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Case Report

A rare side effect after local corticosteroid injection for carpal tunnel syndrome: Acute horseshoe abscess

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ABSTRACT

Local corticosteroid injections are commonly used for carpal tunnel syndrome. Rarely, hand infections can occur after injection. This report presented a 60-year-old female patient who developed a horseshoe abscess after corticosteroid injection for carpal tunnel syndrome. Early surgical intervention, intravenous antibiotics, and early mobilization led to successful management. Proper sterilization is crucial to prevent complications. Understanding hand anatomy is essential for prompt diagnosis and treatment of infections.

Keywords: Carpal tunnel syndrome, corticosteroid, horseshoe abscess, infection, injection.

Pyogenic flexor tenosynovitis is an aggressive infection of the digital flexor tendon sheaths, clinically defined by Kanavel's[1] four cardinal signs: flexed posture of the affected finger, pain along the tendon sheath, pain with passive extension, and fusiform swelling.[2,3] A horseshoe abscess, a rare and severe form of pyogenic flexor tenosynovitis, should be considered in patients presenting with local infections following corticosteroid injections.[4,5] Prompt empirical antibiotic treatment and drainage are crucial. This case report presented the first known instance of a horseshoe abscess developing after a corticosteroid injection for carpal tunnel syndrome.

CASE REPORT

A 60-year-old female patient presented to our clinic with complaints of pain in the right wrist, particularly at night, and numbness and tingling in the first three fingers, persisting for a duration of two months. The patient had no additional disease in her medical history other than hypertension. The patient had a smoking history of 30 pack-years. The patient's occupational history revealed that she was a tailor. The patient was previously diagnosed with carpal tunnel syndrome by electroneuromyography at an external center and received splinting and exercise therapy, but there was no alleviation of her complaints. In the physical examination of the patient, there was no swelling, redness, or increased temperature in the joints. The joint range of motion (ROM) was complete and pain-free. There was no neurological deficit. The Tinel and Phalen tests were positive. The ultrasound-guided corticosteroid injection was performed by a single physiatrist using a 5-12 MHz linear transducer ultrasonography (USG) device. The skin over the affected wrist was prepared using povidone-iodine antiseptic solution, and a sterile probe sleeve was used. Single-use bacteriostatic and sterile gel was used. The procedure began by positioning the patient comfortably seated, with the hand supported on a pillow. The shoulder was kept in a neutral position, the elbow at 90° flexion, the forearm supinated, and the wrist in a neutral position with the fingers semi-flexed, facing the examiner. Under USG guidance, the median nerve was examined at the scaphoid-pisiform level of

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Figure 1. Image taken on the third day after corticosteroid injection, showing diffuse swelling and erythema across the entire hand, including the thenar and hypothenar areas. Significant swelling is apparent distal to the wrist crease.

the carpal tunnel inlet, and anatomical or acquired structures that could potentially compress the nerve were ruled out. The ultrasound probe was then placed transversely in a short-axis orientation over the distal crease of the wrist to guide the injection into the carpal tunnel around the median nerve in an in-plane manner with an ulnar approach. Under the guidance of USG, a 22-gauge needle injector was used to inject 1 mL of Diprospan (suspension containing 7 mg/mL [2 mg + 5 mg/mL] of betamethasone). The patient was recommended to use the wrist rest splint continuously for five days after the injection. On the third day after the injection, the patient returned to our outpatient clinic due to pain and swelling in the thenar region and wrist (Figure 1).

On inspection, the patient had redness and swelling on the thenar region and the volar surface of the wrist, with no fever. The joint ROM of the wrist and all metacarpophalangeal, proximal interphalangeal, and distal interphalangeal joints was limited and painful. Hand radiography, hand and wrist superficial USG imaging, and laboratory tests were performed. No osseous pathology was detected on direct radiography. The results of the laboratory tests were as follows: white blood cell count, 12.9 103/mm^3; C-reactive protein, 123 mg/L; erythrocyte sedimentation rate, 38 mm/h; Brucella IgG and IgM, negative; and QuantiFERON test, negative. Superficial USG revealed a hypoechoic heterogeneous collection area in the volar face in the thenar and hypothenar regions of the right wrist. Contrast-enhanced magnetic resonance imaging of the wrist showed a full-thickness rupture in the flexor pollicis longus (FPL) muscle and signal intensity changes consistent with tenosynovitis around the flexor tendons on the palmar face and at the level of the distal interphalangeal joints of the fourth and fifth fingers (Figure 2). Based on the evaluation, including clinical and radiological findings, the patient was diagnosed with a horseshoe abscess that developed after the corticosteroid injection.

