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Case Report

Candida Parapsilosis associated rice bodies in the extensor compartment of the wrist—an emerging finding

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ABSTRACT

Candida parapsilosis has been considered an emerging pathogen with increasing incidence reported in the literature. As a normal commensal of human skin, it is likely that *Candida* species could gain access to soft tissues of the hand and wrist by direct inoculation, resulting in an infectious tenosynovitis. With the increased prevalence of intravenous drug use (IVDU), users are at increasing risk for musculoskeletal infections including soft tissue abscesses, cellulitis, tenosynovitis, and septic arthritis. Chronic tenosynovitis, with rice body formation in particular, is a comparatively rare musculoskeletal infection. Knowledge of this entity, the related pathogens, imaging findings, and the treatment plan is important not only to the treating clinician, but also to radiologists as the physiological and anatomic consequences can be detrimental to patient recovery.

Introduction

Fungal septicemia, a life threatening infection that primarily targets immunocompromised and hospitalized patients, has become a widespread topic of discussion in the last 4 decades [1]. The *Candida* species, in particular, are one of the top 5 causes of nosocomial blood stream infections in the United States [2]. The common *Candida* species include: *C. albicans, C. glabrata, C. tropicalis, C. parapsilosis, and C. krusei* with *Candida parapsilosis* surfacing as the second most common emerging pathogen of the group. A case report of *C. parapsilosis* being a fatal causative agent in an intravenous drug user caught the attention of the medical community in the 1940s [3]. Since the initial report, cases of endocarditis, septic emboli, meningitis, peritonitis, and arthritis, amongst other infections, have been

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widely reported secondary to *C. parapsilosis* septicemia [1]. More contemporary studies have focused on the link between intravenous drug use (IVDU) and *C. parapsilosis* due to the massive increase in mortality from drug overdoses in the United states in the last decade. It is estimated that due to the recently popularized "opioid epidemic," there has been an increase IVDU of >500% since 1990 [4].

Musculoskeletal complications of *C. parapsilosis* are of concern because of this resurgence of IVDU as typical injections sites for recreational users include the cubital fossa (most common), forearm (next most common), followed by the hand, foot, leg, neck, and groin as published in an Australian study [5]. The resultant regional and related complications include cellulitis, soft tissue abscesses, osteomyelitis/discitis, and septic arthritis [6]. The upper extremity, specifically the hand and wrist, being a common injection site for IVDU is at risk for infection based on the interconnected anatomy between different compartments. The flexor and extensor wrist tendons are surrounded by synovial sheaths comprised of visceral and parietal layers [7]. The sheaths act as a conduit, allowing infection to spread locoregionally. Therefore, an understanding of the flexor and extensor hand/wrist compartments, reliance on imaging and understanding of the causative organism is of primary interest to hand surgeons to ensure proper surgical planning and infection control. We report an unusual case of extensor tendon sheath tenosynovitis of the wrist and distal forearm with rice body deposition secondary to *C. parapsilosis* infection in an intravenous drug user.

Case presentation

A 44-year-old female with a reported remote history of tuberculosis exposure, Raynaud's phenomenon, and chronic obstructive pulmonary disease presented to her primary care physician with 1 year history of a painful dorsal right hand mass. The mass, according to the patient, recently enlarged and had become more painful. Social history was positive for 1 pack per day cigarette use and history of recreational IVDU. Injection track marks were noted on the dorsum of the distal forearm. On examination, the patient had a large, lobulated, dorsal wrist mass that was fluctuant and tender to palpation. The overlying skin was erythematous and had some excoriations as the patient admitted to scratching the lesion. The extensor tendons were difficult to examine through the mass, but there was no decreased range of motion.

Upon attempted aspiration of the lesion in the office, serosanguinous, nonpuruluent appearing fluid was expressed. Differential considerations at that time included abscess, primary synovial based process such as synovial osteochondromatosis, tenosynovitis related to rheumatoid arthritis (RA), or synovial-based mass. Radiological imaging was recommended.

