

Using Telehealth Rehabilitation Therapy to Treat a Finger Flexor Tendon Repair During COVID-19

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Telehealth-assisted finger rehabilitation therapy demonstrated good functional results following repair of a zone 2 flexor tendon laceration.

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In 1948, Sterling Bunnell, MD, used the term *no man's land* to describe the area between the A1 pulley at the volar aspect of the metacarpophalangeal joint and the insertion of the flexor digitorum superficialis tendons on the middle phalanx (zone 2).¹ Bunnell's description referenced the area of land in World War I between the trenches of opposing armies, and his goal was to emphasize the heightened risks of performing tendon repair in this area, as these repairs were notorious for poor outcomes. In lieu of tendon repair, Bunnell advocated treatment of tendon lacerations in this area with tendon excision and grafting.

It was not until the 1960s that researchers began to advocate for acute repair of tendons in this area.^{2,3} Since Verdan's and Kleinart's work, fastidious adherence to atraumatic technique and improvements in suture technique and rehabilitation protocols have allowed hand surgeons to repair tendons in this area with some level of success. Over the ensuing decades, acute repair of flexor tendon injuries within zone 2 has become the standard of care. The importance of meticulous technique during flexor tendon repair cannot be overemphasized; however, without appropriate hand therapy, even the most meticulous repair may fail.

COVID-19 has created significant barriers to patient care. Reducing travel and limiting face-to-face patient visits have been emphasized as methods that reduce spread of the virus, but these restrictions also prevent patients from easily accessing hand therapy. Recent adoption of telemedicine and videoconferencing technologies may help to reduce some of these barriers, but few previous studies have described

the use of videoconferencing technology to supplant face-to-face hand therapy visits. This case describes the use of videoconferencing technology to provide hand therapy for a patient following repair of an acute flexor tendon laceration in zone 2.

CASE PRESENTATION

A patient aged < 50 years presented to a US Department of Veterans Affairs (VA) hand surgery clinic 2 days after sustaining a laceration to the flexor digitorum profundus (FDP) in zone 2 of the small finger while cleaning a knife. During the discussion of their treatment options and the recommended postoperative hand therapy protocol, the patient noted difficulty attending postoperative appointments due to COVID-19 as well as a lack of resources. Given these limitations and following discussion with our hand therapist, we discussed the potential for telehealth follow-up with videoconferencing. Four days following the injury, the patient underwent repair of the FDP. During surgery, the laceration was present at the level of the A3 pulley. The FDP was repaired using a 6-0 polypropylene synthetic suture for the epitendinous repair and 4-strand core suture repair using 3-0 Fiberwire suture in a modified cruciate fashion. The A2 and A4 pulleys were preserved, and venting of the pulleys was not required. At the time of surgery, the flexor digitorum superficialis and radial and ulnar digital neurovascular bundles were intact. Following surgical repair of the tendon, the patient was placed into a dorsal blocking splint with a plan for follow-up within 2 to 3 days.

The patient attended the first postoperative visit in person on postoperative

TABLE 1 Appointments and Treatment Timeline

Appointment Types	Dates	Occupational Therapies
Surgery	March 3	
In person	March 3-5	Dorsal blocking orthosis fabricated with MCP joints in flexion and IP joints in extension; Coban wrap for edema management; HEP: passive flexion (MCP/PIP joint/distal IP and composite), active extension inside orthosis, 10 to 15 repetitions every waking hr
In person	March 19	In clinic for suture removal
Telehealth	March 27	Adding to HEP: passive extension of IP joints, reverse blocking for lumbricals; Place and hold in flexion 10 to 15 reps every waking hr Scar massage 6 min daily
	April 3	No show
Telehealth	April 10	Add to HEP: moist heat twice daily Composite wrist/finger flexion/extension, finger flexion with wrist flexion/extension, hook fist 10 repetitions every other hr
Telehealth	April 17	Reviewed HEP: composite wrist/finger flexion/extension, finger flexion with wristflexion/extension, hook fist 10 repetitions every other hr ^a Discontinue dorsal blocking orthosis Adding spring extension orthosis, 30 min, 3 times daily PIP joint
Telephone	April 27	
Telehealth discharge	May 6	Discharge HEP: moist heat twice daily Theraputty: flexion, extension, adduction, abduction, pinches 20 min twice daily Composite flexion and extension stretching for 20 secs, repeated often throughout the d
Telehealth discharge	June 15	

Abbreviations: MCP, metacarpophalangeas; IP, interphalangeal; HEP, home exercise program; PIP, proximal interphalangeal.

^aWould typically add a flexor digitorum sublimis block; however, was unable bilaterally due to a possible congenital deficit.

day 2. During this visit, the postoperative splint and dressings were removed, and a forearm-based dorsal blocking orthosis was fabricated using thermoplastic. At this visit, the veteran relayed concerns regarding psychosocial and resource barriers in addition to concerns surrounding COVID-19 that would prevent travel to and from hand therapy appointments. Due to these concerns, a passive-motion protocol was initiated using the Indiana manual as a guide.⁴ The patient returned to the hand clinic at 2 weeks after surgery for evaluation by the operating surgeon and suture removal. All visits after the suture removal were conducted via either telehealth with videoconferencing or by telephone (Table 1).