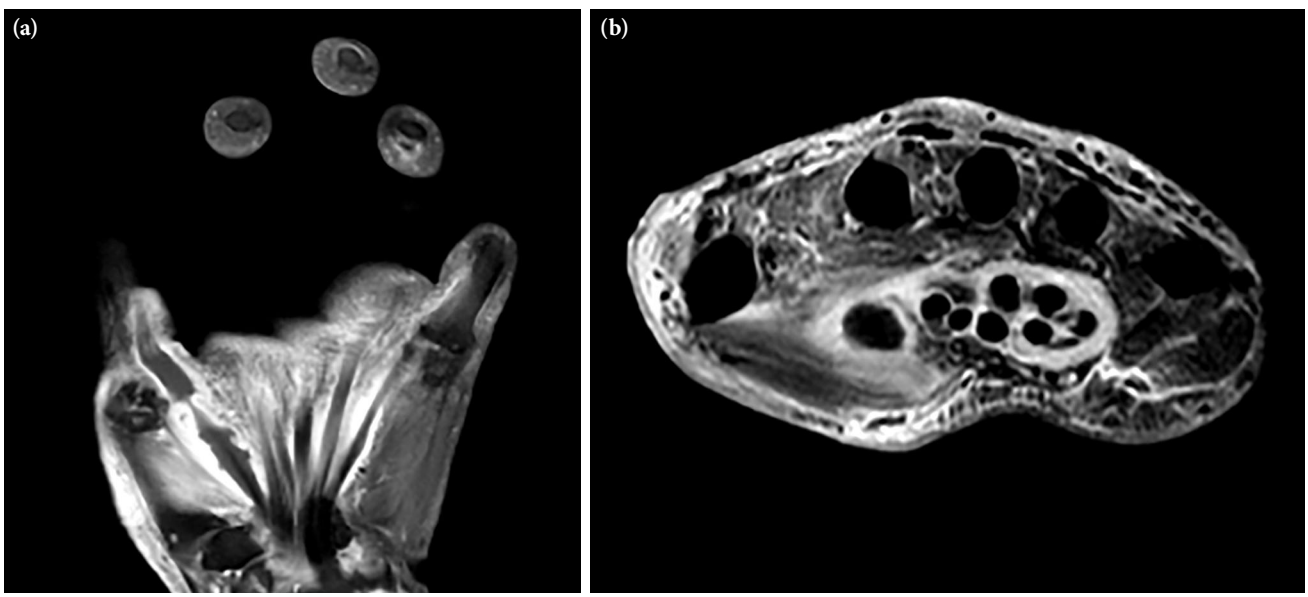

Figure 2. **(a)** Contrast-enhanced MRI shows a full-thickness rupture of the FPL and tenosynovitis around the flexor tendons and distal interphalangeal joints of the fourth and fifth fingers (black arrows). **(b)** T1 sequence axial image (white arrow).
MRI: Magnetic resonance imaging; FPL: Flexor pollicis longus.

Figure 3. Image of the patient's hand on the first postoperative day.

The patient was referred to the departments of orthopedics and infectious diseases for consultation. The orthopedics department scheduled emergency surgery for the patient.

At the orthopedic department, emergency surgery was planned, and debridement was performed. It was observed that 20 mL of purulent fluid was discharged. After the infected part of the FPL tendon was excised during the operation, primary repair was not possible due to the infection. The infected area was cleaned and sutured (Figure 3). *Staphylococcus aureus (S. aureus)* growth was detected in the culture sample taken from the wound site. The infectious diseases clinic initiated intravenous daptomycin at a dose of 500 mg once daily. Active assistive ROM exercises were applied to the wrist and fingers until wound healing was completed, followed by stretching and strengthening exercises, occupational therapy, and cold pack and whirlpool treatments.

With the consideration of infection at discharge, trimethoprim-sulfamethoxazole (160/800 mg, twice daily) and ciprofloxacin (750 mg, twice daily) were started. At the one-month follow-up, there was no swelling or redness in the wrist or thenar area. The C-reactive protein value decreased to 2.2, and the white blood cell count decreased to 5.9×103/mm^3. The ROM of the wrist, metacarpophalangeal, proximal interphalangeal, and distal interphalangeal joints was clear and pain-free. Since the FPL muscle was ruptured, the first finger could not flex, while the remaining fingers had full flexor muscle strength. Written informed consent was obtained from patient.

