

Case Report

Successful limb salvage in a case of pretibial soft tissue defects combined with *Aeromonas hydrophila* infection

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Received July 28, 2018; Accepted February 12, 2019; Epub April 15, 2019; Published April 30, 2019

Abstract: *Aeromonas hydrophila* is a gram-negative bacterium that can act as an opportunistic pathogen. Generally, *A. hydrophila* infection-induced diseases are serious and violent and have a high mortality rate. This article reports a case of pretibial soft tissue defects complicated by *A. hydrophila* infection after open calf fracture surgery. This case report aims to enhance the understanding of this complex disease and to improve the associated clinical practice. In patients being assessed for the presence of this infectious disease, rapid pathogen identification is paramount to facilitate effective treatment. This report additionally highlights positive clinical outcomes with the use of flow-through inferior epigastric artery perforator flap dissociating implantation to repair soft tissue defects of the calf.

Keywords: *Aeromonas hydrophila*, soft tissue defects, inferior epigastric artery perforator flap

Case introduction

A 38-year-old male patient was transferred to our department due to skin and soft tissue defects that arose after surgery for a left tibial fracture. The patient's condition is detailed as follows: (1) The patient was admitted to the hospital due to traumatic left leg deformity, pain, and activity restriction for a 1 h period. Debridement, open reduction, internal fixation of the left tibial fractures, and negative suction to the wound surface were performed under general anesthesia in the emergency department. Partial tissue necrosis was evident on the skin of the calf following this surgery. A physical examination of this tissue revealed that a skin and soft tissue defect approximately 15*3 cm in size was present in front of the left pretibial area. The wound edge was not smooth. Both the tibia and the steel plate used for fixation were exposed in this wound, and fresh granulation tissue had formed on the wound surface. To facilitate further treatment, the patient was admitted to our department for treatment of skin and soft tissue defects arising after the surgical repair of left tibial and fibular fractures. (2) The patient had been healthy in the past and did not suffer from any chronic

diseases such as high blood pressure or diabetes. Chronic infectious diseases such as hepatitis or tuberculosis were also not present. The patient had no history of other major surgeries or trauma, no history of food or drug allergies, and no history of blood transfusion. He was born nearby, denied having access to water from areas experiencing epidemic disease and had no history of smoking or drinking. The patient was married and both his spouse and children were healthy. (3) A physical examination showed that the patient's body temperature was 38.5°C, his pulse rate was 83 beats/min, his respiratory rate was 17 breaths/min, and his blood pressure was 120/71 mmHg. The patient was fully conscious, with an increasing sense of malaise and declining spirit. No yellow coloration was observed on the skin or sclera, no palmar erythema was evident, nor was there any evidence of spider angioma. There were no obvious abnormalities of the heart, lungs, or abdomen. Bowel sounds were detectable 5 times/minute. Spine and limb functionality were assessed via specialized examinations. Physiological reflexes were presented, and pathological reflexes were not inducible. Specialized examinations were as follows: the spine had no obvious deformities, and there was no pain associated



Figure 1. The wound surface of the left calf is approximately 15 cm × 3 cm after debridement. The steel plate and tibia are exposed.

with pressure on the spinous process. A skin soft tissue defect approximately 15 cm × 3 cm in size was evident in front of the left pretibial area. The wound edge was not smooth. Both the tibia and the steel plate used for fixation were exposed in the wound, and fresh granulation tissue had formed on the wound surface. The dorsal pedal artery was exposed and could be probed, and toe activity and the peripheral blood supply were normal.

After transfer to our department, the patient developed a fever, with a body temperature of 38.5°C. The vacuum suction device over the wound surface was immediately removed, the suture was dismantled, the deep fascia was fully opened, and tests on the wound secretions and for drug sensitivity were performed. The patient was administered cefazolin to prevent infection. The emergency examination results were as follows: the blood routine showed that the white blood cell count (WBC) was $11.56 \times 10^9/L$, with a neutrophilic cell ratio (NEUT) of 87%. On the following day, the patient's body temperature rose to 39.1°C. Cultures of the wound secretions revealed the presence of *Aeromonas hydrophila*. Drug sensitivity tests demonstrated that this bacterium was sensitive to levofloxacin (≤ 1), ceftazidime (≤ 1), and aztreonam (≤ 2). Cefazolin was immediately discontinued, and levofloxacin combined with ceftazidime was administered for the anti-bacterial treatment. Five days later, the patient's body temperature returned to normal (36.6°C). A reexamination of the blood routine yielded a WBC of $6.8 \times 10^9/L$, with a neutrophilic cell

ratio (NEUT) of 87%. Drug sensitivity culture tests were negative during 3 subsequent, consecutive tests. His body temperature remained normal, and the wound infection was controlled. The pretibial soft tissue defect in the left calf of the patient remained relatively large, with an area of approximately 15 cm × 3 cm. The steel plate and tibia were exposed (**Figure 1**), and a flow-through inferior epigastric artery perforator flap dissociating implantation was used to repair the wound surface. A preoperative portable

