TURKISH JOURNAL OF EMERGENCY MEDICINE

Case Report/Case Series

Access this article online

Quick Response Code:

Website: https://turkjemergmed.com/

DOI: 10.4103/tjem.tjem_73_25

Can a stingray tear a tendon? A case report of delayed Achilles rupture following envenomation

Jacob Stibelman, Moamen Elhaddad*, Alexander Carrillo-Kashani, B. David Massaband

Cedars-Sinai Medical Center, Los Angeles, California, USA
**Corresponding author*

Abstract:

Stingray injuries, though common in coastal regions, rarely result in severe musculoskeletal complications such as tendon rupture. This case report presents the first documented instance of a 61-year-old male who sustained a stingray injury to the Achilles tendon, initially masked by a concurrent infection, leading to a delayed diagnosis and surgical repair. The patient presented to urgent care 5 days postinjury with pain, erythema, and chills, and was treated for a soft-tissue infection. Persistent symptoms prompted a referral to the emergency department (ED), where magnetic resonance imaging revealed a complete Achilles tendon rupture with associated infection. Surgical repair was delayed until the infection resolved, and a V-Y gastrocnemius advancement was performed 9 weeks postinjury. The patient achieved full recovery at 1-year follow-up. This case underscores the importance of a high index of suspicion for musculoskeletal injuries in marine trauma, the role of advanced imaging in the ED, and the need for interdisciplinary management to prevent long-term complications. Emergency physicians must consider tendon injuries in patients with persistent symptoms following stingray envenomation, ensuring timely diagnosis and treatment to optimize outcomes.

Keywords:

Achilles tendon rupture, marine envenomation, soft-tissue infections, stingray injuries

Introduction

Stingray injuries are a relatively common marine envenomation, with approximately 750–2000 reported cases in the United States annually.[1] The vast majority of these injuries – 98%, according to Katzer *et al*., occur in the foot and ankle due to the common practice of wading in shallow coastal waters, where stingrays are often buried in the sand.[2] These injuries typically result in localized trauma, including puncture wounds, lacerations, and envenomation from the venomous barb. The venom can cause severe pain, swelling, muscle cramps, and, in some cases, systemic symptoms such as nausea, vomiting, and respiratory distress.[3]

Beyond the immediate soft tissue damage, stingray injuries pose a significant risk of secondary bacterial infection. Marine pathogens such as *Photobacterium damsela*, *Vibrio alginolyticus*, *Citrobacter freundii*, *Aeromonas hydrophila*, and *Pseudomonas aeruginosa* are frequently isolated from wounds sustained during stingray envenomation.[4-8] Prompt and appropriate antimicrobial therapy is crucial in mitigating these risks, particularly in deep puncture wounds or immunocompromised individuals.

Submitted: 23-02-2025
Revised: 06-04-2025
Accepted: 15-04-2025
Published: 01-10-2025

ORCID:
JS: 0009-0008-0893-8278
ME: 0000-0002-5881-8986
ACK: 0009-0009-3694-1383
BDM: 0009-0001-3718-1883

Address for correspondence:
Dr. Moamen Elhaddad, Cedars-Sinai Medical Towers, 8631 West 3rd St., Suite 940-E, Los Angeles 90048, CA, USA.
E-mail: mddpmworld@gmail.com

How to cite this article: Stibelman J, Elhaddad M, Carrillo-Kashani A, Massaband BD. Can a stingray tear a tendon? A case report of delayed Achilles rupture following envenomation. Turk J Emerg Med 2025;25:313-6.

While soft-tissue complications are well-documented, musculoskeletal sequelae, including tendon injuries, necrotizing fasciitis, and compartment syndrome, are exceedingly rare.[8,9] Emergency physicians are often the first to evaluate and manage these injuries, making it crucial to recognize the potential for severe complications. This case report presents the first documented instance of an Achilles tendon rupture resulting from a stingray injury, where the initial diagnosis was obscured by an overlapping infection, ultimately delaying surgical intervention. The case underscores the importance of a high index of suspicion, thorough diagnostic evaluation, and multidisciplinary management in emergency settings.

