Hand Surgery and Rehabilitation 37 (2018) 243–246

Available online at
ScienceDirect
www.sciencedirect.com

Elsevier Masson France
EM|consulte
www.em-consulte.com

Original article

Ultrasound for the diagnosis of pyogenic flexor tenosynovitis

Échographie pour le diagnostic de phlegmon des gaines des fléchisseurs des doigts

G. Prunières [a], Y. Igeta [a,b], J.J. Hidalgo Díaz [a], S. Gouzou [a], S. Facca [a], F. Xavier [c], P. Liverneaux [a,*]

[a] *Icube CNRS 7357, service de chirurgie de la main, université de Strasbourg, hôpitaux universitaires de Strasbourg, FMTS, 10, avenue Baumann, 67403 Illkirch cedex, France*
[b] *Department of Orthopedic Surgery, Juntendo University, 3–1–3 Hongo Bunkyo-ku, 113–8431 Tokyo, Japan*
[c] *Department of Spine Surgery, Dalhousie University, QEII Health Sciences Centre, Hali 1796, Summer street, Halifax, NS, B3H 3A7, Canada*

ARTICLE INFO

Article history:
Received 8 January 2018
Received in revised form 25 February 2018
Accepted 15 March 2018

Keywords:
Ultrasound
Objective measurement
Cellulitis
Emergency
Sheath

ABSTRACT

The usefulness of ultrasound for making the diagnosis of pyogenic flexor tenosynovitis (PFTS) has been demonstrated. The primary goal of this study was to show that the diameter of the flexor sheath near the A2 pulley was larger when PFTS was present compared to the healthy contralateral finger. The secondary goal was to determine the reproducibility of these ultrasound measurements. Our series included 20 patients (12 men and 8 women) operated due to PFTS. The average age was 41.7 years old. The average diameter of the digital sheath measured near the A2 pulley on transverse and longitudinal ultrasound sections was 5.01 mm (transverse 5 mm, longitudinal 5.03 mm) on infected fingers, and 4.17 mm on healthy contralateral fingers. Reproducibility, as measured by the intraclass coefficient between transverse and longitudinal values, was 0.910 for infected fingers and 0.928 for contralateral fingers, thus was excellent. Our hypothesis was confirmed. A unilateral increase of more than 20% in diameter of the flexor sheath measured in transverse or longitudinal ultrasound sections near the pulley A2 contributes to the surgical indication when a patient presents with PFTS.

Mots clés :
Échographie
Mesure objective
Phlegmon
Urgence
Gaine

RÉSUMÉ

Certains auteurs ont montré l'intérêt de l'échographie dans le diagnostic de phlegmon des fléchisseurs des doigts. Le but principal était de montrer que le diamètre échographique de la gaine des fléchisseurs en regard de la poulie A2 était supérieur en présence de phlegmon par rapport au doigt controlatéral. Le but secondaire était de montrer la reproductibilité des mesures. Notre série comprenait 20 patients (12 hommes, 8 femmes) opérés d'un phlegmon des fléchisseurs des doigts, âgés en moyennes de 41,7 ans. Le diamètre moyen de la gaine digitale mesuré en regard de la poulie A2 sur des coupes échographiques transversales et longitudinales était de 5,01 mm, transversales de 5 mm, longitudinales de 5,03 mm sur les doigts infectés de phlegmon, et de 4,17 mm dans tous les cas sur les doigts controlatéraux sains. La reproductibilité, mesurée par le coefficient intraclasse entre les valeurs transversales et longitudinales, était de 0,910 pour les doigts infectés et 0,928 pour les doigts controlatéraux, elle était excellente. Les hypothèses étant vérifiées ; une augmentation unilatérale > 20 % du diamètre de la gaine des fléchisseurs mesurée en coupe échographique transversale ou longitudinale en regard de la poulie A2 permet de poser une indication chirurgicale devant un tableau de phlegmon des gaines des fléchisseurs des doigts.

* Corresponding author. Department of Hand Surgery, University Hospital of Strasbourg, 10, avenue Baumann, 67403 Illkirch cedex, France.
E-mail address: Philippe.liverneaux@chru-strasbourg.fr (P. Liverneaux).

https://doi.org/10.1016/j.hansur.2018.03.002
2468-1229/

1. Introduction

Hand infections are a common reason for consultation but can be difficult to diagnose [1]. Among these conditions, pyogenic flexor tenosynovitis (PFTS) is a surgical emergency in which the functional outcome is impacted by the diagnostic delay [2]. The prognosis is related to the severity determined based on the intraoperative appearance of the sheath and flexor tendons [3,4]. Certain authors have shown that when PFTS is present, the diameter of the flexor sheath measured by ultrasound was increased compared to the healthy contralateral side and also contained liquid [5]. Others have proposed the systematic use of ultrasound imaging in the emergency department for the same indication [6]. Since the exact location of the ultrasound probe has not been described in these published studies, there is a risk of measurement errors.

