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Bone graft donor site infection with a rare organism, *Aeromonas Hydrophila*. A typical location, presentation and organism with 2 years follow-up. Case report

Obada Hasan[a], Wajiha Khan[a], Muneeba Jessar[a], Aly Zaheer Pathan[b,*], Riaz Hussain Lakdawala[c]

[a] Department of Surgery, Aga Khan University Hospital, Karachi, Pakistan
[b] Graduate MBBS, Aga Khan University, Karachi, Pakistan
[c] Section of Orthopedics, Department of Surgery, Aga Khan University Hospital, Karachi, Pakistan

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ABSTRACT

INTRODUCTION: *Aeromonas* are Gram-negative bacilli often causing necrotizing fasciitis or sepsis in immunocompromised patients. *Aeromonas Hydrophila* is most often found in immunocompromised patients or those with burns or aquatic trauma. When patients present with a discharge and infection on bone graft donor site and progressive sepsis, an *Aeromonas hydrophila* infection should be considered in the differential diagnosis.

PRESENTATION OF CASE: We report here a rare case of *Aeromonas hydrophila* with surgical site sepsis/infection in an immunocompromised 69 years old female, with several comorbids. Here we are reporting infection on donor surgical graft site, sparing major surgical site with the implant. After getting culture report of exudates from the wound that grew *A. hydrophila*, immediate wound debridement and antibiotic beads insertion was performed with appropriate antimicrobial therapy and regular wound dressing. She was followed for around 2 years.

DISCUSSION: This is the first report to our knowledge of *A. Hydrophila* infection in bone graft donor site. *Aeromonas* most often cause gastrointestinal and soft tissue infections, and bacteremia in immunocompromised patients. Early surgical intervention is essential to reducing mortality in deep soft tissue infections caused by this organism. *Aeromonas* have shown resistance to penicillin but are sensitive to other broad-spectrum antibiotics.

CONCLUSION: Early suspicion, diagnosis, and treatment with potent antibiotics are needed to prevent any further complications resulting from infection by this emerging aggressive pathogen.

1. Introduction

Aeromonas species are Gram-negative bacilli that thrive in aquatic environments, but may be found in nearly all other environmental settings, except in extreme conditions [1].

They cause necrotizing fasciitis and sepsis in patients with hepatic diseases, diabetes mellitus, and immunocompromised status [1–4]. Most severe soft tissue infections reported, have been caused by *Aeromonas hydrophila* [5–7].

Until recently, *A. hydrophila* was believed to be mainly a marine and amphibian pathogenic organism [1]. However, these organisms can act as primary pathogens in human hosts. Few reports have been published of *A. hydrophila* infections resulting from nonaquatic injuries in healthy patients [8–10]. Typically, patients who contract *A. hydrophila* are immunocompromised or have sustained burns or trauma in an aquatic environment [1,2,6,7].

In the case of rapidly developing soft tissue infections, *A. hydrophila* may be considered by surgeons as a pathogen in immunocompromised patients [7].

The aim of this case report was to show a rare organism that can cause infection on bone graft donor site and management of that infection in the best possible way by antibiotic beads insertion.

Our case report has been reported in line with SCARE criteria [11].

2. Presentation of case

A 69 years old female with limited-community ambulation presented to our clinic with history of open reduction internal fixation

* Corresponding author at: Section of Orthopedics, Department of Surgery, Aga Khan University, P.O. Box 3500, Stadium Road, Karachi 74800, Pakistan.
E-mail addresses: obada.husseinali@aku.edu (O. Hasan), wajiha.altaf92@gmail.com (W. Khan), the.dermatologist86@gmail.com (M. Jessar), alyzaheer@gmail.com (A.Z. Pathan), riaz.lakdawala@aku.edu (R.H. Lakdawala).

