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Case Report

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Soft Tissue Infection Caused by Raoultella planticola Oxa 48 like: A Case Report

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Abstract

This article analyzes the management of a rare clinical entity: soft tissue infection caused by Raoultella planticola. This is a gram-negative, anaerobic, non-motile bacillus that habitually resides in soil and aquatic environments[1]. Generally considered innocuous and of low virulence, it can become aggressive and challenging to manage due to its similarity with Klebsiella spp[1,3]. Here, we present the approach and results of the first reported case of soft tissue infection caused by this microorganism, treated at the Carlos Andrade Marín Specialty Hospital.

Keywords: Necrotizing Fasciitis, Infection, Soft Tissues, Raoultella planticola, Klebsiella, Wounds, Negative Pressure Therapy, Antibiotic Therapy.

Introduction

Raoultella planticola is an anaerobic, gram-negative, non-motile bacterium that belongs to the Raoultella genus. It is commonly found in water, soil, and aquatic environments[1,3]. Initially classified as a member of the Klebsiella genus[5], it was reclassified as Raoultella spp[8]. in 2001 based on genomic studies of 16S rRNA and rpoB.[4] sequencing. This bacterium is a rare human pathogen, with the first reported human infection dating back to 1984 in a patient with sepsis[9]. Since then, most reported cases have been associated with bacteremia

As an enterobacterium, Raoultella planticola causes pathology when predisposing factors make the host susceptible, behaving as an opportunistic pathogen. These two factors are categorized as[7]:

1. Local Factors: They facilitate microbial penetration through the disruption of mucocutaneous barriers (such as surgical or traumatic wounds, burns, catheters, drains, and other devices), as well as prosthetic materials. This also includes certain therapeutic procedures.

2. General factors: Direct or indirect alterations in the immune system caused by chronic or systemic diseases, pharmacological immunosuppression (e.g., in transplant or oncology patients), and extreme ages (neonates or the elderly).

These predisposing factors make enterobacteria the main etiological agents of nosocomial infections associated with healthcare services.

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Background

During the 1950s and 1960s, broad-spectrum antibiotics were introduced for treating gram-negative bacteria. Enterobacteria have since developed various mechanisms to evade antimicrobial

action, notably through beta-lactamase enzyme production. Resistance to carbapenems in enterobacteria arises through two mechanisms:

1. Decreased expression of outer membrane porins, complicating antibiotic penetration into the periplasmic space.

2. Acquisition of genes encoding enzymes capable of degrading carbapenems. [3,8]. Therefore, in various microbiology and molecular biology studies, an extensive variety of carbapenemases has been identified as part of the different enterobacteria. These enzymes belong to three molecular classes based on Ambler's classification of beta-lactamases, specifically classes A, B, and D.[8].

Microbiological and molecular biology studies have identified a wide variety of carbapenemases among enterobacteria. According to Ambler's classification of beta-lactamases, carbapenemases are categorized into three molecular classes: A, B, and D. The D class includes the OXA-48 carbapenemase, almost exclusively described in the Enterobacteriaceae family. The first OXA-48-producing enterobacterium was identified in a K. pneumoniae strain isolated in Turkey in 2001[8,9].

The OXA-48 protein provides these bacteria with hydrolytic characteristics different from those of other group D carbapenemases. They have the ability to hydrolyze penicillins and cephalosporins, but their hydrolytic capacity against oxyiminocephalosporins (cefotaxime, ceftriaxone, ceftazidime, cefepime) is weak. Cultures obtained worldwide support the observation that a marked sensitivity to these antibiotics predominates.[3,8,9]. It has also been identified that Turkey, the Middle East, and North Africa are considered endemic areas due to the proliferation of OXA-48 carbapenemase-producing enterobacteria. In contrast, in the Americas, Russia, China, and Australia, only sporadic cases of "OXA-48-like" carbapenemase-producing enterobacteria have been reported. [9]. This article aims to analyze a clinical case involving a soft tissue infection caused by Raoultella planticola OXA-48 like.

Method

This observational study examines clinical records, photographs, and antibiograms documenting the evolution of the infected wound. A multidisciplinary approach was adopted, incorporating initial clinical management and surgical procedures. The therapeutic strategy's efficacy is evaluated.

