon lacerations can be a consequence of these types of injuries. One retrospective population study found an incidence of 33.2 acute traumatic tendon injuries per 100,000 person-years [2-3].

While these injuries are common, it is rare that the orthopaedic surgeon is permitted the opportunity to re-evaluate the tendon repair in an open fashion after the patient has healed. Results of these encounters are often clinically based. We present the case of a patient who sustained an acute tendon laceration and underwent operative repair before undergoing distal radius fracture operative fixation for a separate injury one year later, allowing direct visualization of the healed tendon repair.

### Case – Initial procedure

The patient is a 68-year-old right hand dominant male who sustained a flexor pollicis longus (FPL) tendon laceration when he fell on glass, cutting his right wrist. The laceration crossed the distal wrist crease and extended from the distal forearm toward the thenar eminence. He was initially seen in the emergency department, where he was evaluated, the wound irrigated and closed, and he was discharged as he had intact function of all digits and nerves. He again presented the next day as he had an acute loss of the ability to flex his thumb. The patient was noted to have an FPL laceration based on physical examination. He was taken to the operating room the same day and underwent irrigation and debridement and repair of the right FPL tendon laceration. The FPL was found to have a complex laceration in Zone V with significant fraying of the distal end (**Fig 1A**). A modified Tsuge technique was performed using a looped 3-0 nylon suture. Given the irregular contour of the laceration and tendon ends, a braided 3-0 ethylene terephthalate suture was used to reinforce the repair in a running locking fashion. This technique resulted in a secure repair with no gapping. To limit unwanted postoperative tethering, a hyaluronic acid (HA) / alginate sheet with activating solution (VersaWrap, Alafair Biosciences, Austin, TX) was then applied over the repair site.

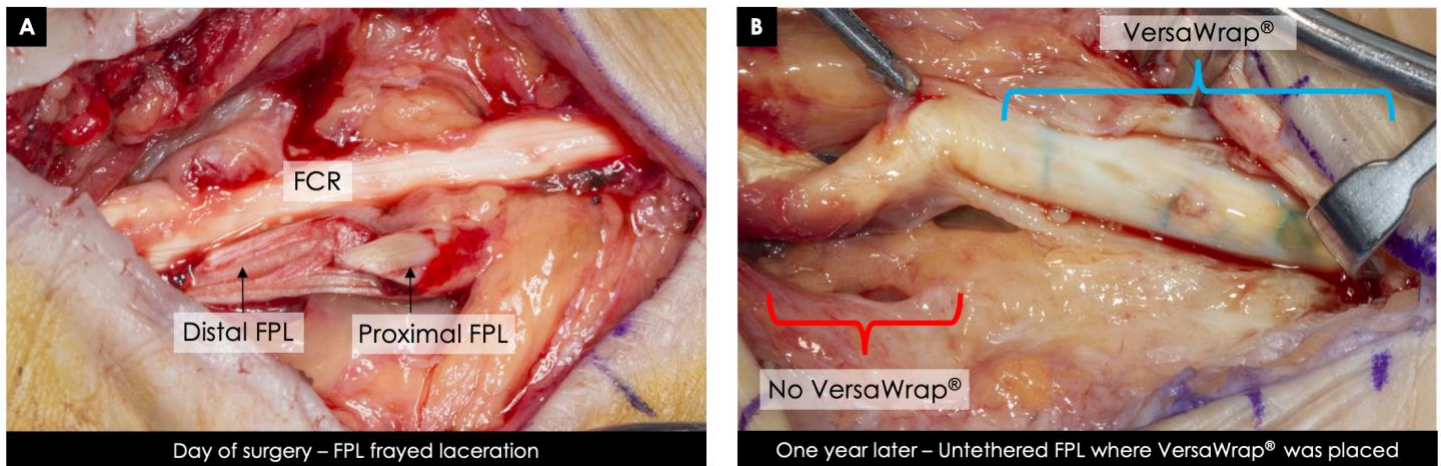
The patient was splinted post-operatively. At his first post-operative appointment he was able to actively flex the thumb interphalangeal joint and was transitioned to a thumb spica splint with the wrist at 20 degrees of extension, the MCPJ at 15 degrees and the IPJ at 30 degrees. He was instructed on passive range of motion (ROM) by occupational therapy. He progressed appropriately over the course of his post-operative visits. At his final follow up appointment (10 weeks postop), he was able to make a full composite fist and had 30 degrees of flexion about the right thumb IPJ when compared to 45 degrees on the contralateral extremity. He had resumed normal activity and was cleared without restrictions.

### Case – Second procedure

Approximately one year later, the patient sustained a right distal radius fracture after falling off a ladder. He underwent closed reduction and casting in the Emergency Department. He was indicated for operative fixation when repeat radiographs were taken one week later and demonstrated a loss of reduction.