An ultrasound of the distal forearm revealed innumerable, smoothly marginated, isoechoic oval-shaped soft tissue bodies associated with the extensor tendon sheaths, measuring between 0.5 and 1.0 cm (Fig. 1). A small linear central cleft or scar could be identified in many of these bodies. A radiograph was recommended in order to confirm whether the bodies

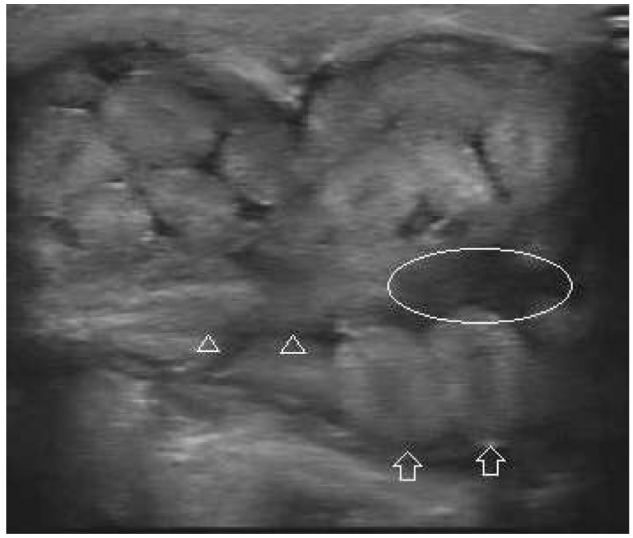

Fig. 1 – Longitudinal ultrasound image of the extensor compartment of the wrist reveals hypoechoic fluid (circle) and rice bodies (arrows) crowding an extensor tendon (arrowhead). Note the linear hypoechoic central scar surrounded by a relatively hyperechoic periphery of the ovoid rice bodies (arrows), resembling a "coffee bean" appearance.

Fig. 2 – Lateral radiograph of the hand reveals a soft tissue prominence along the dorsum of the wrist (circle) without bone erosion.

exhibited any mineralization (Fig. 2). No ossification or calcification was identified but a large soft tissue mass was evident tenting the skin on the dorsum of the wrist.

Subsequently, magnetic resonance imaging with contrast was performed to further characterize the nature of these bodies and their relationship with the extensor tendon sheaths (Fig. 3A-E). The magnetic resonance imaging also revealed innumerable nonenhancing, coffee-bean shaped isointense bodies distending the 3rd and 4th extensor tendon sheaths, in direct contact with the extensor tendons. The bodies were noted to be predominately dorsal to the tendons and the intrasubstance tendon signal was normal.

Fig. 3 – (A) Sagittal proton density fat saturation image through the central aspect of the wrist reveals fluid and rice body distention of the extensor tendon sheaths (circle). Note the extensor tendon within the dorsal aspect of the wrist (arrowheads). (B) Coronal proton density fat saturated image through the extensor compartments of the distal forearm, wrist, and proximal hand reveal fluid and rice body distention of the tendon sheaths. Note the central, linear, hypointense scar and the relatively hyperintense periphery of the rice body (circle). (C) Axial proton density fat saturated image at the level of the proximal wrist reveals distention of the extensor compartments with large rice-bodies and fluid (circle). The rice bodies (arrowhead) exhibit a linear central low signal intensity scar (asterisk) and a higher signal intensity periphery. Note entrapped tendon (arrow). (D) Coronal T1 fat saturated postcontrast image reveals thickened synovium with prominent enhancement (circle) along the dorsum of the wrist. (E) Axial T1 fat saturated postcontrast image at the level of the proximal wrist reveals thickened, prominently enhancing synovium and distended extensor compartments (circle). Note entrapped tendon (arrow).

The distended synovial sheath of the affected compartments exhibited thickening and increased enhancement.

Based on the constellation of imaging findings, a differential diagnosis of synovial chondromatosis, extrapulmonary tuberculosis, and rheumatoid arthritis was proposed. The diagnosis of RA was thought to be unlikely in the absence of a corroborating past medical history and a negative RA factor test. Subsequently, after consultation with a hand surgeon, the patient was scheduled for definitive treatment with removal of the tendon sheath bodies and surgical exploration.

