CASE REPORT

Catfish Spine Envenomation: A Case of Delayed Presentation

Nadeem Ajmal, FRCS; Lillian B. Nanney, PhD; Sean F. Wolfort, MD

From the Departments of Plastic Surgery (Drs Ajmal, Nanney, and Wolfort) and Cell Biology (Dr Nanney), Vanderbilt University Medical Center, Nashville, TN.

Catfish spine envenomations can result in debilitating hand problems. Virulent bacteria may be introduced through a puncture wound. An offending organism may be difficult to culture, and a foreign body may be missed unless there is a high index of suspicion. The majority of cases present early and symptoms resolve within 3 months. We report a markedly delayed presentation and treatment of a catfish “finning” injury that resulted in chronic tenosynovitis to the hand. A review of the literature and current treatment recommendations are provided.

Key words: catfish, envenomations, case report, delayed presentation

Introduction

Catfish are widely sought, as a food source commercially and by anglers for sporting activities. More than a thousand species have been recognized, most of them in freshwater and a few in salt water.^{1,2} Many of these species are capable of inflicting venomous injuries to humans. The painful nature of these injuries has been known for centuries, but the potential of these fish for inflicting distressing and even life-threatening injuries has only been appreciated in the latter half of the 20th century. Hand infections have been reported in association with catfish spine envenomations.^{3,4} Because the venom is introduced by the fish through the spines of the fins, the recipient of the insult is said to have been “finned.” The injury usually manifests itself acutely as immediate throbbing pain, which may spread to involve the whole extremity. A variety of organisms not typically encountered have been implicated in the causation of acute and chronic infection.⁵ Late presentations have been reported, especially with *Mycobacterium* species.

We report a markedly delayed case of finning injury that presented 13 months after the initial accident. This case is unique, not only because of the chronic nature of the infection, but also due to the delay in its diagnosis. Based on a MEDLINE search of the past 30 years, we

identified only 1 other case of chronic tenosynovitis of the wrist due to such a finning injury.⁶

Case report

A 39-year-old, previously healthy male carpenter suffered a puncture wound to the dorsum of his right (dominant) hand after being finned while attempting to remove a catfish from the hook. This injury resulted in immediate severe pain and swelling, which spread to the whole limb. Erythema was noted at the puncture site. He was treated with a 10-day course of cephalexin by his primary care physician. His pain, edema, and erythema decreased. There was no initial attempt to extract the foreign body. No radiograph was obtained on initial presentation.

In the ensuing months, the patient experienced recurrent episodes of pain and swelling, until at 6 months he developed a “knot” on the dorsum of his hand between the third and fourth metacarpals. This swelling ruptured spontaneously and discharged blood-stained fluid. The knot subsided, but he continued to experience intermittent pain and swelling of the hand, for which he did not seek medical attention.

Thirteen months after the initial injury, the patient presented to a local emergency department with a painful swollen hand. A plain radiograph revealed 2 catfish spines embedded in the soft tissues between the third and fourth metacarpal bones. Only 1 of the spines was

Corresponding author: Sean Wolfort, MD, 230 MCS, Vanderbilt University Medical Center, Nashville, TN 37232 (e-mail: sean.wolfort@vanderbilt.edu).

Figure 1. Radiopaque foreign body between third and fourth metacarpal heads encircled.

appreciated at the time. The hand was explored in the emergency room through a dorsal incision under local anesthetic. One of the 2 spines was removed, followed by thorough irrigation and primary closure of the wound. The patient was discharged home on a course of cephalexin after receiving an intramuscular injection of ceftriaxone. The symptoms worsened in the next few days and he was referred to our department.

On examination, the patient had a painful swollen right hand and wrist, with erythema around the suture line. A residual foreign body between the heads of the third and fourth metacarpals was seen on the plain radiograph (Figure 1). Magnetic resonance imaging suggested gross inflammation of the tenosynovium of the wrist (Figure 2). Because of a family history of rheumatoid arthritis, a serum rheumatoid panel was ordered. Erythrocyte sedimentation rate, rheumatoid factor, C-reactive protein, anti-streptolysin O, and antinuclear antibody levels were all within normal limits. The patient was admitted, and treatment was commenced with elevation, immobilization, and intravenous antibiotics (levofloxacin, amoxicillin/clavulanate). He was brought to the operating room, where under tourniquet control the previous incision was opened followed by wound lavage. White pasty material and evidence of inflammation was encountered on opening of the dorsum of the hand between the third and fourth metacarpals (Figure 3A). Extensive inflammation and the inability to visualize the foreign body with the resolution afforded by intraoperative fluoroscopy prevented us from isolating the foreign body. Needle localization was attempted, but was unsuccessful. We felt that the surgical manipulation was leading us dangerously close to the volar neurovascular

