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Medically managed gout precipitating acute carpal tunnel syndrome

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Abstract
Background The most common compressive neuropathy affects the median nerve in the carpal tunnel; it is typically chronic and progressive. Acute carpal tunnel syndrome (ACTS), on the other hand, is a less frequently encountered surgical emergency that usually occurs in the setting of trauma, such as a displaced fracture of the distal radius or carpal dislocation. To our knowledge, there are only two cases of acute carpal tunnel secondary to gout reported in the literature, with both being outside of the USA and the last case being over 20 years ago. We reviewed the literature describing acute carpal tunnel syndrome (ACTS) caused by gout and present a recent case of atraumatic ACTS caused, in part, by a tophaceous gouty mass.
Methods Review of the literature consisted of a PubMed search of all articles in the English language using the following keywords: "Acute Carpal Tunnel Syndrome" and "Tophaceous Gout" and "Gout."
Results We present the youngest reported case of atraumatic ACTS caused by tophaceous gout and the only reported case with a documented history of gout being actively medically managed with a uric acid lowering agent. This was successfully treated with an emergent extended carpal tunnel release, a complete flexor synovectomy, and excision of a gouty mass adhered to the carpal tunnel floor.
Conclusions Atraumatic ACTS secondary to gout is rare and has never been reported in a patient already being managed with uric acid lowering agents. Such a presentation requires rapid surgical exploration with release of the carpal tunnel, debridement of all gouty tissue, and increasingly aggressive adjuvant medical therapy.

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Introduction

The carpal tunnel is a constrained space predisposing the median nerve within it to the most common compressive neuropathy, carpal tunnel syndrome. It is typically chronic and progressive with an incidence of approximately 1 to 3 per 1000 patients per year [1]. In most cases, it is evaluated, worked up, and treated on an elective, outpatient basis. This confined anatomic space also leaves the nerve vulnerable to acute compression.

Acute carpal tunnel syndrome (ACTS) is a less frequently encountered surgical emergency that usually occurs in the setting of trauma. It differs from chronic carpal tunnel syndrome by the rapid rise in pressure in the carpal canal causing acute progressive median nerve paresthesias over the course of hours to days. It is most commonly due to a displaced fracture of the distal radius followed by fracture-dislocations of carpal bones [12]. Other less common atraumatic causes include hemorrhage, vascular malformations, and bleeding disorders [12]. Here, we present a unique case of atraumatic ACTS secondary to gout.

Case Report

The patient is a 32-year-old, right-hand dominant, limousine driver with a significant history of gout refractory to typical oral regimens; he was taking febuxostat, a xanthine oxidase inhibitor, and had not previously been seen by a hand surgeon. His first flair was at age 21.

He presented to the emergency department with a 4-day history of increased redness, pain, and swelling of the dorsal right wrist and a 3-day history of progressive paresthesias in the thumb, index, and long fingers. Hand surgery was consulted to evaluate for septic arthritis versus compartment syndrome. At presentation to the emergency department,

moderate swelling and erythema of the palm and volar wrist were observed coupled with exquisite tenderness to palpation; the patient was unable to actively flex or extend his fingers and passive extension caused significant pain. There was a positive Tinel's sign over the carpal tunnel. Seven millimeter static two-point discrimination was documented for the thumb, index, and long fingers with normal sensation in the ulnar and radial nerve distributions. He had no history of trauma or fever, but did report a celebratory dinner involving multiple beers and a large steak in the days preceding his presentation. The total white blood cell count was 8.21 K/μl. X-rays of the wrist were consistent with diffuse gout with no acute findings. Given the history of gout and evidence of acute carpal tunnel syndrome, he was taken to the operating room for open carpal tunnel release and exploration.

