

# *Edwardsiella tarda* as a Cause for Limb- and Life-threatening Soft Tissue Infections: What All Plastic Surgeons Need to Know

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**Summary:** *Edwardsiella tarda* (ET), a Gram-negative bacterium, causes an extremely uncommon, yet highly aggressive, soft tissue infection. Although plastic surgeons are frequently involved in the primary care, debridement, and secondary reconstruction of difficult soft tissue infections, infections caused by ET have received scant attention in the plastic surgery literature, perhaps because of the rarity of occurrence. We present a case of a 58-year-old man with alcohol abuse and hepatitis C who developed an upper extremity soft tissue infection after a catfish injury, which rapidly deteriorated to cause multiorgan failure and death within 5 days of admission. We will discuss the management of this rare but potentially lethal infection as well as the review of the current literature. (*Plast Reconstr Surg Glob Open* 2020;8:e3016; doi: 10.1097/GOX.0000000000003016; Published online 17 September 2020.)

**E**T has been found to be an uncommon cause of infections in humans. ET, as an etiologic agent of human soft tissue infections, causing infections in the form of necrotizing fasciitis and myonecrosis is even more rare.<sup>1</sup> In an inclusive review of international medical literature and a retrospective review of medical records, Hirai et al<sup>1</sup> in 2013 reported 72 cases of ET in humans, which included only 18 soft tissue infections. Our search of the Pubmed MEDLINE database using search keywords of “Human *Edwardsiella tarda*” revealed only 6 additional cases of reported ET infections in humans.<sup>2-7</sup>

Necrotizing fasciitis (NF) and myonecrosis (MN) are the most aggressive forms of soft tissue infections and carry a high mortality and morbidity despite advances in antibiotics, medical supportive care, and surgical management.<sup>8</sup> The soft tissue infections resulting in NF and MN are mostly poly-microbial in infectious etiology, Group-A Streptococcus, methicillin-resistant *Staphylococcus aureus*, *Vibrio vulnificus*, *Klebsiella*, *Clostridium*, *Escherichia coli*, and fungal causes among the common responsible organisms. In the previous reports, ET has been the organism responsible for an aggressive soft tissue infection, including NF and MN,<sup>1,3,9</sup> with a dramatically high rate of mortality (>60%).<sup>1</sup> Plastic surgeons are frequently involved in the

primary care, debridement, and secondary reconstruction of difficult soft tissue infections. We found no description in the plastic surgery literature to propose ET as a potential, although rare, cause for a soft tissue infection with a substantial rate of loss of limb and life. We present a case of ET infection following catfish injury, discuss its management, and a review of the current literature.

## CASE REPORT

A 58-year-old African American man with a history of alcohol abuse and hepatitis C was transferred to our university hospital intensive care unit from an outside facility, with sepsis. He presented to an outside ER with initial complaints of left hand swelling/pain and malaise for 36 hours. The patient related a history of an injury from a catfish bone two days before his presentation, followed by pain and swelling of his left hand, progressive nausea, and malaise. At the time of transfer, hand examination was limited by the patient's altered mental status but there was demonstrated edema of the dorsum of the hand and thenar eminence extending to the wrist with a mild pain on active motion. The examination did not show erythema, warmth, or crepitus, and the hand x-ray was normal. Given the limitations of the hand examination, compartment pressures were measured in the thenar space and interosseal approximately 4 hours after intensive care unit admission and were recorded at 17 mm Hg. Duplex of the left upper extremity was unremarkable, and the patient was not sufficiently stable for further imaging.

Antibiotics were initiated and blood cultures obtained. Over the next 4–6 hours, the hand swelling increased moderately, and digit flexion and extension were limited. Over

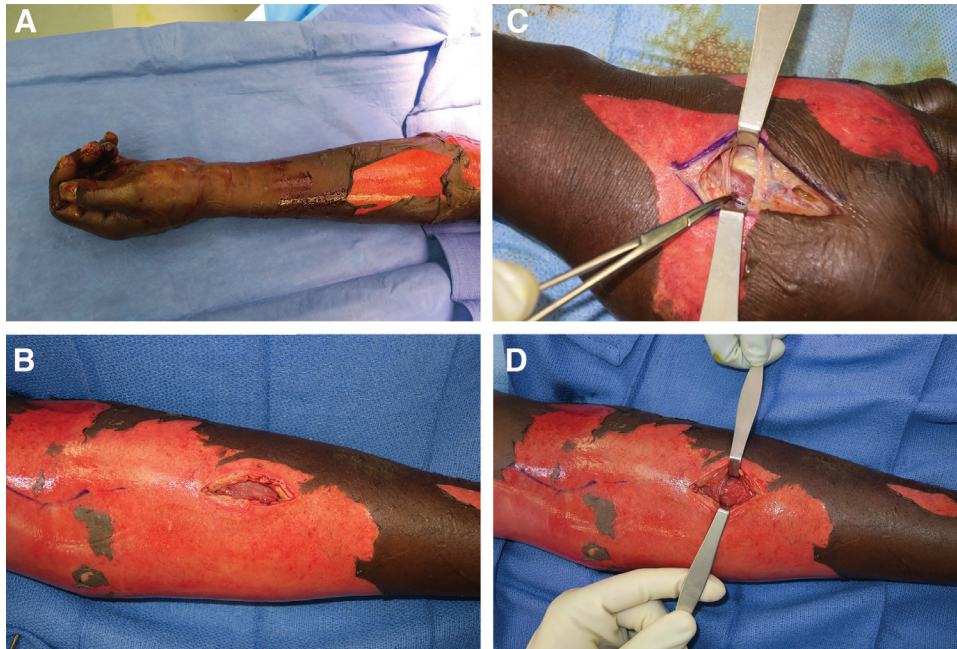
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**Fig. 1.** Intraoperative photographs of the left upper extremity showing volar distal left upper extremity (A), dorsal left hand (B), and the left forearm flexor and extensor compartments (C and D). Apart from epidermolysis (blistering skin changes), muscle and soft tissue appear healthy.

the next several hours, the patient became progressively hypotensive and required intubation and high-dose vasopressor support. Blood cultures from admission revealed ET and an infectious disease consultation was requested.