Figure 2. Abundant tenosynovium involving extensors at dorsal wrist (magnetic resonance image).

bundles. The search for the spine was abandoned, and this wound was left open. The wrist capsule was opened through a separate dorsal incision, revealing white pasty, granular material involving the edematous tenosynovium and capsule (Figure 3B). The carpal bones were involved as well, and these were scraped for biopsy and culture. Tissue biopsies were taken for histology and cultures, and an attempt was made to remove as much of this material as possible. This incision was closed. Histology showed chronic inflammation with granulation tissue and a marked histiocytic response. Some amorphous foreign material was also seen, but the specimen was negative for granulomas. The tissue sent for microbiologic examination did not grow any organisms on routine cultures; specialized cultures for atypical mycobacteria, vibrio, and fungi were negative. After consultation with the infectious disease team in the hospital, and given the indolent course, an infection with atypical mycobacteria was suspected, although no such organisms were isolated. The patient responded well to the surgery and antibiotics, and was discharged home on a 6-month course of oral rifampin and clarithromycin.

In his follow-up visit 2 months after the operative debridement, the patient reported that he was doing some light work but still suffered from occasional bouts of pain. Despite continued antibiotic therapy, the patient never became symptom free. On examination, the wrist remained swollen to a lesser degree but with acceptable range of motion at the wrist and hand. Another attempt was made to isolate the foreign body to remove the only obvious nidus of infection. The hand was re-explored 15 months after the initial injury and 2 months after the first surgical procedure. A pasty white substance similar to what was seen more proximally in the wrist during the last procedure was encountered. Specimens were

Figure 3. A, Dorsal third web space exposed for foreign body retrieval. B, Dorsal wrist capsule with white, pasty, granular material throughout tenosynovium.

sent for histological and microbiological examinations. The catfish fin that was embedded in the dorsal third web space was identified and removed (Figure 4). The patient had an uneventful recovery and was symptom free for the next few months, during which time his antibiotic therapy was discontinued.

However, 5 months later the patient returned with a presenting complaint of recurrent episodes of pain aggravated by work. The symptoms improved with the use of antibiotics, but continued to recur on cessation. The infectious disease consultant suggested commencement of a prolonged course of antibiotics, aggressively targeting atypical mycobacteria, particularly *Mycobacterium marinum*, using a combination of rifampin and clarithromycin. Currently the patient has returned to work but suffers from episodes of pain aggravated by heavy work. His wrist remains intermittently swollen, and he remains on antibiotics.

Discussion

Catfish (class: Osteichthyes; subclass: Siluroidea) vary greatly in size and shape, and can weigh from a few

Figure 4. Second catfish spine removed from dorsal third web space.

grams to 200 kg.¹ Most of these fish live in freshwater, with a few found in saltwater, and both have been implicated in venomous injuries to humans. These injuries occur most often in the hand region during an attempt to unhook the fish or in the feet while wading in shallow water. A tiny species found in Amazonian waters, candiru (genus *Vandellia*), is attracted to urine and may swim up into the human urethra and become lodged, requiring surgical removal.⁷ Catfish are characterized by a pair of long whiskerlike barbels producing a feline resemblance, which contrary to common belief are harmless and provide sensory function. The dorsal and pectoral fins are responsible for most of the morbidity associated with catfish encounters. Catfish react to being grabbed by lashing from side to side and by erecting the fins, the combination of which can produce a puncture wound and even a laceration. The venomous glands are located within the integument that encloses the spine, so whenever a spine is torn, the venom is released and transmitted through the puncture wound. The purpose of these envenomations is self-defense rather than food gathering. The species differ in their toxicity depending on environmental factors, especially predation. Many of the larger species have been reported to have less potent venoms as compared to the smaller species.⁸ The catfish venom is a combination of hemolytic, dermonecrotic, inflammatory, and vasoconstrictive factors, which vary among species.^{9,10} The venoms from saltwater and Asian fish are reported to be more potent and produce worse symptoms.¹¹ All these toxins have been reported to be heat labile, completely losing their activity when exposed to temperatures of 45°C for 10 minutes.¹² A secondary source of toxins has also been identified in the epidermal cells of the catfish skin, and harmful sequelae are referred to as *crinotoxicity*. Crinotoxins are proteinaceous substances that are secreted when the cat-