In the operating room prior to incision, a dorsal radiocarpal aspiration was performed with an 18-gauge needle under sterile prep and no purulence was encountered; final cultures were subsequently negative for organisms. An upper arm tourniquet was inflated to 250 mmHg without exsanguinating the extremity. A standard carpal tunnel incision was made distal to the wrist flexion crease. With the transverse carpal ligament exposed, a significant bulge was observed; as the ligament was sharply released just radial to the hook of the hamate, the carpal tunnel contents protruded indicating a significant depressurization. At this point, the incision was extended stepwise across the wrist crease and continued on to the distal forearm. The median nerve was identified and protected. As the tenosynovium was entered in the carpal tunnel, immediate liquefied gout was encountered. A formal synovectomy of all nine flexor tendons was therefore performed, and no significant attrition was observed. The resulting inflamed synovial tissue was speckled with multiple foci of tophaceous gout and was contiguous with a large 2.5–3-cm tophaceous gouty mass (Fig. 1) found adherent to the proximal floor of the carpal tunnel and distal edge of the pronator quadratus; this was removed en bloc. The final pathology report was subsequently consistent with tophaceous gout. The wound was irrigated until clear effluent was seen. No purulence was encountered and final cultures were once again negative for organisms. Complete passive flexion and extension of all digits was achievable at the time of closure.

Postoperatively, the patient had rapid relief of his pain and paresthesias with static two-point discrimination improving to 5 mm in the thumb, index, and long fingers within 24 h. He was kept as an inpatient for 1 day to initiate immediate range of motion with occupational hand therapy and consult with the rheumatology service. They initially recommended discontinuing febuxostat and initiating a prednisone taper followed by a maintenance regimen consisting of allopurinol with colchicine and indomethacin for flares. He was followed closely as an outpatient by hand surgery, occupational hand therapy, and rheumatology. He healed fully with no wound complications, progressed to 90 % of his contralateral hand strength after 4 weeks, and was able to return to work as a driver after 5 weeks. Active and passive ranges of motion were comparable to the contralateral hand at 3 months, and no flexor deficits were detected (Fig. 2). As of a 6-month follow up, no further gouty attacks were reported.

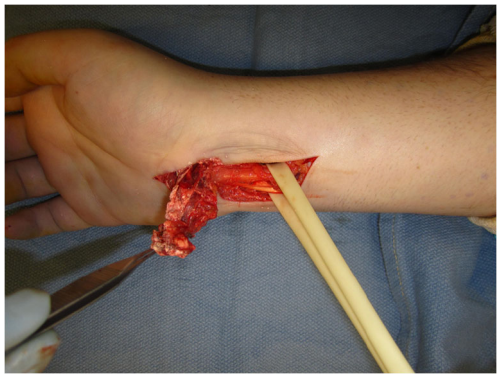

Fig. 1 Removal of tophaceous mass with the median nerve and flexor tendons protected by the Penrose drain

Discussion

ACTS, unlike chronic carpal tunnel syndrome, is a surgical emergency that typically occurs in the setting of trauma. In the case described, atraumatic compartment syndrome of the carpal tunnel secondary to gout was suspected, and the patient was taken to the operating room for emergent decompression. Tophaceous gout is a known cause of chronic carpal tunnel syndrome with a reported incidence of 0.6 % [11]. Several case reports address this topic and most were eventually treated with elective surgery [2, 6].

Atraumatic ACTS is a clinical diagnosis. Etiologies include purulent flexor tenosynovitis or hemorrhage into the canal [8]. Rapid progressive onset of paresthesias and/or widened two-point discrimination in the median nerve distribution should raise clinical suspicion for ACTS. A Tinel's sign or other positive provocative maneuvers may also be present in addition to pain. Thenar atrophy will not typically be seen, unless the presentation is acute-on-chronic. In the setting of trauma, some have advocated checking carpal tunnel pressures or observing these patients for a limited amount of time [7]. Without a history of trauma, these approaches are unlikely to alter appropriate management and could delay intervention unnecessarily.

Acute carpal tunnel caused by tophaceous gout has only been described twice in the literature; both case reports were from outside the USA and the most recent one was over 20 years ago [9, 10]. In 1988, Ogilvie and Kay [9] described the first case of ACTS caused by gout in England. This 55-year-old male patient had swelling and fluctuance for 2 days before presenting to the emergency department. They

