Journal of Hand Therapy 32 (2019) 121–123

Contents lists available at ScienceDirect

Journal of Hand Therapy

journal homepage: www.jhandtherapy.org

JHT Read for Credit Article #599.

Case Report

Dynamic ultrasound imaging for the assessment of extensor tendon adhesion after fifth metacarpal intraarticular head fracture: A case report

Tugce Ozekli Misirlioglu MD [a,*], Hakan Ozben MD [b]

[a] Department of Physical Medicine and Rehabilitation, Koc University School of Medicine, Istanbul, Turkey
[b] Department of Orthopaedics and Traumatology, Hand and Microsurgery Unit, Koc University School of Medicine, Istanbul, Turkey

ARTICLE INFO

Article history:
Received 3 December 2016
Received in revised form
16 June 2017
Accepted 3 July 2017
Available online 28 October 2017

Keywords:
Hand
Intra-articular fractures
Metacarpal bones
Rehabilitation
Tendons
Ultrasound

ABSTRACT

Study Design: Case report.
Introduction: Development of extensor tendon adhesions is a common complication after intra-articular metacarpal head fracture. Whenever these adhesions cannot be mobilized by rehabilitation, tenolysis should be considered. However, the decision for tenolysis is often delayed. When the rehabilitation program comes to a plateau and clinical examination may not be sufficient to find out the cause, dynamic ultrasound (US) can show where the gliding mechanism is disrupted and help clinicians to give an accurate decision for determining the next steps.
Purpose of the Study: To determine the role of dynamic US during hand rehabilitation.
Methods: A 22-year-old woman presented with a fifth metacarpal intra-articular head fracture. Ten days after the surgery (open reduction and internal fixation) the hand rehabilitation program was commenced. After the third week, the metacarpophalangeal (MP) joint range of motion (ROM) gradually diminished. Dynamic US near the level of fifth MP joint revealed diminished extensor tendon excursion and capsular thickening.
Results: Considering physical and sonographic findings, surgical tenolysis and capsular release was planned. After surgery, the DIP, PIP and MP joints reached full passive ROM.
Conclusion(s): Ultrasound is a quick and practical way to diagnose tendon adhesions. With this report, the authors suggest that clinicians may use dynamic US, especially in times when the patient comes to plateau during hand rehabilitation.
Level of Evidence: IV.

Introduction

The most common complication of intraarticular metacarpal head fracture is reported as stiffness. Extensor tendon adhesions, collateral ligament or dorsal capsular contracture, or articular incongruity are the accused causes of this stiffness.[1] Despite the use of early mobilization protocols, metacarpal and phalangeal fractures that damage the extensor mechanism can result in adhesion formation, thereby limiting flexion in addition to extension by acting as a tether on the dorsum of the finger.[2]

Whenever these adhesions cannot be mobilized by rehabilitation, tenolysis, intended to disrupt nongliding adhesions that have formed along the surface of a tendon after injury or repair, should be considered. However, because tenolysis represents another surgical insult to the previous surgical area, the decision to perform tenolysis is often delayed. Adequate hand rehabilitation program for 3 months after the surgery and having reached to a plateau in which no improvement has occurred over the preceding 6 weeks is usually requested before this decision.[2] It is also said that the patient best suited for tenolysis is one whose repaired tendon has a localized adhesion that limits gliding.

Ultrasound (US) is becoming popular for the measurement of tendon gliding distance at wrist and hand.[3,4] Evaluation of the tendons with US is a quick and practical way to assess the integrity and movement of tendons during hand rehabilitation. Especially when the rehabilitation program comes to plateau and clinical examination may not be sufficient to find out the cause, dynamic US can show tendon adhesions, localize the zone where this gliding mechanism is disrupted, and help the clinicians to give accurate decision for determining the next steps during rehabilitation program.

Conflict of interest: All named authors hereby declare that they have no conflicts of interest to disclose.

* Corresponding author. Department of Physical Medicine and Rehabilitation, Koc University School of Medicine, Istanbul, Turkey. Tel.: +90 532 6421357.
E-mail address: tozeklim@gmail.com (T.O. Misirlioglu).

