Hand Surgery and Rehabilitation xxx (2018) xxx–xxx

Available online at
ScienceDirect
www.sciencedirect.com

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

Original article

Usefulness of ultrasound for the diagnosis of pyogenic flexor tenosynovitis: A prospective single-center study of 57 cases

Intérêts de l'échographie dans le diagnostic des phlegmons des gaines digitales. Évaluation prospective continue monocentrique de 57 cas

E. Jardin [c], M. Delord [a,*], S. Aubry [b], F. Loisel [a], L. Obert [a]

[a] *Service de chirurgie orthopédique traumatologique plastique assistance main, CHU Jean-Minjoz, boulevard Alexandre-Fleming, 25000 Besançon, France*
[b] *Service de radiologie, CHU Jean-Minjoz, boulevard Alexandre-Fleming, 25000 Besançon, France*
[c] *Clinique de Diaconat-Roosevelt-Service SOS Mains, 14, boulevard du Président Roosevelt, 68200 Mulhouse, France*

ARTICLE INFO

Article history:
Received 22 March 2017
Received in revised form 16 December 2017
Accepted 29 December 2017
Available online xxx

Keywords:
Ultrasound
Flexor tendon digital sheath infection
Emergency
Dermohypodermal infection

ABSTRACT

Pyogenic flexor tenosynovitis (PFT) is a functional emergency in hand surgery; however, its diagnosis can be difficult to make. It should always be considered when a patient presents with an inflamed finger. The goal of this study was to investigate the usefulness of ultrasound in the diagnosis of early PFT. Seventy-three patients with suspected pyogenic flexor tenosynovitis were candidates for the study. Since the diagnosis of PFT was obvious in 16 patients, they were excluded from the study and immediately underwent surgery. The remaining 57 patients underwent a clinical examination by a senior surgeon, a blood test for C-reactive protein levels and an ultrasound (US). The US results were compared to the intraoperative findings if the patients were operated or to the clinical outcome in non-operated patients. Seventeen patients had the US diagnosis of PFT confirmed intraoperatively. In 10 patients, the US diagnosis of PFT was not confirmed intraoperatively. In 29 other patients, the diagnosis of PFT was ruled out by US; they all had good outcomes after being treated with antibiotics. In one patient for whom the diagnosis of PFT had been ruled out by US, PFT was actually present. Ultrasound had 94% sensitivity, 65% specificity, 63% positive predictive value, and 95% negative predictive value. Ultrasound is useful as a diagnostic tool for managing early PFT thanks to its excellent negative predictive value and specificity. This objective examination complements the surgeon's subjective clinical examination.

Mots clés :
Échographie
Phlegmon des gaines digitales
Urgence
Dermohypodermite bactérienne

RÉSUMÉ

Le phlegmon des gaines, urgence fonctionnelle de la main, doit toujours être évoqué devant un doigt inflammatoire, mais son diagnostic de certitude peut parfois être difficile. L'objectif de cette étude était d'évaluer l'intérêt de l'échographie dans la démarche diagnostique des phlegmons débutants. Cinquante-sept patients présentant un aspect inflammatoire d'un doigt ont été inclus. Ils bénéficiaient d'un examen clinique seniorisé, d'un bilan biologique avec dosage de la CRP (C-Réactive Protéine) et d'une échographie. L'absence de doute sur le diagnostic de phlegmon était un critère d'exclusion et les patients bénéficiaient alors d'une prise en charge chirurgicale d'emblée. Les conclusions des échographies étaient ensuite comparées aux conclusions peropératoires si les patients étaient opérés ou aux résultats cliniques de suivi des patients non opérés. Dix-sept patients ont eu une confirmation du diagnostic de phlegmon par l'échographie et la chirurgie ; pour 10 patients, le diagnostic échographique de phlegmon n'a pas été confirmé en peropératoire ; 29 patients dont le diagnostic de phlegmon avait été infirmé à l'échographie ont présenté une évolution satisfaisante. Pour un patient l'échographie a infirmé le diagnostic, mais un phlegmon était néanmoins présent. L'échographie présentait donc une sensibilité

* Corresponding author.
E-mail addresses: manue.jardin@orange.fr (E. Jardin), margaux_delord@hotmail.com (M. Delord), saubry@chu-besancon.fr (S. Aubry), francois_loisel@yahoo.fr (F. Loisel), laurentobert@yahoo.fr (L. Obert).

https://doi.org/10.1016/j.hansur.2017.12.004
2468-1229/

de 94 %, une spécificité de 65 %, une valeur prédictive positive de 63 %, une valeur prédictive négative de 95 %. L'échographie est un bon examen diagnostique lors de la suspicion de phlegmon débutant, puisque sa valeur prédictive négative est importante et sa sensibilité est forte. Cet examen objectif apparaît comme un complément à l'examen clinique subjectif du praticien.

1. Introduction

Kanavel [1] defined the characteristics of pyogenic flexor tenosynovitis (PFT) of the hand in 1905. The four hallmarks described by Kanavel are still used to diagnose PFT: fusiform swelling of the finger, tenderness to palpation over the tendon sheath, marked pain with passive extension of the digit and flexed posture of the involved digit. Since these signs are rarely all present in the early stages, it is not always possible to make a firm diagnosis.