Intraoperative highlights following dorsal compartment dissection included an entangled “mass” structure that

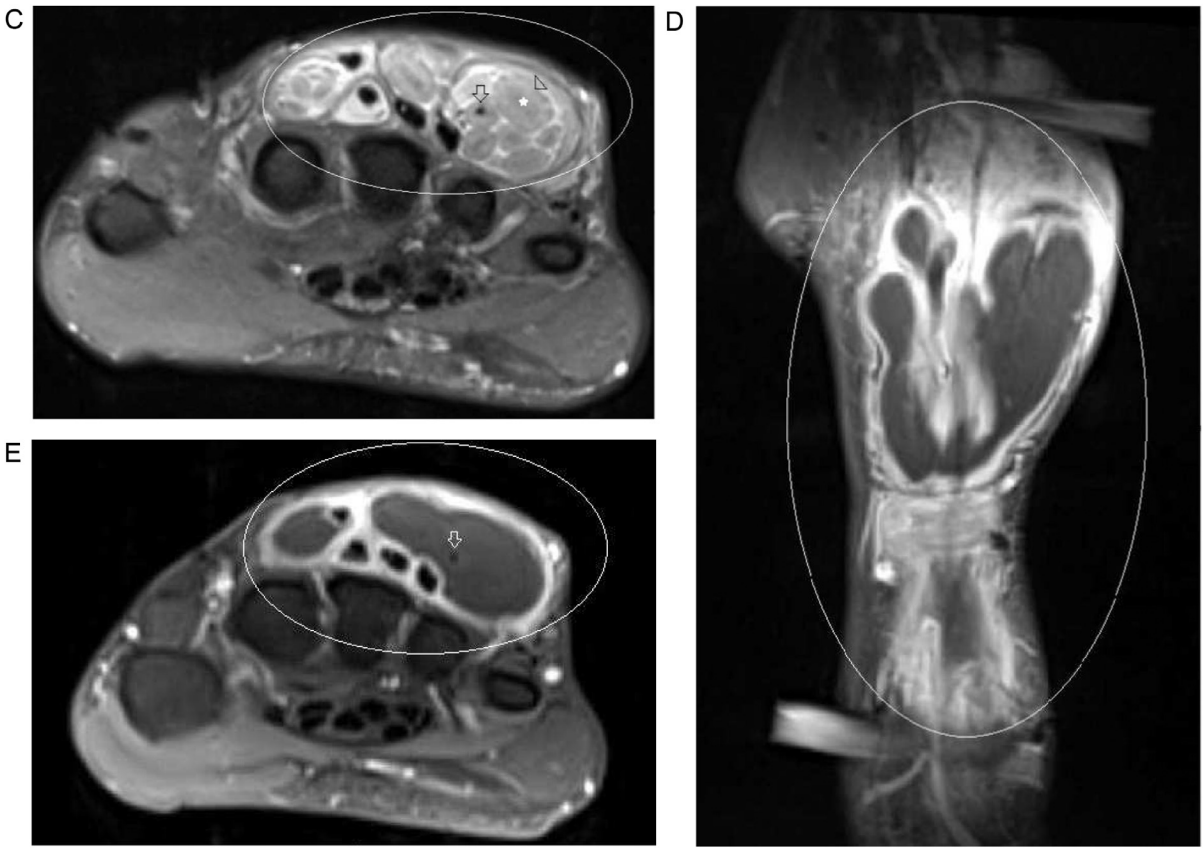

Fig. 3 – Continued

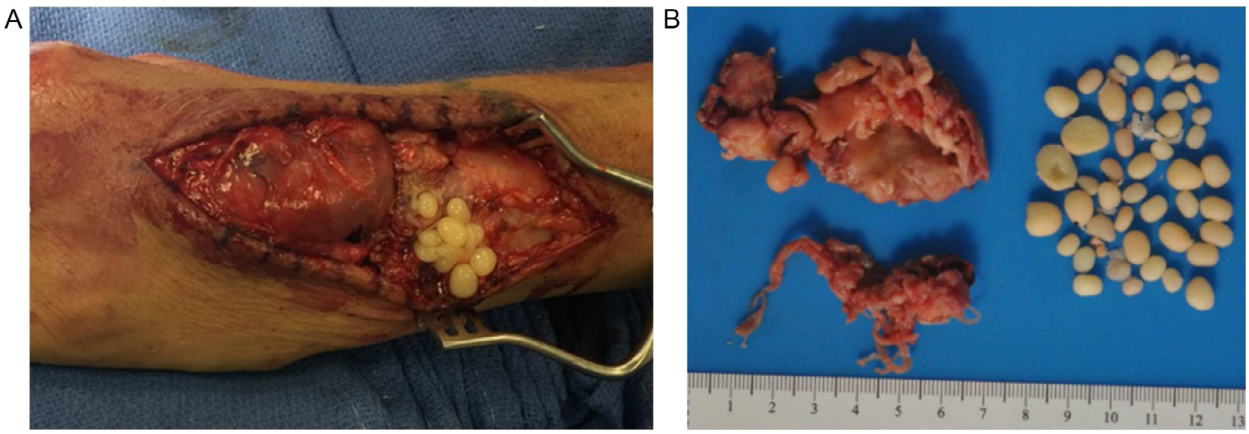

Fig. 4 – (A) Dorsal compartment dissection included an entangled mass that appeared inflammatory in nature with multiple surrounding loose bodies. The above image is oriented with the patient's elbow to the left. (B) Inflammatory mass comprising excised synovia (left) and numerous rice body-like structures (right) removed from distal forearm.

appeared inflammatory in nature, eroding the extensor tendons (Fig. 4). Multiple extensor digitorum communis tendons of the 2nd, 3rd, and 4th digits were stretched and eroded, resulting in poor extension upon passive motion following excision of the lesion. As a result, a tendon shortening and transfer to unify the extensor digitorum communis and extensor indices proprius was performed.