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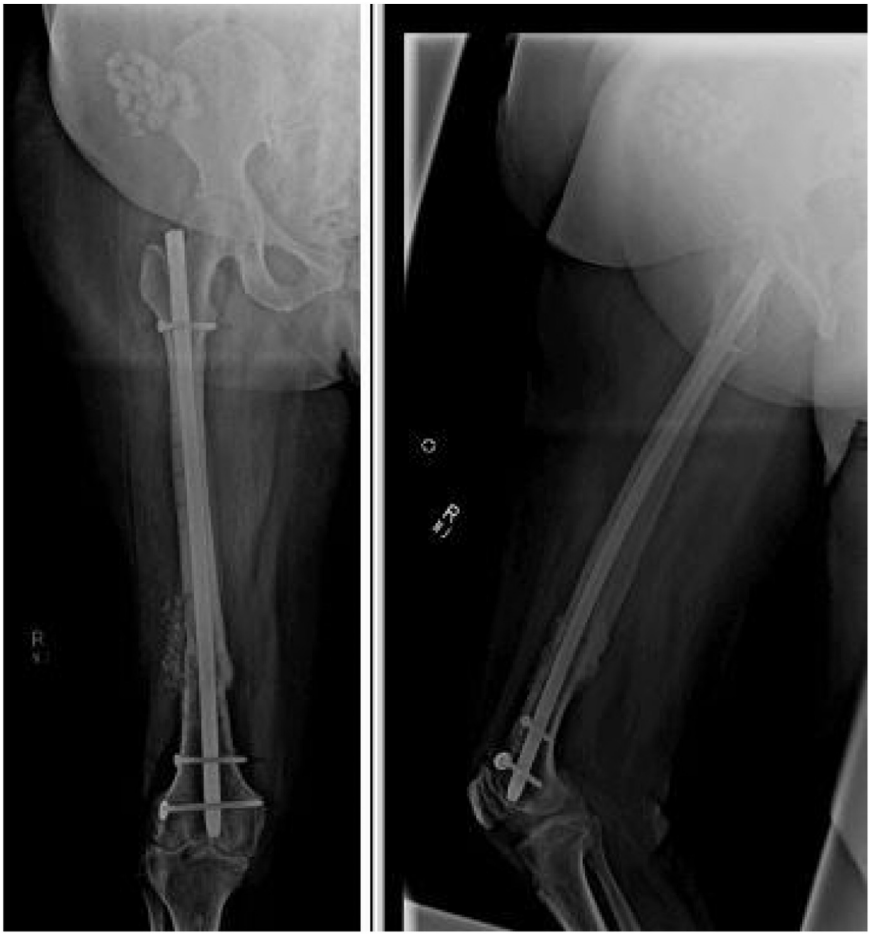

Fig. 1. Post Antibiotics beads x-ray showing the beads in right iliac region and bone graft at fracture site.

of her distal femur following a ground level fall 5 months back. Since then she was unable to bear weight with tenderness on her right thigh and knee. Scar was healthy and there was no wound discharge. X-ray showed a broken plate with atrophic non-union of distal femur shaft.

History revealed she had insulin dependent diabetes mellitus, hypertension, ischemic heart disease, chronic kidney disease, restrictive airway disease, osteoporosis, and hepatitis C (treated). She is obese with BMI 31.

Urine detailed report was positive for nitrites, more than 20 leukocytes/HPF and numerous bacteria. Urine culture showed *E. coli* sensitive to Augmentin, Piperacillin-tazobactam and Gentamycin. CRP and ESR levels were high (7 mg/dL and 52 mm/1st hour, respectively). Following discussion and approval fromthe infectious disease team she was kept on intravenous piperacillin-tazobactam from admission. The next day she underwent removal of implant and Intramedullary Nailing with autologous bone graft from iliac crest and Bone Morphogenetic Protein (BMP) insertion. Culture taken from the fracture site showed no growth of organisms. Dressing was done on 5th postoperative day (POD). Postoperative rehabilitation started as per hospital protocol included chest, ankle pumping and quadriceps isometric physiotherapy. Considering her BMI and the co-morbids the surgeon advised her bed to chair non-weight bearing ambulation on the operated side. Postoperative stay was uneventful, and the wound remained dry, clean and healthy. She was discharged from hospital in satisfactory condition on 10th POD on oral Augmentin, analgesics and aspirin for 7 days and was called for follow up within a week. Stiches were removed 2 weeks post-surgery and the wound looked healthy.