Doppler probing device was used to examine the location, caliber, and routes of the inferior epigastric artery and to mark it on the abdominal wall. A paraumbilical perforator vessel, which supplied the flap, was identified during surgery. The rectus abdominis muscle fibers in front of the vascular pedicle were incised. The route of the vascular pedicle in the muscle was then explored. The branch vessels in this muscle were carefully separated and ligated, and the vascular pedicle was dissociated from the rectus abdominis muscle. The vascular pedicles were then ligated and disconnected, and the flaps were dissociated. After flap dissociation, the inferior epigastric artery and its accompanying veins were anastomosed to the posterior tibial artery and its accompanying veins. A postsurgical compression dressing was conducted using an abdominal band. Routine treatments, including the administration of antibiotics, antispasmodics, antithrombotics, and treatments aimed at improving circulation, were performed. The flap was baked with light to keep it warm. The flap color was ruddy, its tension was moderate, and its capillary regurgitation was normal. Sixteen days after surgery, the patient was stable, and the flaps were still intact and were not necrotic. The patient was then discharged (**Figure 2**).

Discussion

Aeromonas hydrophila is a human intestinal bacterial species that can cause opportunistic infections. It is a gram-negative bacterium that can be either an aerobe or a facultative anaer-



Figure 2. The color and luster of the flap are normal after surgery. It has a soft texture and lacks any evidence of swelling.

obe and is widely found in bodies of water, soil, vertebrate intestines, and human feces. It is commonly found to be associated with humans, livestock, and fish, providing many opportunities for exposure. *A. hydrophila* can produce highly toxic exotoxins, including necrotoxins, hemolysins, and enterotoxins, causing fulminant hemorrhagic diseases in fish and potentially causing intestinal, skin, and soft tissue infections, necrotizing fasciitis, and sepsis in humans [1]. Extracellular enzymes can facilitate the growth of these bacteria within permissive sites in a patient's body, and secreted proteases can directly act on tissues, leading to tissue dissolution and necrosis [2]. Currently, rates of *A. hydrophila* detection are increasing. Because it can produce β -lactamase, it often displays multiple drug resistance [3]. Therefore, one should reasonably select antibiotics according to the drug sensitivity tests in clinical practice. The present case was of pretibial soft tissue defects complicated by *A. hydrophila* infection after open calf fracture surgery. No related pathogens were detected before the patient was transferred to our department. The pretibial soft tissue was partly necrotic, providing a clear indication of infection. After the patient transferred to our department, his blood and wound secretions were cultured. These tests detected *A. hydrophila* growth. After adjusting the patient's antibiotics according to the results of the drug sensitivity tests, the patient's condition rapidly improved.

The perforator flap is an increasingly common approach in the field of flap transplantation,

and its use is consistent with the principle of "good healing in the accepted area with minimal loss in the donor area" for tissue transplantation. Free skin flap transplantation is an ideal treatment method for the repair of large-area skin defects in the arms and legs after trauma [4]. In 1989, Koshima initially proposed the concept of the deep inferior epigastric perforator (DIEP) and applied it successfully in the clinic [5]. Allen further successfully applied a DIEP in breast reconstruction in 1994 [6]. As

the most commonly used perforator flap in clinical research and application, DIEP is widely used for breast reconstruction, reconstruction and repair of limbs and related sites, with good efficacy. The DIEP flap has the advantage that there is no need to alter posture when repairing limb wounds. The surgical operation can be performed simultaneously in both the acceptor and donor areas, shortening the overall surgery time. The occurrence of complications such as abdominal wall bulging or abdominal wall hernia was also reduced. The vascular pedicle can be either long or short as needed, increasing the flexibility of such graft repair. It can be acquired to be longest at the starting point of the external iliac artery [7]. The donor flap is larger than in other methods, yet the operation at the donor site is less invasive. The donor flap region is concealed, thereby meeting preferred aesthetic requirements. In the present case, the patient had a relatively large pretibial soft tissue defect. After controlling the infection present in this patient, the flow-through inferior epigastric artery perforator flap dissociating repair was performed. The skin flap survived with an overall healthy appearance and without significant swelling. The tissue damage in the flap donor area was mild.

This case serves as a reminder that in patients likely to have infectious diseases, rapid pathogen identification and the determination of pathogen drug susceptibility is vital. A pre-bridement culture should be performed when possible, as this will be conducive to further disease prevention, allowing for more definitive

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and effective antibiotic treatment. The use of a flow-through inferior epigastric artery perforator flap dissociating implantation to repair soft tissue defects of the calf causes little damage to the donor site and is satisfactory with regard to reconstruction of the acceptor area. The overall curative effects of this approach are more targeted treatment and better outcomes.

Disclosure of conflict of interest

None.

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