Intraoperative fluid and loose body samples were sent to microbiology and pathology for further evaluation which demonstrated a positive fluid culture for *C. parapsilosis*. Polymerase chain reaction test for tuberculosis testing at the institutional level and also at the Centers for Disease Control and Prevention was negative. Microscopic examination revealed synovial hyperplasia, chronic inflammation,

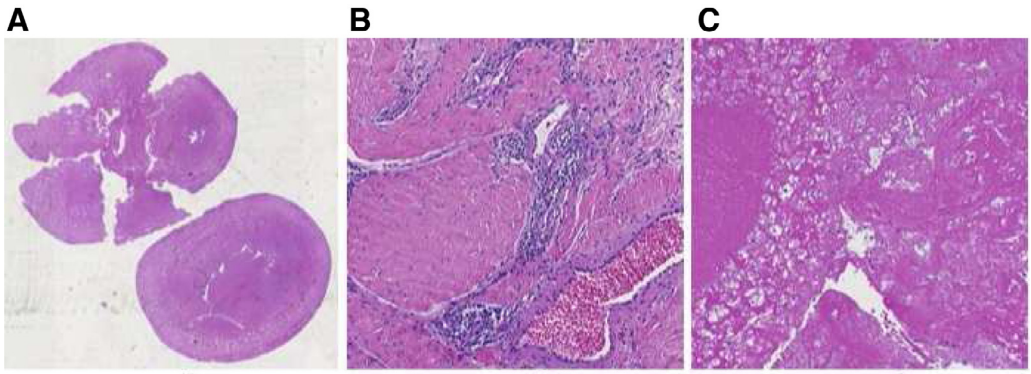

Fig. 5 – (A-C) H&E stain- (A) Organizing fibrin floating in joint space as rice bodies (x40); (B) Subepithelial fibrin deposits and chronic inflammation (x100); (C) fibrin (x100).

and extensive subepithelial fibrin deposition often forming loose rice body like structures (Fig. 5A-C). The Acid-Fast Bacilli (AFB) stain, immunohistochemical stain, and molecular test were negative for mycobacterial organisms. Grocott's methenamine silver stain was negative for fungal organisms.