Case

A 39-year-old female patient, with no prior personal medical history, underwent a lipo-transfer procedure at a private medical center 25 days before hospital admission. This aesthetic procedure involves extracting fat from specific body areas via laser liposuction or lipolaser and transferring it to another area to correct imperfections, typically for cosmetic purposes, such as adding volume. Following the procedure, the patient experienced no immediate complications and was discharged with a prescribed antibiotic regimen of amoxicillin + clavulanic acid and clarithromycin, though the dosage and duration of treatment were not specified.The patient reported that days after discharge, she noticed edema and erythema in the left gluteal region. She also mentioned sustaining direct trauma to the same area four days post-surgery (the mechanism of the trauma was unspecified). This event led to severe pain, limited ambulation, and intense discomfort. In response, she self-medicated with cefuroxime but did not experience any improvement. Subsequently, the patient sought care at a private clinic, where she was diagnosed with necrotizing fasciitis. At this facility, she underwent two surgical debridements, and a negative-pressure wound therapy system was applied after the second procedure. No laboratory test results or culture data were provided.

During her treatment at this clinic, the patient was administered tigecycline, vancomycin, and meropenem (dosages and treatment duration were not specified). According to the transfer summary, these antibiotics were discontinued prior to her discharge. Under these conditions, the patient was admitted to the Complex Orthopedic Lesions Unit at the "Carlos Andrade Marín" Specialty Hospital for evaluation, monitoring, and comprehensive management. During hospitalization in the Complex Orthopedic Lesions Unit, laboratory tests were performed, yielding the following results: CRP: 19.90 mg/L, Leukocytes: 12.15 x10³/µL, Hemoglobin: 7.3 g/dL, Hematocrit: 21.9%, Platelets: 244,000/µL, Urea: 50.9 mg/dL, Creatinine: 0.3 mg/dL, Total Proteins: 3.60 g/dL, Albumin: 1.0 g/dL.

Based on these findings, an integrated multidisciplinary clinical approach was initiated, involving Internal Medicine, Plastic Surgery, Nutrition, Psychology, and Infectious Disease services. The goal was to improve the patient's condition prior to surgical management by optimizing nutritional status and maintaining the previously prescribed antibiotic therapy.

Once the patient's general condition improved, with increased protein levels, surgical debridement and sample collection for culture were performed. Additionally, a Negative Pressure Wound Therapy system (V.A.C.®) was applied.

During the surgical procedure, an extensive wound measuring approximately 50 cm in length and 20 cm in width was observed, with significant loss of soft tissues, including muscle, fascia, subcutaneous tissue, and skin [Fig. 1].

Culture results revealed the presence of Raoultella planticola MRE (Multi-Resistant Enterobacteria), as detailed in the antibiogram in Table No. 1. Consequently, contact isolation was implemented.

TISSUE CULTURA.....: MICROORGANISM IDENTIFIED: *RAOULTELLA PLANTICOLA*	
AMIKACIN	SENSITIVE - <= 2
CIPROFLOXACIN	SENSITIVE - <= 0,25
GENTAMICIN	SENSITIVE - <= 1
IMIPENEM	RESISTANT - 8
MEROPENEM	RESISTANT - 8
PIPERACILINA + TAZ	RESISTANT - >= 128
COLISTIN	SENSITIVE - <= 0,5
TIGECICLINA	SENSITIVE - <= 0,5
RESISTANCE MECHANISMS : MICROORGANISM RESISTANT TO CARBAPENEMS OBSERVATION: CARBAPENEMASE **TYPE OXA 48** CONFIRMED BY INSPI (*National Institute of Public Health Research Of Ecuador*)	

Table 1: Culture and Antibiogram Results

Therapeutic Approach:

The patient presents a complex infection. A comprehensive analysis of the patient is conducted, prioritizing clinical evaluation over surgical intervention. This is because, without adequate clinical conditions, surgical procedures could constitute an aggressive measure, potentially exacerbating the lesion or even resulting in death. For this reason, medical-nutritional compensation is initiated (including blood products, protein supplementation, electrolytes, etc.), along with early psychological intervention to address the depression or stress often associated with such conditions.

The initial surgical plan was highly conservative, considering the presence of chronic inflammation and the lack of clear necrosis definition. Overly aggressive resection at this stage could remove tissue that might later prove viable. The primary focus was obtaining a culture sample through a biopsy, resecting an evidently inflamed and necrotic portion of tissue, which was sent to the laboratory for analysis. Negative pressure wound therapy (NPWT) was applied to help delineate viable from non-viable tissues and to protect delicate structures (vessels and nerves) using PVA foam.