DISCUSSION

Pyogenic flexor tenosynovitis is an aggressive infection of the digital flexor tendon sheaths.[6] Kanavel[1] clinically defined hand flexor sheath infection with four findings: the flexed posture of the affected finger, pain along the tendon sheath, pain in passive extension, and fusiform swelling of the affected finger. Our case clinically met all these criteria. In previous case series of hand infections, the prevalence of pyogenic flexor tenosynovitis varied between 2.5% and 9.4%.[7,8] The tendon sheath of the first finger was adjacent to the radial bursa, and the sheath of the fifth finger was adjacent to the ulnar bursa. The radial and ulnar bursae can communicate proximally to the carpal tunnel through the space of Parona, which is observed in 50 to 80% of the population.[9] The space of Parona is limited to the pronator quadratus, digital flexors, FPL, and flexor carpi ulnaris at the wrist. Clinically, pain, tenderness, and swelling can be observed in the thenar, hypothenar, and wrist regions.[10] Knowing the anatomy and potential variants of this space is of clinical importance due to the spread of inflammation caused by infectious or neoplastic processes.[5] In cases of aggressive infection, failure to promptly perform drainage can result in the progression of flexor tendon sheath adhesions, leading to poor functional outcomes such as ruptures.[4]

The primary factors leading to the development of pyogenic flexor tenosynovitis include inoculation due to trauma, hematogenous spread, and animal bites.[11] Immunosuppressive conditions, such as diabetes mellitus, long-term corticosteroid use, and intravenous drug use, can be considered among the risk factors.[2] Our patient did not have these risk factors but had a history of hypertension and smoking. The patient may not have been able to fully adhere to the recommendations for splinting and rest following the injection. Given her occupation as a tailor, which requires continuous use of her finger dexterity, it is plausible that the mechanical stress exerted on the tendon during her daily activities could have played a significant role in the subsequent rupture. This persistent mechanical loading, combined with the lack of adequate immobilization, may have exacerbated an underlying condition of chronic degeneration within the tendon. The emergence of the infection could be attributed to a focal synovial response triggered by the intracellular uptake of the injected corticosteroid particle microcrystals. This synovial response may have progressed destructively, leading to the accumulation of purulent fluid and subsequent rupture of the tendon.

Staphylococcus aureus is the most implicated agent in pyogenic infections. In a previous case report, Shah et al.[10] described *S. aureus* growth in the culture samples taken from the horseshoe abscess that developed after corticosteroid injection into the trigger finger. Similarly, the intraoperative culture sample of our patient indicated *S. aureus* growth. Pyogenic infections occur in three distinct stages: the initial inflammatory phase characterized by the distension of the tendon sheath with exudative fluid, followed by the accumulation of purulent fluid, and culminating in the septic necrosis of the surrounding structures. Garber et al.[12] presented a case report of acute rupture of tibialis anterior pyogenic tenosynovitis in an immunosuppressed patient. In our case, we propose that the rupture of the FPL tendon may have been precipitated by a pyogenic infection that arose on the background of chronic tendon degeneration following corticosteroid injection.

In the differential diagnosis of pyogenic flexor tenosynovitis, it is important to consider the possibility of conditions such as fractures, reflex sympathetic dystrophy, cellulitis, septic arthritis, necrotizing fasciitis, and gout.[4] In a clinically suspected patient, leukocytosis and an elevated C-reactive protein level can assist in diagnosis. On magnetic resonance imaging, infectious tenosynovitis is typically hypointense on T1-weighted images and hyperintense on fluid-sensitive T2-weighted images, and there is prominent contrast enhancement around the tendon sheath on contrast-enhanced images.[13] On USG, fluid collection within the tendon sheath, anechoic heterogeneous appearance, tendon thickening of more than 25%, and irregularity of tendon fibrils may be observed.[14,15] The treatment includes urgent drainage, debridement of tissues, cleaning of the tendon sheath, and broad-spectrum antibiotic therapy.[16] Due to the presence of *S. aureus* growth, our patient was prescribed daptomycin with broad aerobic and anaerobic gram-positive activity, to which a clinical response was achieved. Upon improvements in laboratory test results and clinical symptoms, the patient was discharged from the hospital.

In conclusion, a horseshoe abscess is a rare and aggressive variant of pyogenic flexor tenosynovitis. It should be considered in the differential diagnosis of patients presenting with a local infection following a corticosteroid injection to initiate early intervention. Empirical antibiotic treatment should be started without delay until purulent fluid is cleared by urgent drainage and the culture results are obtained. To our knowledge, our patient represents the first case of horseshoe abscess development after corticosteroid injection performed for the treatment of carpal tunnel syndrome. Additionally, careful patient selection should consider risk factors, and sterilization protocols must be rigorously followed during corticosteroid injection procedures.

Data Sharing Statement: The data that support the findings of this study are available from the corresponding author upon reasonable request.

Author Contributions: Idea/concept, design, control/supervision: G.Ç.; Data collection and/or processing, analysis and/or interpretation: A.B.; Literature review, writing the article, critical review: G.Ç., A.B., H.H.H.; References and fundings, materials: H.H.H.

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