fish is excited. These substances may coat the spine and increase the virulence, or if introduced into open skin can cause symptoms similar to envenomations.^{12,13}

The clinical course of catfish finning injuries depends on the species. Typically, immediate throbbing pain is experienced around the wound, which can spread proximally to involve the whole limb, and is followed by erythema and swelling.⁵ Muscle fasciculations, local hemorrhage, and excessive tissue necrosis out of proportion to the size of the wound are not uncommon. Other less common problems include lymphangitis, lymphedema, and peripheral neuropathies. In the majority of cases, these symptoms resolve without sequelae. However, severe tissue necrosis leading to the amputation of the involved part has been reported.^{14,15} In addition, the spine often becomes embedded because its angled, serrated edges make retrograde removal difficult. The fin often remains behind if excessive force is used for the removal.

Infections are the most serious long-term complications. Freshwater catfish generally stay in slow, still, and often dirty waters, thereby potentially increasing the risk of infection, even though apparently clean waters can also harbor serious pathogens. The risk is also theoretically increased by the vasoconstrictive effect of the venom.^{13,15}

A variety of virulent organisms have been reported, which differ depending on the habitat of the fish. These include *Klebsiella*, *Erysipelothrix*, *Nocardia*, *Chromobacterium*, *Sporothrix*, *Actinomyces*, *Edwardsiella*,^{4,16} *Mycobacterium*,^{6,17} *Aeromonas*,^{18–20} and *Vibrio* species.^{4,21,22} The most worrisome organisms are *Vibrio* species for saltwater and *Aeromonas* species for freshwater infections. Infections with *Vibrio* species can be serious, particularly in immunocompromised patients.²³ The antimicrobials effective against *Vibrio* species are different from empiric therapy used after commonly seen soft tissue injuries. Isolation of these organisms is difficult and may be easily overlooked on standard deoxycholate agar plates.²⁴ Newer techniques using molecular genetics are promising, but currently are not widely available.^{25–28} Therefore, one must be aware of the association of catfish spine injuries with these infections to institute proper therapy.

Atypical mycobacteria have been associated with chronic infections of the hand and the wrist.²⁹ Hand and wrist synovial tissue and tendon sheaths are the most common sites of atypical mycobacterial infections, with *M. marinum* being the most common offender.³⁰ The presence of *M. marinum* should be seriously considered when there is a history of abrasion in contaminated water or puncture wounds from marine life.³¹ Others have noted that the diagnosis of atypical mycobacterial infec-

tions is commonly delayed.^{6,32,33} We suspect that our patient fell into this category because a positive response to therapy against mycobacteria was observed. However, we cannot exclude a response by other organisms susceptible to our antimicrobials, such as *Aeromonas* and *Vibrio* species. The absence of granulomas on histology could be due to a sampling error.

Based on the literature and our own experience, we believe that treatment of these injuries should include aggressive cleansing of the wound and the surrounding area. An attempt to remove any spinal sheath or remnant must be undertaken, as this radiolucent organic matter may produce inflammation and harbor virulent organisms. A long-acting local anesthetic can help relieve the symptoms and reverse the vasoconstrictor effect.¹¹ This treatment should be instituted only after a careful neurologic examination. Immersion in water (45°C–60°C or as hot as can be tolerated without scalding) has been advocated because the toxins in the venoms have been shown to be heat labile.⁵ Although the catfish spines are not always radiopaque, radiographs should be taken at the initial assessment. With a high index of suspicion and a negative plain radiograph, magnetic resonance imaging may localize the foreign body.^{34–38}

Interestingly, in our case the retained spine was not recognized on magnetic resonance imaging. Ultrasound is another modality for foreign body identification and has gained popularity among hand specialists for its speed and low cost.^{39,40}