PFT progression has three distinct phases, as described by Michon [2]. Significant effusion in the tendon sheath can be detected with ultrasonography (US), which contributes to the diagnosis of PFT when clinical signs are not obvious. In fact, the triad of a red, hot, swollen finger can be a genuine diagnostic challenge. In the early stages, the clinical picture of PFT can be confused with cellulitis [3]. The treatment of these two conditions differs. Any diagnostic delay or error increases the post-infection morbidity [4–6]. Other differential diagnoses are aseptic tenosynovitis in the context of rheumatoid diseases such as chondrocalcinosis [7] and gout [8], which may have a similar clinical presentation to PFT.

The objective of this study was to evaluate the diagnostic usefulness of US for managing an inflamed finger suggestive of PFT.

2. Patients and methods

2.1. Patients

This was a prospective study conducted in an emergency hand care center in France between January 1, 2012 and March 31, 2015. Of the 73 patients who presented with an inflamed finger (pain, redness, heat) suggestive of PFT, 16 who had a confirmed diagnosis of PFT were excluded, as this results in emergency surgical treatment without additional imaging tests.

The remaining 57 patients with an uncertain diagnosis were included in the study. There were 35 men and 22 women; their average age was 49 years (16–87 years). Inclusion criteria were finger pain with visible signs of inflammation, a confirmed infection entry portal or pain over the flexor tendon sheath cul-de-sac with a probable but unconfirmed diagnosis of PFT.

2.2. Treatment

Upon arrival, all patients underwent a clinical examination by a surgery resident and attending surgeon that included questions about comorbidities such as immunosuppression, diabetes and history of rheumatoid diseases. Next, laboratory tests were ordered including C-reactive protein (CRP) levels, along with radiographs to rule out a microcrystalline process and look for loose bodies.

If the clinical examination could not definitively conclude that PFT was present, ultrasonography (US) was performed on an emergency basis on the same day the patient arrived at the hand center. US was performed while the results of the laboratory tests were pending and, thus, did not delay the initiation of treatment [2]. This examination was performed by a resident with at least 2 years' training in musculoskeletal ultrasonography, by a senior radiologist at the hospital or by an attending surgeon who had received additional ultrasonography training. The machines used were a Toshiba Aplio 500 (Toshiba, Tokyo, Japan) with 12 MHz linear probe and a Sonosite S-Nerve (SonoSite, Bothell, Washington, USA) with a 6–15 MHz linear probe.

The US was used to look for direct signs of early PFT [9–11]:

- hypoechogenic peritendinous effusion with no signal on color Doppler (Figs. 1 and 2)
- thickened synovial sheath that is hypoechogenic and hyperemic on color Doppler in acute inflammatory phase (Figs. 3 and 4).

When looking for these signs, the contralateral finger or a healthy finger near the involved finger was used for comparison (Fig. 5). The palmar and dorsal synovial recesses were also examined to look for liquid effusion, suggestive of associated arthritis. US was also used to look for loose bodies if a relevant history was present, and for signs of a microcrystalline process [12].

US was positive and confirmed the diagnosis of PFT if the peritendinous effusion was greater than that in the comparator finger or if the synovial sheath was thickened. Once the diagnosis was made, the patient was sent for surgical treatment consisting of

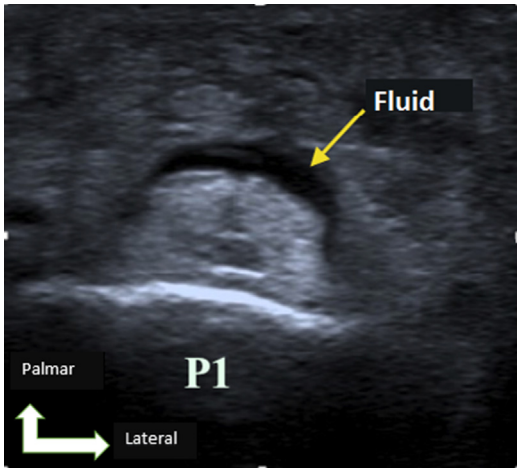

Fig. 1. Peritendinous effusion on a transverse view.

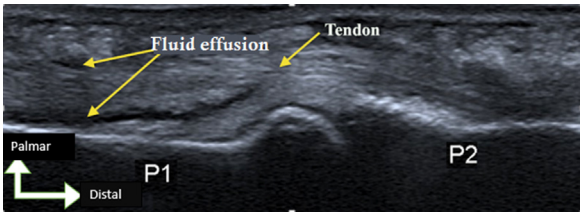

Fig. 2. Peritendinous effusion on a longitudinal view.

Please cite this article in press as: Jardin E, et al. Usefulness of ultrasound for the diagnosis of pyogenic flexor tenosynovitis: A prospective single-center study of 57 cases. Hand Surg Rehab (2018), https://doi.org/10.1016/j.hansur.2017.12.004