Case Report

# Flexor tenosynovitis in a 6-month-old infant after penetrating trauma: case report

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## Keywords

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## Abstract

We present the case of a 6-month-old infant with flexor tenosynovitis of the ring finger after penetration of a splinter in the distal interphalangeal fold. Thorough irrigation and debridement were necessary after ineffective conservative antibiotic treatment of 48 hours. This is the youngest case ever described in literature. Children present differently from adults in terms of route of inoculation and causative pathogens. The Kanavel signs and inflammatory blood markers have a lower sensitivity than in adults. A high index of suspicion is needed because of the poor clinical and biochemical reliability in infants.

## Introduction

Septic flexor tenosynovitis is an infection of the flexor tendon sheath which can lead to tissue necrosis, stiffness and amputation. Dr Allen Kanavel, a Chicago surgeon, treated this kind of infection before the existence of antibiotics. His extensive research of potential spaces of the hand is still the mainstay in the treatment of hand infections (1, 2). The Kanavel signs are a semiflexed position of the finger, fusiform swelling, excessive tenderness over the flexor tendon sheath and pain on passively extending the finger. Because of the low incidence, there are no studies validating the sensitivity or specificity of these signs, especially not in the pediatric population. There is discussion, even in adults, which signs are the most useful (3, 4). This study discusses the current literature of septic flexor tenosynovitis in children on the basis of a case report of a 6-month old infant and highlights the differences with the adult population.

## Case report

A 6-month-old infant presented at the emergency department with a two-day history of a painful swollen ring finger on the right hand. There was no relevant past medical history. Her father recently made a wooden cradle for his daughter, of which a sharp splinter entered her finger. She became febrile with peaks of temperature of 38.6°C. The general practitioner removed the visual part of the splinter and started empirical oral antibiotic treatment with 250 mg amoxicillin/clavulanic acid three times a day. Examination by the pediatrician in the emergency department two days later revealed a fusiform swelling of the fourth finger, which was held in a slight flexion. There was also an extension of erythema to the palmar space. A possible entry point was noticed in the distal interphalangeal fold (Fig. 1). Pain was observed on palpation and with passive finger extension. The white blood cell (WBC) count was 14,7 x10*9/L (normal: 6-13,0 x 10*9/L) and C-reactive protein (CRP) level was 54.1 mg/dL (normal: 0-1 mg/dL). Plain radiographs (Fig.2A) and an ultrasound showed no remaining foreign body but the ultrasound was positive for synovial thickening and mild fluid effusion in the tendon sheath (Fig 2B). She was admitted to the pediatric department after administration of intravenous (IV) amoxicillin/clavulanic acid with continuation every 8 hours. Because there was no clinical improvement after two administrations, the hand surgeon proceeded to perform an irrigation and debridement. Sheath irrigation was used with distal opening of the sheath and proximal syringe irrigation. Symptoms disappeared after 24 hours and she was discharged home with peroral amoxicillin/clavulanic acid therapy. A follow-up examination one week later showed no remaining signs of infection. Antibiotic treatment was stopped after a total treatment of ten days. Hand function turned back to normal and there were no problems at six weeks follow-up.

## Discussion

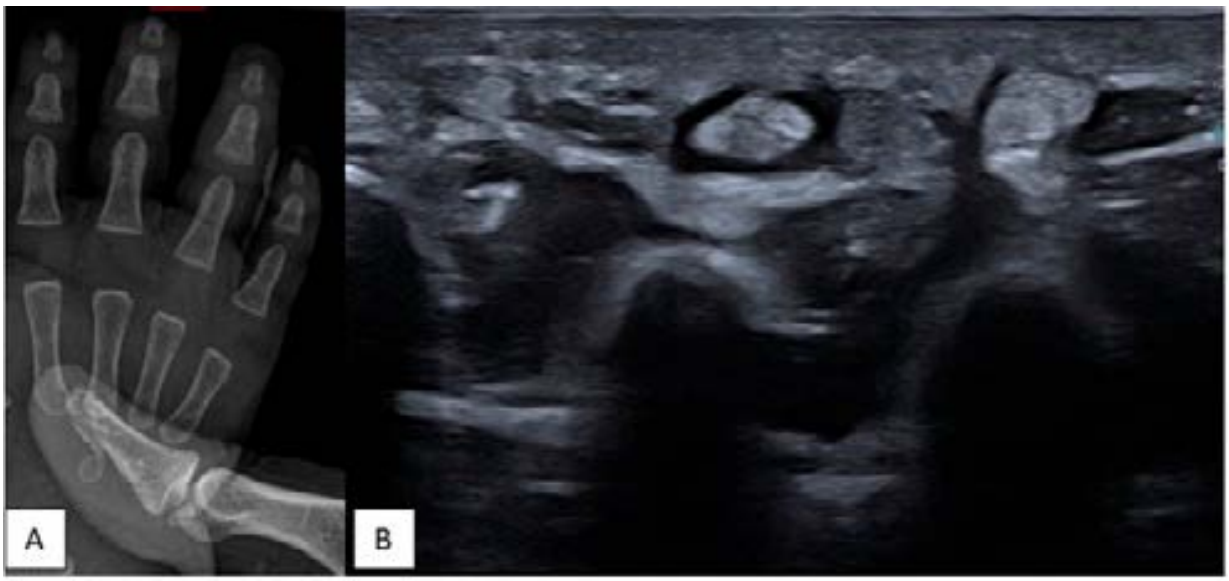
Flexor tenosynovitis is a well-known medical condition requiring prompt surgical and antibiotic treatment in adults (1). Although clinical decision making has been copied to children, it is less reliable due to the lack of cooperation and variable presentations (5, 6). The 6-month-old infant described in this case report is so far the youngest case described in literature. Brusalis et al. reported that of thirty-two patients with flexor tenosynovitis, with an average age of 9.5 years, 25% had no antecedent injury (6). Hematogenous flexor tenosynovitis is rare in adults and when this occurs disseminated gonococcal infections are often considered (1). This is however quite rare in the pediatric population. An alternative route of introduction in children is digital sucking or nail biting. Predominant mouth flora, Eikenella species, has often been detected in upper-extremity infections in children (7).