Discussion

C. parapsilosis is an emerging pathogen with increasing incidence since 1990 [8]. As a normal commensal of human skin, it is plausible that this *Candida* species could gain access to soft tissues of the hand and wrist by direct inoculation, resulting in an infectious tenosynovitis. Patients with a history of IVDA would be inherently at risk for deep soft tissue infections with this pathogen. In addition, any breach of sterile technique within the operating room or during routine steroid injections would also place patients at risk in the healthcare setting [8].

This case is the first to our knowledge to document this pathogen associated with chronic tenosynovitis and rice bodies within the extensor compartment of the distal forearm and wrist. Rice bodies were initially described in association with mycobacterium infections; however, these bodies have also been noted in patients with RA. The pathophysiology of rice bodies is not certain but the article of Jeong et al. tended to agree with the theory that rice bodies likely arise from microinfarcted synovium that is shed into the joint space and subsequently enveloped by fibrin deposition [9]. This summation also agrees with our histopathologic findings. Jeong et al. also proposed that rice body formation is can be the result of "any chronic arthritis or bursitis, whether inflammatory or infectious."

Interestingly, the Gram stain of our samples did not reveal any organisms; however, the cultures ultimately grew *C. parapsilosis*. According to a multicenter study of Gram stain error rates, there was an overall 5% discrepancy rate between the Gram stain and the culture results. A subset analysis of the discrepancy rate revealed that 58% of the discrepancies involved a negative gram stain that resulted in a positive culture. "Inappropriate specimen sampling, specimen processing, smear preparation, and prior antibiotic therapy are all factors that can have an adverse impact on Gram stain result [10]."

Many of the rice bodies in our case measured up to 1 cm and exhibited an oval shape. In addition, we noticed a central linear scar-like area that resembled a coffee bean-like morphology on ultrasound (US) and MR. The bodies exhibited a relatively isoechoic outer component and hypoechoic central component on US. Similarly, on MR, we appreciated an isointense outer component with a relatively hypointense central core on PD fat saturated sequences. The bodies were isointense to muscle on T1 sequences and did not reveal any enhancement after IV contrast administration. The surrounding synovium exhibited thickening and prominent enhancement. While increased fluid was noted within the tendon sheaths on US and MR, the majority of the potential space was occupied by rice bodies in this case. The adjacent tendons exhibited normal intratendinous echogenicity and signal. Conventional radiographs only revealed a soft tissue mass-like swelling, without calcifications. Given the paucity of references about rice bodies associated with *C. parapsilosis* in the literature, we could not conclude whether our imaging findings were specific to this particular organism.

The severity of tendon involvement in this case could only be recognized intraoperatively. The chronic and intimate nature of this infection caused the extensor tendons to become stretched and degraded, causing a lengthening of the extensor tendons. Because of the increased laxity of the tendons after the removal of the rice bodies a tendon shortening had to be performed in order to restore the correct amount of tendon tension for proper function.

According to Fichadia et al., a patient with *C. parapsilosis* infection of the flexor tendon sheath of the long finger was treated successfully with micafungin followed by voriconazole. Yamamoto et al., advocated for the use of a combination of ethambutol and clarithromycin or fluconazole for the treatment of a patient with *C. parapsilosis* infection of the flexor compartments of the wrist and little finger.

It is important for radiologists to include fungal etiologies, such as *C. parapsilosis* in patients presenting with intra-articular or tenosynovial rice bodies. While rice bodies are thought to be the result of chronic tenosynovitis and are most

commonly associated with nontuberculosis mycobacterial infections and RA, several case reports of rice bodies associated with fungal etiologies have recently been documented. Similarly, surgeons should be aware of this entity and realize that complications can arise due to chronic mass effect of large rice bodies on tendon function. In addition, Yamamoto et al. highlighted that surgeons should be aware of the possibility of recurrence of the disease during postoperative follow-up [11]. Similarly, follow-up US and MR studies should be scrutinized for evidence of recurrence.

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