The patient returned to emergency department after a week and reported swelling and discharge at right iliac crest bone graft donor site. Wound scar looked healthy with minimal swelling and tenderness at right iliac fossa. Emergent surgical debridement and hematoma evacuation were performed, and broad-spectrum intravenous antibiotics were started (gentamycin). Intraoperative cultures showed no growth and the patient was discharged. She was advised weight bearing as tolerated with support (walker).

Three weeks following her second surgery she was admitted with complaint of wound discharge and mild pain. Blood tests were normal except for CRP and ESR levels which were high (5 mg/dL and 96 mm/1st hour, respectively). Wound debridement and antibiotic beads insertion (Gentamycin + Piperacillin-Tazobactam + Ceftriaxone) was done after taking infectious disease team on board. Intraoperative Cultures were chased and *Aeromonas Hydrophila* was found in the wound.

Daily dressing of the wound and administration of Intravenous ceftriaxone antibiotic for 7 days helped in proper healing of the wound. Follow up after 1 week was satisfactory, the wound was clean with healthy granulation tissue and the thigh wound had healed with satisfactory radiographs (Fig. 1). She was using elbow crutch with weight bearing as tolerated.

Clinical and radiological union at fracture site was achieved after 3 months (Fig. 2) and patient was back to her usual status of health before sustaining the fracture. On her last follow-up, around 2 years postoperatively, she was full weight-bearing with healed scars. No issues were seen at the bone graft donor site and antibiotic beads were still in place. Taking into consideration her surgical risk, we planned not to remove the beads.

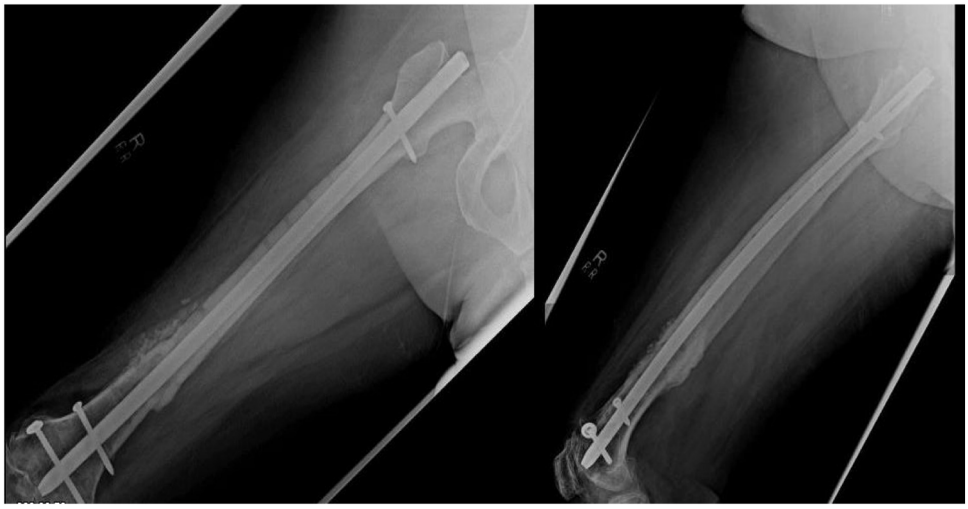

Fig. 2. X-ray of the right femur showing complete healing at fracture site 5 months postoperatively.

3. Discussion

This report is the first description, to our knowledge, of a bone graft donor site infection caused by a rare organism, *A. hydrophila*. All *Aeromonas* isolates were resistant to amoxicillin but extended-spectrum beta-lactam and fluoroquinolone were active against more than 95%.

Aeromonas hydrophila is a heterotrophic, motile, gram-negative, rod-shaped bacterium mainly found in areas with a warm climate and in water sources. Grown on cefsulodin-irgasan-novobiocin (CIN) agar, being both oxidase and indole positive helps in its laboratory identification. It causes a wide range of human illness, including intestinal and extra-intestinal diseases and syndromes, ranging from systemic and local infections in both immunocompetent and immunocompromised hosts [1]. For example, acute gastroenteritis, hepatobiliary tract infections, peritonitis, soft tissue infections, meningitis, pneumonia, empyema, and primary septicemia [1,7,12]. It has also been implicated as a cause of cholangitis, septic arthritis, osteomyelitis, myositis, ocular infections, urinary tract infections, and hemolytic uremic syndrome [1,13].

