CLINICAL VIGNETTE

Closed-Fist Injury: What Dangers Lurk Within

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Case Presentation

A 27-year-old, right handed male presented to the Emergency Department complaining of intense pain and redness over the dorsum of his right hand. He stated that he had been in an altercation the week prior and had noted a small laceration over the right middle finger metacarpophalangeal (MCP) joint. He had sought care the same night at a local urgent care where he received a tetanus booster as well as a prescription for hydrocodone/acetaminophen. He reported no other significant medical or surgical history and denied past or present illicit drug use.

On exam, temperature was 99.8F, blood pressure was 128/78 with a pulse of 97, and pulse oximetry was 99% on room air. The patient was in significant distress due to pain. Evaluation of the right hand revealed diffuse erythema on the dorsum with impaired extension of the right middle finger. There was a small laceration over the middle finger MCP joint with expressible purulent drainage. The patient was unable to tolerate passive extension of the middle finger at the MCP joint due to extreme pain.

Given the above findings, a presumptive diagnosis of right middle finger MCP septic arthritis with extensor tenosynovitis was made and cultures from the site of infection were obtained. Intravenous ampicillin/sulbactam was started empirically along with parenteral pain medications. Orthopedic surgery was emergently consulted for operative joint wash-out. Cultures revealed polymicrobial growth with *Eikinella corrodens* and *Streptococcus sp*. After several days of antibiotics, the infection resolved, and the patient was discharged on hospital day 3 with slight residual impairment of extensor function of the right middle finger.

Discussion

Closed-fist injury (CFI) is an often overlooked pattern of injury, which can portend catastrophic consequences for the patient if not recognized and treated in an urgent manner. Indeed, the seemingly benign appearance of the initial exam, often presenting as a seemingly superficial laceration <1 cm in length, can belie the potentially morbid consequences underneath. This injury most commonly results from a laceration over the middle finger MCP joint, sustained during blunt force contact with the oral mucosa or tooth of another individual. As young males are most likely to engage in physical altercation, it is of no surprise that CFI predominates in this population.[1-3]

Due to the relatively scant protection afforded by the overlying skin and subcutaneous tissue, the tendon sheath, tendon, bone, neurovascular tissue, and joint space itself are at significant risk of disruption in a CFI. Indeed, damage to underlying bone(s) occurs in 17-58% of CFIs, not to mention joint violation and tendon injury rates of 52-62% and 15-20%, respectively.[1,4,5]

As signs of infection may take several days to manifest and other more obvious injuries may distract the clinician, CFI injuries can easily be overlooked.[4] This is unfortunate as approximately one-third of CFIs become infected.[1,3,4,6] More specifically, CFIs can proceed to osteomyelitis (16%), tenosynovitis (22%), and septic arthritis (12%).[1,4,7] As any of these can lead to significant permanent disability, it is imperative that all primary physicians examine patients involved in interpersonal violence for this injury pattern.

As a part of this evaluation, the function of the extensor tendon underlying the injury must be examined in isolation (ie, while immobilizing all other digits). Impaired extensor function suggests underlying tendon injury, mandating more expeditious orthopedic/hand surgery referral. However, it should be noted that incomplete tendon disruption could yield a surprisingly normal exam.[4] Similarly, a high index of suspicion for violation of the underlying joint capsule should be maintained as this can lead to septic arthritis.[1,2,4]

Since CFIs predominantly result from contact with the oral mucosa of another human, skin, and oral flora are well represented in cultures taken from CFI infections. While *Streptococcus* (82% of isolates) and *Staphylococcus* (57%) species tend to be the most common, polymicrobial infection tends to be the rule with mixed aerobic and anaerobic flora.[4,8,9] Indeed, an average of four bacterial species are isolated per wound. Given the variety of pathogens, the use of broad-spectrum antibiotics is indicated.[4,8,9]

Management of an uninfected CFI begins as stated earlier with a fastidiously careful exam done under surgical light, paying particular attention to evaluating for damage to underlying tendon, bone, and joint capsule. Plain radiography may also assist the exam by identifying fractures and/or foreign material (tooth fragment).[1,2,4] The wound should then be cleansed with povidone-iodine or similar antiseptic solution.[2,4] Irrigation with saline under pressure has been shown to be one of the most effective strategies at reducing the risk of infection, with one study demonstrating a five-fold decrease.[10]

Since primary closure would make the wound more susceptible to infection, it is generally recommended to keep CFI wounds open. Further, if tendon injury is suspected, a bulky dressing should be applied in order to maintain the hand in a position of function to minimize the risk of tendon atrophy.[4] If underlying damage to the tendon, bone, or joint capsule is noted, consultation/referral with an orthopedist should be made on an urgent basis.[1,2,4]

Most sources strongly recommend prophylactic use of antibiotics with coverage against *Streptococcus*, *Staphylococcus*, and anaerobic organisms.[2,10] In general, amoxicillin/clavulanate alone or a combination of ciprofloxacin and clindamycin in those allergic to penicillins provide adequate coverage.[1,2,4] Any patient with a CFI should have close follow-up for a wound check in 1-2 days.

A CFI wound that becomes infected is a true medical – and potentially surgical – emergency. Parenteral antibiotics are indicated and a hand surgeon should be emergently consulted for operative exploration and possible arthrotomy in cases of suspected septic arthritis.[1,2,4] It is only with expeditious and aggressive management that morbidity can be minimized.

In summary, CFI is a potentially devastating injury whose benign outward appearance belies the catastrophe that lurks beneath. As these patients are likely to have first contact with non-surgical providers, such providers should be knowledgeable with respect to the recognition, evaluation, and initial management paradigm of CFI. It is only via this level of clinical vigilance that a potentially crippling disease process may be halted and the patient restored to good health.

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