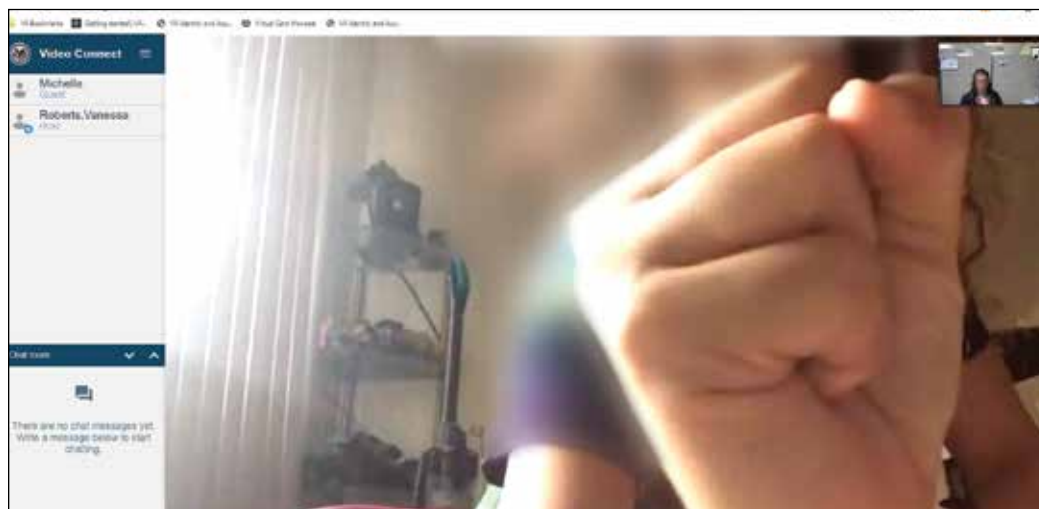
The operative team evaluated the patient 5 times following surgery. Only 2 of

these visits were in-person. The patient attended 6 hand therapy sessions with 2 in-person visits to occupational therapy (Figure 1). The remaining 4 visits were conducted using videoconferencing. The patient received therapy supplies by mail as needed, and their use was reviewed in telerehabilitation sessions with videoconferencing as needed. During their postoperative course, the patient experienced little edema or scar tissue formation, and recovery was uncomplicated. The patient developed a mild extensor lag for which a proximal interphalangeal joint spring extension orthosis was provided via mail (Figure 2). The patient admitted only partial adherence with this orthosis, and at discharge, a 10-degree extensor lag remained. The patient was not concerned by this extension deficit and did not experience any associated

FIGURE 1 Home Exercise Program



FIGURE 2 Full Flexion at 8 Weeks



functional deficits, demonstrated by scores on the Quick Disabilities of the Arm, Shoulder and Hand questionnaire and Patient Specific Functional Scale (Table 2).

DISCUSSION

Few studies have been published that address the efficacy of telerehabilitation after surgical management of traumatic injuries involving the upper extremity. One Australian study performed by Worboys and colleagues concluded that utilization of telehealth services for hand therapy visits may provide accurate patient assessment with favorable patient satisfaction.⁵ Another study performed in the UK by Gilbert and colleagues demonstrated that videocon-

ferencing is well received by patients, as it may offer shorter wait times, improved convenience, and reduced travel cost.

The authors noted that although videoconferencing may not completely replace in-person therapy, it could act as an adjunct.⁶ While these in-person visits may be necessary, particularly to establish care, at least one study has demonstrated that patients may prefer follow-up via telehealth if provided the option.⁷ In a randomized, controlled study performed in Norway, patients were randomized to either an in-person or video consultation with an orthopedic outpatient clinic. Of patients randomized to the in-person clinic visit, 86% preferred to have follow-up via videoconferencing.⁷

TABLE 2 Outcome Measures

Measures	Evaluation	Discharge
Quick Disabilities of the Arm, Shoulder and Hand questionnaire	75.0	34.0 ^a
Patient Specific Functional Scale ^b	0	10 ^a

^aMeets minimum detectable change.

^bPatient Specific Functional Scale helps to quantify activity limitation in patient-selected goals over time. The patient selected writing and house maintenance, which were both evaluated at 0 (unable) at initial evaluation and 10 (no difficulty) at discharge (meets minimum detectable change).

Previous studies have demonstrated that telehealth may produce accurate patient assessment, with relatively high patient satisfaction. Given the COVID-19 pandemic and the limitations that this crisis has placed on in-person outpatient visits, clinics that previously may have been resistant to telehealth are adapting and using the technology to meet the needs of their population.⁸ The present case demonstrates that videoconferencing is feasible and may lead to successful results, even for cases requiring significant hand therapy follow-up, such as flexor tendon repairs.

CONCLUSIONS

Although in-person hand therapy remains the standard of care following flexor tendon repair of the hand, situations may exist in which hand therapy conducted via telehealth is better than no hand therapy at all. The present case study highlights the use of telehealth as an acceptable supplement to in-person postoperative visits.

In our case, use of a standardized protocol with an emphasis on hand function and patient satisfaction as opposed to strict range of motion measurements produced good results. Although a specific telehealth satisfaction measure was not used in this case, commonly used questionnaires may be integrated into future visits to improve telehealth implementation and patient experience. In this specific case, the veteran felt that hand function was regained and expressed general satisfaction with the telemedicine process at the conclusion of care. While telehealth was a useful adjunct in the treatment of the present patient, further study of videoconferencing should be con-

ducted to determine whether hand therapy conducted via telehealth could be implemented more broadly following upper extremity surgery.

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Disclaimer

The opinions expressed herein are those of the authors and do not necessarily reflect those of *Federal Practitioner*, Frontline Medical Communications Inc., the US Government, or any of its agencies.

Ethics and consent

The authors report that the patient did not provide written informed consent. All patient information has been changed to avoid identification.

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