Among these, the three most common human infections caused by *Aeromonas* species are gastrointestinal infection, skin and soft-tissue infection, and bacteremia in immunocompromised individuals [1,12].

Transmission of *A. Hydrophila* usually occurs through consumption of contaminated food or by exposure of wounds to an environment inhabited by the pathogen. Usually people suffering from chronic illness, such as cirrhosis, malignancy, recent trauma, hepatobiliary and pancreatic diseases, chronic renal failure, diabetes mellitus, or steroid use, get severe soft tissue infections caused by *A. Hydrophila* [12].

Fatality rates in cases of bacteremia range from 28% to 46% often caused by *Aeromonas hydrophila* and *Aeromonas veronii biovar sobria,* most *Aeromonas* infections being polymicrobial [13,14].

The main mechanism of tissue damage *A. hydrophila* possesses is a gene called Aerolysin Cytotoxic Enterotoxin (ACT) that releases a toxin. The aerolysin toxin is an extracellular, soluble, hydrophilic protein that exhibits both hemolytic and cytolytic properties, and is produced by some strains of *A. Hydrophila*. It binds to specific glycoprotein receptors on eukaryotic cell surfaces allowing it to insert into the lipid bilayer and form holes [15].

In reviewing literature and a few case reports from around the globe, interestingly most reported fever as the primary clinical presentation in the first 2 days following inoculation [10,16]. In our case the patient did not develop fever and only presented with wound discharge, which was sterile on culture sensitivity examination.

In orthopedic procedures, especially where implants are used, this organism is encountered rarely. Very few case reports mentioned this as the primary pathogen found responsible for delayed or chronic osteomyelitis in patients after open reduction and internal fixation for open fractures. They emphasized on the rule of multidisciplinary approach in managing these cases. Water/marine exposure and imunocompromised status were among risk factors, but not necessary [17–19]. This organism was also reported to cause bone and soft tissue infections even in healthy immunocompetent individuals without water exposure [20].

Early surgical intervention is essential in saving the life of patients with *Aeromonas* septicemia with deep soft tissue infection. Certain reports also point that delays in surgical removal of necrotic tissue have resulted in high mortality [21]. In our case we were working with the infection disease team from day 1. That helped in early advice for reoperation and the decision of antibiotic beads.

Another key concern regarding *Aeromonas* infections is their resistance to antibiotics such as Penicillin, Ampicillin, Carbenicillin and Cefazolin [22]. Thus, standard empirical therapies, that are effective against streptococcal or staphylococcal soft tissue infections, do not provide coverage for *Aeromonas* infection. The organism is usually found to be susceptible to broad spectrum cephalosporins, aminoglycosides, carbapenems, chloramphenicol, trimethoprim – sulfamethoxazole and quinolones [15].

4. Conclusion

This case report shows rare infection of donor bone graft site by a *A. hydrophila* in an immunocompromised patient due to multiple comorbids. Symptoms of disease progression may vary in such patients. Soft tissue infection may rapidly progress to fatal sepsis. Early identification and proper surgical intervention, along with appropriate antibiotic therapy, lead to better outcome. A multidisciplinary approach should be followed with all these patients to avoid catastrophic results.

Conflict of interest

None.

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Ethical approval

Ethical approval has been given by Ethics Review Committee at our institution, Aga Khan University, Karachi, Pakistan.
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Consent

Written informed consent was obtained from the patient for this case report and accompanying images. Approval has been taken from our institutional Ethics Review Committee.

Author contribution

Obada Hasan-study concept, writing the paper.
Wajiha Khan-data collection, writing the paper.
Muneeba Jessar-data collection, writing the paper.
Aly Zaheer Pathan- writing the paper.
Riaz Hussain Lakdawala- Study concept, writing the paper.

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Guarantor

Obada Hasan, Wajiha Khan, Muneeba Jessar, Aly Zaheer Pathan, Riaz Hussain Lakdawala.

Provenance and peer review

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