The patient subsequently underwent a right distal radius open reduction and internal fixation two days later. His original incision was incorporated into a modified Henry approach. The flexor carpi radialis was identified and retracted and the subsheath was incised. This exposure revealed the previously repaired FPL, which was intact. The repair was visualized and noted to have healed entirely. There were no adhesions in the area where VersaWrap had been applied. Proximal to the placement of VersaWrap, though, adhesions were noted (**Fig**

**1B).** The tendon was carefully retracted, and the patient's distal radius open reduction and internal fixation was performed without complication.



**Figure: A)** Day of surgery: frayed distal stump of FPL, longitudinal splits and disruption of the epitendinous layer; not a standard sharp FPL laceration; **B)** FPL approximately one year later: The surgeon noted lack of adhesions where VersaWrap was placed with evidence of adhesions where VersaWrap was not placed

## Results

At the patient's first post-operative visit two weeks following the second procedure, the incision was well-healed, and his sutures were removed. He was transitioned to a removable wrist brace at that time. He progressed appropriately without complication and at final clearance he was again able to make a well-aligned composite fist with normal range of motion and full flexion and extension of the thumb IP joint. His key pinch strength at 2 years and 2 months postoperatively was 11 kg (versus 8 kg on the contralateral side).

## Discussion

The incidence of flexor tendon injuries is quoted as 4.83 per 100,000 persons [3]. While tendons may successfully be repaired, re-rupture and postoperative adhesions frequently complicate clinical outcomes.

Tendons consist of endotenon, paratenon, and epitenon. Intrasynovial tendons are also enveloped in synovial covering and sheath. This sheath provides the tendon the environment for maximal excursion which relies on the tendon gliding within the sheath. In cases of injury and repair, this gliding motion may be inhibited by cicatrix and adhesions that form during the healing process. As such, interventions are sought to optimize tendon gliding after repair to improve resulting range of motion and function.

Many studies have examined the use of biologic agents as an adjunct to achieve this goal. Hyaluronic acid (HA) is one such treatment that has emerged. Sun et al demonstrated decreased resistance to tendon gliding in their canine model [4]. Other studies have found similar results with these adjuncts [5-6].

Upon inspection at the second look procedure the surgeon stated that VersaWrap demonstrated the ability to prevent tethering / adhesion formation where applied. This case provided the rare opportunity to visualize a tendon repair after the patient healed and was cleared for full activity. **Fig 1B** displays the tendon at the second operative intervention for the patient's unrelated surgery. The tendon repair was intact with no

adhesion formation in the area where VersaWrap had been placed, while proximal to this area, adhesions were noted.

It remains crucial to highlight that this repair and the use of VersaWrap was in conjunction with early postoperative rehabilitation. Current protocols aim to improve clinical outcomes by maximizing tendon excursion, employing active and passive range of motion. One such protocol, which was used in this case, is the Duran protocol, which has been shown to decrease the risk of re-rupture while having a slightly higher risk of decreased postoperative digit ROM [7]. In this case, the protocol was selected given the frayed nature of the tendon ends that were repaired.

The presented patient was prescribed occupational therapy at the first post-operative visit and was fitted for a splint to protect the repair. His progress was monitored over several visits and he continued to improve through the guidance of occupational therapy. At his final visit, the patient was satisfied with his result and demonstrated no limitations.

This case highlights that surgical adjuncts such as VersaWrap, when used in conjunction with proper tendon repair and postoperative rehabilitation, can protect healthy tendon gliding, prevent unwanted postoperative tethering, and lead to successful clinical outcomes.

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## Surgeon Profile

### **Julia Nuelle, MD**

Major Julia A.V. Nuelle, MD has served as the Chief of the Hand, Upper Extremity, and Microvascular Surgery Division at the Brooke Army Medical Center since 2019 providing expert care for the active-duty service members, wounded warriors, military beneficiaries, and civilian trauma populations.

Dr. Nuelle graduated from Saint Louis University in St. Louis, Missouri summa cum laude with a Bachelor's Degree in Investigative and Medical Science. She was commissioned as a Second Lieutenant in the United States Air Force upon graduation, then she attended Loyola University Chicago Stritch School of Medicine in Chicago, Illinois, where she graduated magna cum laude with a Doctor of Medicine Degree in 2011.

Dr. Nuelle trained in orthopaedic surgery at the University of Missouri and returned to Loyola University Chicago for fellowship training in hand, upper extremity, and microvascular surgery. It was in her post-graduate medical education that she developed her interest in treatment of congenital hand differences and complex extremity limb optimization.

As the only Level 1 Trauma Center in the Department of Defense, Brooke Army Medical Center's orthopaedic hand surgery division provides expert trauma care to patients with upper extremity injuries, while also providing vital readiness and graduate medical education training to orthopaedic surgery residents. Dr. Nuelle's passion for education has led to her involvement in orthopaedic resident education, and she currently serves as the Associate Program Director for Quality Improvement and Patient Safety. Dr. Nuelle also partners with orthopaedic, plastic, and vascular surgery colleagues to support Wounded Warriors and care for patients with complex upper extremity injuries.

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