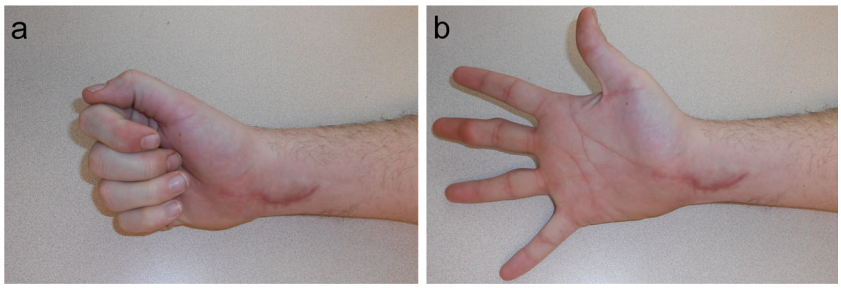

Fig. 2 Active range of motion at 4-month follow up visit: **a** Full finger flexion and (**b**) full finger extension

proceeded with a carpal tunnel release with no mention of a synovectomy or further exploration; gouty deposits were found. The patient went on to drain material from the incision for 6 weeks, but made a full recovery [9]. Pai and Tseng [10] described a 70-year-old male Taiwanese patient who presented with 10-day history of symptoms including median nerve paresthesias. This case was initially treated with two corticosteroid injections with no relief. A carpal tunnel release and flexor tenosynovectomy were then performed; at the time of surgery, the patient was diagnosed with gouty arthritis.

Medical management of gout should ideally precede, if not prevent, the need for surgical management. Currently, this initially includes lifestyle and medication changes. Patients should decrease consumption of meats high in purine content, high fructose corn syrup, and alcohol, especially beer [4]. Urate elevating medications, such as thiazide and loop diuretics, niacin, and calcineurin inhibitors, should be decreased if possible. Acute gouty attacks can be differentiated based on severity of symptoms and number of joints involved. If pain is less than 6/10 and gout involves one to two joints, monotherapy can be initiated with nonsteroidal anti-inflammatory drugs (NSAIDs), systemic corticosteroids, or colchicine [5]. These agents can be combined at the discretion of the provider, although NSAIDs and corticosteroids should not typically be used together due to potential gastrointestinal side effects.

Long-term management of gout involves daily maintenance medication. Uric acid-lowering therapy should be initiated if the patient has tophi, multiple gouty attacks per year, or a history of uric acid urolithiasis; the serum urate target should be less than 6 mg/dl [4]. Initial pharmacologic treatment includes a xanthine oxidase inhibitor (allopurinol or febuxostat) [5]. The rheumatology task force panel states that prophylaxis can be continued or started during an acute attack granted appropriate anti-inflammatory therapy has been instituted [5]. If continued signs or symptoms occur, the single agent is titrated to the maximum appropriate dose before adding a uricosuric uric acid-lowering agent (probenecid) [4].

Our patient is the youngest reported case of atraumatic ACTS caused by gout and the only reported case with a documented history of gout being actively medically managed with a uric acid-lowering agent. He had clinical findings consistent with both an acute gouty flare and acute carpal tunnel syndrome. Absence of fever and elevated white count made an infectious etiology less likely. The presence of ACTS in this patient prompted rapid surgical intervention. The factors leading to the carpal tunnel pressure exceeding the critical threshold for acute progressive symptoms likely included severe synovitis, liquefied gout, and mass effect by the deep tophus. Given that the tophus was presumably slow-growing and chronic, unknown variables, and potentially the patient's recent diet, likely acutely exacerbated the level of soluble gout and the degree of synovitis. A standard open palmar carpal tunnel release would not have adequately addressed any of these factors and could have resulted in persistent symptoms or poor wound healing. Wound healing complications have been reported [3, 9].

Conclusion

ACTS is much less frequent than its chronic form, occurs mainly in trauma, and progresses over hours to days. Whether traumatic or atraumatic, ACTS is typically an indication for immediate carpal tunnel decompression. When ACTS secondary to gout is suspected, one should be prepared to extend the incision, complete a flexor synovectomy, and explore the entire carpal tunnel in order to adequately address the potential causes for increased pressure. Medical management of gout does not rule out the potential for significant complications, such as ACTS. When surgery is necessary, adjuvant hand therapy and medical management are paramount to an acceptable outcome.

Conflict of Interest Logan Carr declares that he has no conflict of interest.

Sebastian Brooke declares that he has no conflict of interest.

John Ingraham declares that he has no conflict of interest.

Statement of Human and Animal Rights All procedures followed were in accordance with the ethical standards of the M. S. Hershey Medical Center's Institutional Review Board on human experimentation (institutional and national) and with the Helsinki Declaration of 1975, as revised in 2008.

Statement of Informed Consent Informed consent was obtained from all patients for being included in the study.

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