Case Report

A 61-year-old male surfer sustained a stingray injury to his left lower extremity while in the waters off Pacific Palisades in California. The stingray barb inflicted a deep laceration over the posterior aspect of his Achilles tendon, approximately 4 cm proximal to its insertion. The patient initially self-treated the wound with hot water immersion. However, 5 days postinjury, he was presented to an urgent care center with worsening pain, erythema, and subjective chills.

On physical examination, a full-thickness laceration was noted on the posterior Achilles region, accompanied by surrounding edema, tenderness, and warmth [Figure 1]. He was diagnosed with a soft-tissue infection and treated with intramuscular ceftriaxone and oral clindamycin. Over the subsequent 3 weeks, the patient made multiple return visits to urgent care due to persistent symptoms but received no changes in treatment. He was eventually referred to the emergency department (ED) for further evaluation.

Figure 1: Clinical presentation of the left Achilles tendon region 5 days poststingray injury. Marked swelling, erythema, induration, and desquamation are seen, with a full-thickness wound and surrounding cellulitis outlined by marked boundaries

Upon the ED presentation, the patient reported ongoing pain and functional impairment of the affected limb. Laboratory studies revealed a white blood cell count of 6.19 × 10^9/L, suggestive of resolving infection. Intravenous vancomycin and ceftriaxone were initiated, and radiographs demonstrated mild soft tissue swelling without bony abnormalities. Although ultrasound could have provided earlier soft tissue assessment, initial clinical suspicion was directed toward infection rather than tendon rupture, given the prominent cellulitis and lack of overt tendon discontinuity on the examination. Radiographs, while useful for excluding fractures or foreign bodies, have limited sensitivity for tendon injuries, which ultimately necessitated magnetic resonance imaging (MRI) for definitive diagnosis. MRI revealed a complete Achilles tendon rupture with edema at the calcaneal insertion, along with a peripheral enhancing fluid collection measuring 2.0 cm × 0.6 cm with a fistulous tract to the skin.

The surgical team was consulted, and after evaluation, they proceeded with an incision and drainage to manage the infection and obtain cultures to guide targeted antimicrobial therapy. The goal was to eradicate the infection before proceeding with definitive tendon repair. The patient was hospitalized for 4 days, receiving IV antibiotics based on culture results, and was subsequently discharged with oral linezolid and cefpodoxime while remaining nonweight-bearing in a walking boot.

At the 5-week postinjury follow-up, physical examination demonstrated a persistent palpable defect in the left Achilles tendon, along with a positive Thompson's test, a positive Matles test, an inability to perform a single-leg heel rise, and diminished baseline left ankle plantarflexion strength [Figure 2]. Given that the wound had healed and the infection had resolved,

Figure 2: Lack of baseline ankle plantarflexion strength observed 5 weeks postinjury

delayed surgical repair was planned 4 weeks later per patient's preference. A repeat MRI confirmed a 7.5 cm full-thickness Achilles rupture [Figure 3].

Intraoperative findings revealed extensive fibrosis bridging the tendon gap, with nonviable tissue necessitating debridement. A V-Y gastrocnemius aponeurosis advancement was performed to restore tendon integrity and optimize functional recovery.

Postoperatively, the patient was immobilized in a below-knee cast with the ankle in 20° plantar flexion for 4 weeks, followed by gradual weight-bearing and structured rehabilitation. By 1-year postsurgery, he had returned to all prior activities, including surfing and hiking, with only mild residual calf weakness.

Written informed consent was obtained from the patient for the publication of this case report, including relevant images and clinical details.

Discussion

This case highlights a rare and severe complication of a stingray injury leading to a complete rupture of the Achilles tendon. To our knowledge, this is the first reported case of its kind. The delayed Achilles rupture in this patient likely represents the combined effects of direct trauma from the stingray barb, venom-mediated tissue damage, and infection-related degradation.

The stingray barb likely created a partial laceration of the Achilles tendon, which subsequently acted as a biomechanical weak point. The venom components, including metalloproteinases, may have further contributed to the progressive breakdown of the tendon matrix.[10,11] These enzymes are known to degrade collagen and other extracellular matrix components, potentially compromising tendon integrity and increasing susceptibility to rupture under mechanical stress.