Tetanus prophylaxis should be given when indicated.^{2,14} After initial management, the wound should be vigorously cleansed, irrigated, explored, and debrided. The hand wound should be left open. As discussed earlier, infection is the most serious complication associated with these injuries. Use of antibiotics is controversial, and the choice depends on a variety of factors, which include freshwater or saltwater accidents, age, immune status of the victim, time of injury to presentation, and presence of foreign body. Antibiotics should cover *Aeromonas* species in freshwater and *Vibrio* species in saltwater accidents. Ciprofloxacin or other fluoroquinolones are popular choices owing to their effectiveness against a variety of gram-negative bacteria.^{41,42} Patients who show signs of systemic infection should be admitted. Specialized culture media may be necessary in cases of suspected marine or halophilic organisms. Direct communication with the microbiology laboratory personnel is advised. If there are symptoms of worsening erythema, drainage, pain, and swelling, retained foreign bodies should be suspected. In cases of suspected atypical mycobacteria causing synovitis, a prolonged course of antituberculosis chemotherapy and the removal of the synovium has been recommended.^{29,43}

References

- Halstead BW. *Poisonous and Venomous Marine Animals of the World*. Princeton, NJ: Darwin Press; 1988:149–185.
- Scoggin CH. Catfish stings. *JAMA*. 1975;231:176–177.
- Mann JW, Wernitz JR. Catfish stings to the hand. *J Hand Surg*. 1991;16A:318–321.
- Baack BR, Kucan JO, Zook EG, Russell RC. Hand infections secondary to catfish spines: case reports and literature review. *Trauma*. 1991;31:1432–1435.
- Murphy DK, Septimus EJ, Wagner DC. Catfish related injuries and infection: report of two cases and literature review. *Clin Infect Dis*. 1992;14:689–693.
- Halla JT, Gould JS, Hardin JG. Chronic tenosynovial hand infection from *Mycobacterium terrae*. *Arthritis Rheum*. 1979;22:1386–1390.
- Arango TOJ, Arbalaez AS, Franco ME. *Vandellia cirrhosa*, poorly known urological parasite. *Actas Urol Esp*. 2001;25:325–326.
- Birkhead WS. The comparative toxicity of stings of the Ictalurid catfish. *Comp Biochem Physiol*. 1967;22:101.
- Calton GJ, Burnett JW. Catfish (*Ictalurus catus*) fin venom. *Toxicon*. 1975;13:399–403.
- Burnett JW, Calton GL, Morgan RJ. Catfish poisoning. *Cutis*. 1985;35:208.
- Blomkalns LA, Otten JE. Catfish spine envenomations: a case report and literature review. *Wilderness Environ Med*. 1999;10:242–246.
- Shiomi K, Takamiya H, Yamanada H, Kikuchi T, Konno K. Hemolytic, lethal and edema forming activities of the skin secretions from the oriental catfish. *Toxicon*. 1975;13:339–403.
- Al-Hassan JM, Thomson M, Ali M. Vasoconstrictor components in Arabian Gulf catfish proteinaceous skin secretions. *Toxicon*. 1986;24:1009–1013.
- Zeman MG. Catfish stings: a report of three cases. *Ann Emerg Med*. 1989;18:211–213.
- Pacy H. Australian catfish injuries with report of a typical case. *Med J Aust*. 1996;2:63–65.
- Howards RJ, Burgess GH. Surgical hazards posed by marine and freshwater animals in Florida. *Am J Surg*. 1993;166:563–567.
- Chow SP, Stroebel AB, Lan JHK. *Mycobacterium marinum* infection of the hand involving deep structures. *J Hand Surg*. 1983;8:568–570.
- Grenga TE. Catfish spine envenomations of the hand. *J Hand Surg*. 1989;14:1035–1036.
- Katz D, Smith H. *Aeromonas hydrophilia* infection of a puncture wound. *Ann Emerg Med*. 1980;9:529–531.