Staphylococcus species are the most frequently cultured organisms accounting for 50% to 80% of cases in both adult and pediatric hand infections (7). In children, methicillin-resistant Staphylococcus aureus (MRSA) has been documented in 38% of cases (6). Comorbidities such as diabetes, vascular disease or smoking are less frequent in children, but polymicrobial infections still account for 28% of cases (6). Possible explanations for high percentages of resistant and polymicrobial infections could be the differences between the adult and the maturing immune system or differences in hand hygiene between adults and children (7). These results are based on a study from the United States of America, but global variations in skin colonization methods should be accounted for.

The four cardinal signs by Kanavel for flexor tenosynovitis are a useful diagnostic tool but have never been prospectively validated in children (2, 4, 8). Pang et al. found that uniform, symmetric swelling has a prevalence of 97% in adults (3). In our opinion, this is the only objective sign to use in very young children as tendon sheath tenderness, partial flexion at rest and pain with passive extension are more difficult to objectivate and match with flexor tenosynovitis in an infant. An infant's hand resting position is always in a semiflexed posture, so isolated partial finger flexion is difficult to determine.

**Figure 1 :** *Dorsal (left) and palmar (right) photo of the right hand with fusiform swelling of digit 4 with erythema extending to the palmar space and puncture wound in the distal interphalangeal fold.*

**Figure 2 :** *A: Plain X-ray of the right hand showing no remaining foreign body. B: Ultrasound showing circumferential hypoechogenicity around a thickened flexor tendon.*



Because of these reasons, the Kanavel signs are less reliable in a pediatric population. Literature shows that for children three signs are apparent in 63% of cases, but reports have been made of children with no positive signs, indicating a great variation in the pediatric population (5, 6). In a case series by Brusalis, children were febrile (> 38°C) in 22% of cases, had elevated CRP in 5%, elevated erythrocyte sedimentation rate (ESR) in 28% and elevated WBC count in 44% (6). Sensitivity of inflammatory blood markers in adults is 76% for CRP, 41% for ESR and 39% for WBC count (9). The difference in sensitivity for CRP level between children and adults is remarkable and consequently we advise ordering ESR as well.

Differential diagnosis must include other infections such as felon, paronychia and herpetic whitlow. These can easily be ruled out based on clinical presentation around the nail or in the finger pulp. Diffuse edema and pain not restricted to only one digit are signs of cellulitis with or without deep space infection (1). Non-infectious etiology (dactylitis) should be accounted for if no entry point is visible. Ultrasound is safe and fast way of identifying tenosynovitis in emergency settings. It can show the thickening of tendon fibers and circumferential areas of hypoechogenicity representing fluid effusion in the tendon sheath (10). In our case, it was important to compare these results with the contralateral or neighboring digits. Septic arthritis is typically caused by a dorsal penetrating wound instead of a volar puncture.

In conclusion, we would like to emphasize the importance of other clinical signs for flexor tenosynovitis in children such as erythema, skin scaling or dryness and the presence of a puncture wound, rather than focusing solely on the Kanavel signs, on account of the poor reliability and variation in the pediatric population. It is important not to dismiss the diagnosis of flexor tenosynovitis because some Kanavel signs are lacking. Empirical broad-spectrum antibiotic therapy with for example amoxicillin/clavulanic acid has to be started immediately and surgical treatment without delay is essential in suspect cases.

The authors have no conflict of interest to declare.

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