Figure 3: Magnetic resonance imaging of the left Achilles tendon 9 weeks postinjury, confirming a 7.5 cm high-grade tear. The image shows significant tendon disruption and surrounding edema following delayed surgical intervention performed before tendon repair

Moreover, secondary infection by marine pathogens such as *Vibrio* or *Aeromonas* spp. might have exacerbated tendon degradation through bacterial protease activity and local inflammatory changes.[12] These microorganisms, frequently isolated from marine injuries, are known to produce proteolytic enzymes that can further weaken connective tissues. Therefore, the interplay between mechanical trauma, venom-induced matrix breakdown, and infection-mediated tissue degradation likely contributed to the delayed rupture observed in this case. However, definitive confirmation of this proposed mechanism would require further study involving similar cases.

The patient's persistent infection necessitated a comprehensive antibiotic regimen and delayed surgical repair. Sachett *et al*. reported that although secondary bacterial infections following stingray injuries are relatively uncommon, they occur in approximately 9% of cases.[13] Severe infections can lead to long-term disabilities, and rare complications include necrotizing fasciitis caused by *V. alginolyticus* (marine stingrays) and *A. hydrophila* (freshwater stingrays), as well as tetanus and invasive mycoses.

Prompt medical intervention, including wound irrigation, debridement, and appropriate antimicrobial therapy, is crucial in managing high-risk stingray injuries, particularly those with deep puncture wounds or affecting immunocompromised individuals.[14] Ciprofloxacin, doxycycline, and trimethoprim-sulfamethoxazole are recommended for both prophylaxis and localized infection management.[15] In addition, hot water immersion therapy, which helps inactivate venom and alleviate pain, is a well-documented first-aid measure in stingray injuries.[10,16-18]

This study points to the need for a thorough diagnostic evaluation in patients presenting with stingray injuries, especially when initial symptoms persist or worsen. While radiographs are often the first-line imaging modality in the ED, MRI is crucial for identifying deeper structural injuries, including tendon ruptures that may not be readily apparent on plain films. The delayed diagnosis in this case highlights the importance of maintaining a high index of suspicion and employing advanced imaging when indicated.

Treatment delays in this case were influenced by multiple factors, including assessments from several healthcare providers that did not fully align with established guidelines for managing lower extremity

infections and Achilles tendon injuries. Suboptimal management practices, such as inadequate antibiotic selection and insufficient weight-bearing guidance, prolonged the patient's recovery and heightened the risk of complications until appropriate care was provided.

This case refers to the need for a structured, methodical approach to marine injuries, addressing not only the immediate wound and envenomation effects but also the potential for deeper musculoskeletal involvement. Emergency physicians should be vigilant in assessing marine injuries and collaborate with orthopedic and infectious disease specialists when indicated. Comprehensive diagnostic assessment, timely imaging, early infection control, and interdisciplinary coordination are essential for optimizing patient outcomes and minimizing long-term disability.

While this report describes a single case, and the rarity of such events limits broad generalizations, the detailed clinical and imaging findings offer valuable insights into the potential for tendon rupture following stingray envenomation. Future studies are needed to better understand the interplay of venom effects, mechanical trauma, and secondary infection in similar cases.

Conclusion

This case highlights a unique and severe complication of stingray envenomation, emphasizing the need for a high index of suspicion for musculoskeletal injuries in marine trauma. Emergency physicians play a critical role in the early identification of such injuries through comprehensive evaluation and appropriate imaging. Prompt wound care, infection control, and multidisciplinary coordination are essential in optimizing patient outcomes and preventing long-term disability.

Further studies and case reports are needed to refine diagnostic and treatment algorithms for stingray-related injuries, ensuring that both soft tissue and musculoskeletal complications are adequately addressed in the emergency setting.

Author contributions

- Conceptualization: BDM, JS
- Data Collection: JS, ME, ACK
- Analysis: ME, JS, ACK
- Manuscript Writing: ME, JS, ACK
- Review and Editing: ME, JS, ACK, BDM.

All authors have reviewed and approved the final manuscript and take responsibility for its content.

Conflicts of interest

There are no conflicts of interest.

Ethical approval

This study was conducted in accordance with institutional ethical guidelines. IRB approval was not required for a single-patient case report.

Consent to participate

The authors certify that they have obtained all appropriate patient consent forms. In the form, the patient has given his consent for his images and other clinical information to be reported in the journal. The patient understands that his name and initials will not be published and due efforts will be made to conceal his identity, but anonymity cannot be guaranteed.

Funding

None.

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