- Hanson PG, Standridge J, Jarrett F, Maki DG. Freshwater infections due to *Aeromonas hydrophilia*. *JAMA*. 1977;238:1053–1054.
- Midani S, Rathore MH. *Vibrio* species infection of a catfish spine puncture wound. *Paed Infect Dis*. 1994;13:333–334.
- Bonner JR, Coker AS, Berryman CR, Pollock MH. Spectrum of *Vibrio* infections in Gulf Coast community. *Ann Intern Med*. 1989;99:464–469.
- Howard RJ, Leib S. Soft tissue infections caused by halophilic marine vibrios. *Arch Surg*. 1988;123:245–249.
- Roland FP. Salt-starch xylose lysine deoxycholate agar: a single medium for the isolation of sodium and non-sodium dependent enteric gram-negative bacteria. *Med Microbiol Immunol (Berl)*. 1977;163:241–249.
- Osawa R, Arakawa E, Okitsu T, Yamai S, Watanabe H. Levels of thermostable direct hemolysin produced by *Vibrio parahaemolyticus* O3:K6 and other serovars grown anaerobically with the presence of a bile acid. *Curr Microbiol*. 2002;44:302–305.
- Sato S, Miura T, Saitoh M, Tsukiashi S, Hongo T, Toba T. Identification of *Vibrio vulnificus* from patients with otitis media and septicemia by PCR method. *Kansenshogaku Zasshi*. 2001;75:307–313.
- Rice SA, McDougald D, Kjelleberg S. *Vibrio vulnificus*: a physiological and genetic approach to the viable but non-culturable response. *J Infect Chemother*. 2000;6:115–120.
- Cerda-Cuellar M, Jofre J, Blanch AR. A selective medium and a specific probe for detection of *Vibrio vulnificus*. *Appl Environ Microbiol*. 2000;66:855–859.
- Kelly PJ, Karlson AG, Weed LA, Lipscomb PR. Infections of synovial tissue by mycobacteria other than *Mycobacterium tuberculosis*. *J Bone Joint Surg*. 1967;49A:1521–1530.
- Kelly PJ, Weed LA, Lipscomb PR. Infections of tendon sheath, bursae, joints, soft tissues by acid fast bacilli other than tubercle-bacilli. *J Bone Joint Surg*. 1963;45A:327–336.
- Williams CS, Riordan DC. *Mycobacterium marinum* infections of the hand. *J Bone Joint Surg*. 1973;55A:1042–1050.
- Kestle DG, Abbott VD, Kubica GP. Differential identification of mycobacteria. *Am Rev Respir Dis*. 1967;95:1041–1052.
- Gunther SF, Elliot RC. *Mycobacterium kansasii* infection in the deep structures of the hand. *J Bone Joint Surg*. 1976;58A:140–142.
- Vincent D, Richardot C, Le Trong B, Hervochon JM, Latintville D. Post-traumatic medial nerve injury due to a foreign body. *Rev Neurol (Paris)*. 2002;158:836–838.
- Groen RJ, Kafiluddin EA, Hamburger HL, Veldhuizen EJ. Spinal cord injury with a stingray spine. *Acta Neurochir (Wien)*. 2002;144:507–508.
- Peterson JJ, Bancroft LW, Kransdorf MJ. Wooden foreign bodies: imaging appearance. *AJR Am J Roentgenol*. 2002;178:557–562.
- Stevens KJ, Theologis T, McNally EG. Imaging of plant-thorn synovitis. *Skeletal Radiol*. 2000;29:605–608.
- Liram N, Gomori M, Perouansky M. Sea urchin puncture resulting in PIP joint synovial arthritis: case report and MRI study. *J Travel Med*. 2000;7:43–45.
- Teefey SA, Middleton WD, Boyer MI. Sonography of the hand and wrist. *Semin Ultrasound CT MR*. 2000;21:192–204.
- Bianchi S, Martinoli C, Abselwahab IF. High-frequency ultrasound examination of the wrist and hand. *Skeletal Radiol*. 1999;28:121–129.
- Auerbach PS, Yajko DM, Nassos PS, Kizer KW, Morris JA, Hadley WK. Bacteriology of freshwater environment: implications for clinical therapy. *Ann Emerg Med*. 1987;16:1016–1022.
- Auerbach PS, Yajko DM, Nassos PS. Bacteriology for marine environment: implications for clinical therapy. *Ann Emerg Med*. 1987;16:643–649.
- Hoffman GS, Myers RL, Stark FR, Thoen Co. Septic arthritis associated with *Mycobacterium avium*: a case report and literature review. *J Rheumatol*. 1978;5:199–209.