The main objective of this study was to show that the diameter of the digital flexor sheath, measured by ultrasound at the A2 pulley, was larger when it was in a symptomatic PFTS finger compared to a healthy contralateral finger. The secondary objective was to determine the reproducibility of the measurements.

2. Materials and methods

All records of patients operated in our department for symptomatic PFTS from July 2016 to November 2016 were reviewed retrospectively. Patients under 18 years of age, pregnant women, PFTS of the thumb or secondary to a fluid injection under pressure, and patients with chronic inflammatory flexor tendon disorders were excluded. Patients with at least three of Kanavel's four cardinal signs, suggestive of a clinical diagnosis of a PFTS, were included: flexed finger, uniform swelling of the entire digit, tenderness along the course of the tendon sheath, and intense pain during passive extension [7]. The cohort included 20 patients, 12 men and 8 women. The average age was 41.7 years old (Table 1).

Preoperative ultrasound was performed in all patients with a LOGIQ E R7® ultrasound machine (General Electric™, Fairfield, CT, USA) equipped with an L8-18i (8–18 MHz) probe and an interface gel (Uni'gel US®, Asept Inmed™, Quint Fonsegrive, France) in the emergency department by different examiners. All the patients were operated under regional anesthesia with an inflated tourniquet placed at the base of the limb without mechanical emptying of the blood vessels.

The outcomes consisted of preoperative ultrasound, clinical and microbiology data (Figs. 1–2). For the ultrasound data, and in order to assess intra- or inter-examiner reproducibility, the diameter of the flexor sheath was measured (in mm) near the A2 pulley in transverse and longitudinal sections on both the infected finger and the healthy contralateral finger perpendicular to the axis of the proximal phalanx. For the clinical data, the PFTS stage was determined intraoperatively based on the Michon classification [3] (Table 2). For the microbiology data, a sample was collected intraoperatively and aerobic-anaerobic bacteria typing was performed.

The normality of the distribution was verified using a Shapiro–Wilk test. The average measurements (diameter of the digital flexor sheath measured in transverse and longitudinal sections) were compared between fingers with PFTS and healthy fingers using Student's *t*-test. Statistical significance was considered when $P < 0.05$. Reproducibility between cross-sectional and longitudinal measurements was verified using the intraclass coefficient (ICC) with 95% confidence intervals. Reproducibility was considered excellent if the ICC was between 0.75 and 1.

3. Results

The results are shown in Table 3. The average diameter of the digital sheath measured on transverse and longitudinal ultrasound sections near the A2 pulley was 5.01 mm on the symptomatic PFTS fingers and 4.17 mm on the healthy contralateral fingers. This 17.8% difference was significant ($P = 0.0005439$).

The average diameter of the digital sheath measured on transverse ultrasound sections near the A2 pulley was 5.00 mm on the symptomatic PFTS and 4.17 mm on the healthy contralateral fingers. This 20.4% difference was significant ($P = 0.000159$).

The average diameter of the digital sheath measured on longitudinal ultrasound sections near the A2 pulley was 5.03 mm on the symptomatic PFTS, and 4.17 mm on the healthy contralateral fingers. This 20.9% difference was significant ($P = 0.0006273$).

The ICC between measured values on transverse and longitudinal sections was 0.910 for symptomatic PFTS fingers and 0.928 for healthy contralateral fingers. Hence, the reproducibility was excellent.

Table 1
Characteristics of 20 patients operated for pyogenic flexor tenosynovitis.

Patient (*n*)	Gender (M/F)	Age (years)	Handedness	Finger (R/L 1–5)	Portal of entry	Appearance of symptoms (days)	Kanavel signs (/4)
1	M	27	L	L2	Sting	2	4
2	M	29	R	L2	Wound by knife	2	4
3	F	37	L	R2	Plant sting	1	4
4	M	51	L	L2	Plant sting	1	4
5	F	31	R	L5	Dog bite	1	4
6	F	40	R	R5	Cat bite	1	4
7	M	62	R	L4	Dog bite	6	3
8	F	30	R	R5	Knife wound	4	3
9	M	44	A	R2	Screwdriver wound	1	4
10	M	56	R	R2	Splinter	3	4
11	M	77	R	L2	Cat bite	3	4
12	M	30	R	R2	Solder wire wound	1.5	4
13	M	35	R	R2	Neglected wound	4	3
14	M	34	R	L2	Neglected wound	0.5	4
15	M	33	R	R3	Neglected wound	5	3
16	F	23	L	L5	Dog bite	1	3
17	F	54	R	R5	Crush injury	1	3
18	M	46	R	L4	Plant foreign body	0.5	3
19	F	57	R	R2	Paronychia	4	3
20	F	37	R	L2	Staple wound	1	3

M: male; F: female; R: right; L: left; A: ambidextrous.