0894-1130/$ – see front matter © 2017 Hanley & Belfus, an imprint of Elsevier Inc. All rights reserved.
http://dx.doi.org/10.1016/j.jht.2017.07.002

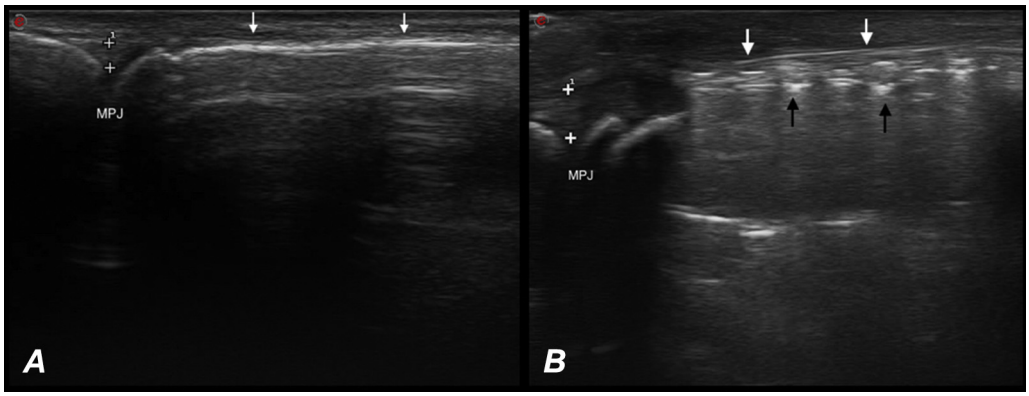

Figure 1. The extensor tendon (*white arrow*) near the fifth MP joint in the long-axis view (**A**) on the normal side (**B**) on the operated side. Black arrows show plate and screws. Increased capsular thickness is noted on the operated side.

Case report

A 22-year-old woman presented with a fifth metacarpal intra-articular head fracture (International Classification of Diseases, 10th revision code; S62.3) after a bicycle accident. Open reduction, plate and screw fixation was performed using dorsal approach without extensor tendon split. Extensor tendon was mobilized radially and dorsal metacarpophalangeal (MP) joint capsulotomy was made in order to expose and reduce the fracture fragments. An intrinsic plus splint was worn full time for the first postoperative 10 days during which a rehabilitation program composed of passive and active range of motion (ROM) and, place-and-hold exercises were commenced. In addition, movement of fingers from fist to hook position was performed both actively and passively for extrinsic extensor gliding. At the end of the postoperative third week, the patient had 70° of active flexion and full extension at the fifth MP joint, 90° of active flexion and full extension at the proximal interphalangeal (PIP) joint, 80° of active flexion and full extension at the distal interphalangeal (DIP) joint. She could make a fist with the tip of the fifth finger touching distal palmar crease. Passive motion was greater only at the MP joint which could be hyperextended to 20°. The ROM at the MP and DIP joints gradually diminished after the third week. At the end of sixth week, the patient had 20° of active and 35° of passive flexion and full extension (but no passive hyperextension) at the fifth MP joint, 70° of active and 80° of passive flexion and 10° extension lag (passive extension to neutral position) at the PIP joint, 80° of active and passive flexion and full active extension at the DIP joint. The ROMs at the MP, PIP, and DIP joints remained the same afterward. Flexor strengthening and extensor tendon stretching exercises were added to the physical therapy program. However, the finger failed to show any improvement. Passive flexion of the MP joint ended with a hard end point meaning that the MP joint of the finger could not be passively flexed beyond 35°. US examination was performed using a 5- to 18- MHz linear probe (Esaote MyLab Class C, Genoa, Italy). Dynamic scanning (longitudinal view) at the level of fifth MP joint revealed no extensor tendon excursion during fifth finger DIP flexion as expected from a normal extensor tendon mechanism. The same US study revealed that the extensor tendon was able to glide at the MP joint during the simultaneous and isolated active MP and PIP joint flexions. However, the extensor tendon did not glide after the limits of active flexion at the MP and PIP joints with further passive flexion of these joints. The fifth MP joint dorsal capsule thickening was also noted (Figure 1, Video). In the light of sonographic and physical findings (especially no improvement in the ROM) and keeping the persistence of hard end point of MP flexion in mind, surgical tenolysis and capsular release were planned at the end of the ninth week. During the surgery, adhesions between the extensor apparatus over the fifth metacarpal and surrounding soft tissue and underlying bone as well as dorsal capsular thickening of the MP joint were visualized. After tenolysis and dorsal capsular release, the DIP, PIP, and MP joints reached full passive ROM. After 2 weeks of vigorous rehabilitation after surgery, the patient could maintain the fifth finger's full ROM actively.