The patient rapidly progressed to multiorgan failure. By 36 hours after admission, the patient developed significant swelling of entire upper extremity with bullae formation, epidermolysis, and evidence of ischemia to the fingertips despite the presence of Doppler signals within the radial and ulnar arteries. In addition, he also began to develop bullae and swelling over the remaining extremities. Given concern for the presence of necrotizing fasciitis or myonecrosis, the plastic surgery team was consulted and the patient was taken emergently to the operating room for exploration 48 hours after presentation. The dorsal hand as well as flexor/extensor compartments of the forearm were incised and evaluated, but only serous fluid and normal muscle and soft tissue in appearance were encountered (Fig. 1). Skin and muscle biopsies subsequently revealed no evidence of tissue necrosis. Intraoperative cultures were negative while the patient was on broad-spectrum antibiotic. Despite aggressive supportive care and broad-spectrum antibiotics, multiorgan failure progressed with severe acidosis and hemodynamic instability and the patient expired 5 days after presentation.

## DISCUSSION

ET is a facultative anaerobe, Gram-negative rod of the Enterobacteriaceae family. The organism is found principally in catfish, largemouth bass, Chinook salmon, sea bass, rainbow trout, eel, flounder, alligator, and some snakes, but can also infect amphibians, birds, and

mammals.<sup>10</sup> Since the original report of isolation from Japanese eel in 1962, ET has been isolated in various geographic distributions and has been cultured from human samples of blood, urine, feces, CSF, bile, CSF, peritoneal fluid, liver abscess, wounds, and even synovial fluids.<sup>2,9,11-13</sup> Although the vast majority of the ET human infections are gastrointestinal illnesses with the presence of the organism in stool cultures, soft tissue infections are mostly single case reports.<sup>1</sup>

A recent review article by Hirai et al<sup>1</sup> found only 72 reported cases of human ET infections in the entire English, French, Spanish, and Japanese literature, with only 18 cases of soft tissue infections. In his review, Hirai found 12 cases of reported human ET infections from the United States, mostly in the southeastern states with a seasonal distribution of cases between June and November.<sup>1</sup> While the overall mortality rate in the Hirai review was 44.6%; the mortality rate of the cases with soft tissue involvement was 11 of 18 cases (61.1%).<sup>1</sup> Also, multivariate analysis by Hirai et al<sup>1</sup> demonstrated liver cirrhosis to be an independent predictor of mortality. When reviewing 11 cases of culture-confirmed extra-intestinal ET from Louisiana, Slaven et al<sup>9</sup> reported 5 wound infections and 5 abscesses requiring incision and drainage. The recommended choice of antibiotics for ET soft tissue infections included ampicillin, cephalosporins, aminoglycosides, and fluoroquinolones, all generally effective against Gram-negative bacteria.<sup>14,15</sup>

In the instance of soft tissue infection and if a potential marine-related injury is presumed, ET should be included in the list of the potential responsible microorganisms. In consideration of the differential diagnosis, especially in situations that involve exposure to catfish (the current

case) and lionfish as the potential cause of the injury, virulent bacterial colonization over the body surface and spiny fish barbs capable of injection of toxic venoms are also potential explanations.<sup>16,17</sup> These cytotoxic chemicals and venoms can also cause signs and symptoms mimicking necrotizing soft tissue infections.<sup>16,17</sup> Gram stains and histologic evaluation can sometimes help differentiate from necrotizing soft tissue infections, although the results may still be equivocal as fulminant tissue necrosis caused by toxin and bacteria may appear similar.<sup>16</sup> Cultures are imperative. The spectrum of soft tissue infection in the ET infection may vary from cellulitis with some secondary skin changes (like in the current case) to MN and NF.

In the current case, the pathology evaluation of the skin and muscle biopsies did not show NF or MN, at least up to the stage of surgical exploration. While it is a possibility that the patient may have formed MN later, it is mostly a matter of speculation. The patient had a history of catfish bone injury and clinical evidence of upper extremity soft tissue infection, in the form of cellulitis and skin presentation as described above, and blood cultures confirmed the underlying organism to be ET. The patient had multiple underlying comorbidities and, following a rapidly deteriorating hospital course, developed multiorgan failure secondary to the systemic infection (sepsis) and died 5 days later. In the current case, one may argue that the plastic surgery team was not involved early, and surgical exploration could have been done earlier than 48 hours into the current case. Considering the intraoperative findings in this particular case, the authors do not believe earlier surgical intervention could have changed the outcome.

Early aggressive intravenous broad-spectrum antibiotic treatment and involvement of an infectious disease specialist as well as early aggressive surgical exploration are key to provide the maximum opportunity of patient survival. Since most of the patients reported with ET soft tissue infections in the literature had multiple premorbid conditions, the potential for mortality is high.

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