Conclusions

Dynamic US may be useful in early detection of tendon adhesions during rehabilitation. The integrity of extensor tendons can be evaluated easily by placing the probe over the metacarpal in a longitudinal plane. In normal states, the forward and backward gliding of extensor tendon over the metacarpal bone with passive flexion and extension of the PIP and MP joints is appreciated. In the event of a tendon adhesion, this gliding is impaired.

US may be useful to show impaired tendon excursion in patient who underwent metacarpal head fracture and who reached a dysfunctional reduced ROM in the related finger joint despite a well-tailored physical therapy program. After ruling out any articular incongruity or screw penetration to surrounding tissues, US can be used as an aid to confirm that the reason of reduced motion is due to tendon adherence. US is also helpful to show the area of tendon adherence so the surgery can be focused in that area.

In conclusion, US is a quick and practical way to diagnose tendon adhesions. With this report, the authors suggest that clinicians may use dynamic US, especially in times when the patient comes to plateau during hand rehabilitation.

Supplementary data

Supplementary data related to this article can be found at http://dx.doi.org/10.1016/j.jht.2017.07.002

References

1. Day SC, Stern PJ. Fractures of the Metacarpals and Phalanges. In: Wolfe SW, ed. *Green's Operative Hand Surgery*. 6th ed. Philedelphia, PA: Churchill Livingstone, an imprint of Elsevier Inc; 2011:239–290.
2. Culp RW, Feldscher SB, Rodriguez S. Flexor and Extensor Tenolysis: Surgeon's and Therapist's Management. In: Skirven TM, ed. *Rehabilitation of the Hand and Upper Extremity*. 6th ed. Philedelphia, PA: Mosby, an imprint of Elsevier Inc; 2011:556–568.
3. Chen M, Tsubota S, Aoki M, Han M. Gliding distance of the extensor pollicis longus tendon with respect to wrist positioning: observation in the hands of healthy volunteers using high-resolution ultrasonography. *J Hand Ther*. 2009;22(1):44–48.
4. Korstanje JW, Schreuders TR, van der Sijde J, Hovius SE, Bosch JG, Selles RW. Ultrasonographic assessment of long finger tendon excursion in zone v during passive and active tendon gliding exercise. *J Hand Surg Am*. 2010;35(4):559–565.

JHT Read for Credit
Quiz: # 599

Record your answers on the Return Answer Form found on the tear-out coupon at the back of this issue or to complete online and use a credit card, go to *JHTReadforCredit.com*. There is only one best answer for each question.

1. Ultrasonic evaluation was undertaken
   a. at 3 weeks post, as a matter of standard protocol
   b. at 6 months post
   c. at the recommendation of the attending CHT
   d. only after initial rehab efforts had stalled
2. Initial rehab was begun
   a. in the operating room with gentle PROM
   b. 24 hours post op
   c. 10 days post op
   d. 6 weeks post op
3. Extensor tendon adhesion following intra-articular Fx of the 5^{th} metacarpal head is
   a. frequently encountered
   b. easily avoided by early motion
   c. unusual
   d. a surgical nightmare
4. Prior to tenolysis the patient demonstrated
   a. limited AROM
   b. limited AROM & PROM
   c. limited PROM
   d. emotional distress
5. The keys to a good outcome were identification of adhesion formation by dynamic ultrasonic evaluation, followed by tenolysis, and further rehab
   a. false
   b. true

When submitting to the HTCC for re-certification, please batch your JHT RFC certificates in groups of 3 or more to get full credit.