In subsequent interventions, after NPWT clearly defined viable tissues, necrotic tissues were resected until uniform granulation tissue was observed. Cultures were recommended at each stage, and the antibiotic regimen was adjusted based on the results.

Once granulation tissue was evident, collagen matrix (Integra®) was applied, supported by NPWT. This approach encouraged granulation tissue formation and created a subdermal filler, aiding both functionality and aesthetics of the affected area. It is noteworthy that the antibiotic regimen was maintained according to culture results throughout this phase.

Finally, after achieving an adequate granulation bed and ensuring the elimination of bacteria that could colonize grafts (e.g., Pseudomonas spp., Raoultella spp., Klebsiella spp., and Enterobacter spp.), epidermal-dermal grafts were placed.

Results

The management of soft tissue infections caused by Raoultella planticola represents a relatively new challenge in human infections. In the case described, a severe soft tissue infection occurred in a 39-year-old female patient who had undergone a cosmetic surgical procedure. The presumed primary causative organism was Raoultella planticola, originally identified as an environmental bacterium. Upon confirming its presence through antibiogram results, a multidisciplinary management approach was implemented. Initial clinical stabilization was achieved through the administration of blood products and protein nutritional supplements. Early psychological intervention was also provided to address in-hospital depression and stress.

During the first surgical debridement, a sample was obtained, identifying the presence of Raoultella planticola OXA-48-like. With precise and confirmed data, a multidisciplinary meeting was held involving the departments of Infectiology, Microbiology, Epidemiology, Psychology, Nutrition, and Orthopedics. A consensus was reached that treatment should follow the existing literature, focusing on improving the patient's clinical condition, enhancing psychological well-being, performing systematic surgical debridements, administering antibiotics based on antibiogram results, implementing strict contact isolation measures, and conducting epidemiological and microbiological monitoring of the identified bacterium.

Prior to the surgical debridement, a new antibiotic regimen was initiated, consisting of tigecycline, ciprofloxacin, and clarithromycin. The following surgical debridements aimed primarily at controlling and eliminating the infection, as well as promoting the recovery and formation of granulation tissue for future coverage. Consequently, based on experience in managing this type of wound with significant tissue loss, the surgical treatment continued with the use of Negative Pressure Wound Therapy (V.A.C.®).

In the second surgical debridement, improvement was already evident in terms of tissue viability, reduction of slough and necrotic tissue, and significant granulation tissue production [Fig. 2]. During the third surgical debridement, it was decided to improve infection control by applying Negative Pressure Wound Therapy (V.A.C.®) with V.A.C. GranuFoam Silver® dressings, resulting in noticeable tissue improvement. No necrosis was observed, although a small amount of slough remained [Fig. 3 and Fig. 4]. In the fourth surgical debridement, abundant granulation tissue was observed, and macroscopic examination showed no signs of infection, no necrotic tissue, or slough. The wound edges were approximated, reducing the wound diameter [Fig. 5 and Fig. 6]. To further encourage granulation tissue formation, it was decided to apply Negative Pressure Wound Therapy (V.A.C.®) with Prontosan® instillation. Once this therapy was initiated, the decision was made to proceed to the operating room for another debridement, with cultures reporting "No Growth," suggesting that the bacterial infection was effectively managed and eliminated.

In the fifth procedure, abundant granulation tissue was observed, and the final tissue induction was performed using a collagen dermal matrix (Integra®), in addition to continued therapy with Negative Pressure Wound Therapy [Fig. 7]. In the sixth debridement, it was decided to remove the collagen inducer, revealing adequate granulation tissue. The decision was made to begin advanced wound healing during hospitalization, with the eventual coverage to be provided by the plastic surgery department. In subsequent.

Dressings, an early process of epithelialization was observed, with no macroscopic evidence of infection [Fig. 8]. The results of the latest cultures confirmed the eradication of Raoultella planticola OXA-48-like.

The next intervention was a surgical debridement performed by the plastic surgery team, who took a culture sample to assess the possibility of a skin coverage procedure. During this debridement, a favorable evolution of the wound was observed, with no signs of infection, no exudate production, no slough, and no necrotic tissue [Fig. 9]. In a final intervention by the Plastic Surgery department at the Hospital of specialties "Carlos Andrade Marín," skin coverage of the wound was performed. [Fig. 10, 11 y 12].

Eight days after the intervention, the dressings were removed, and graft integration was observed. [Fig. 13]. The patient was discharged by the plastic surgery department and was advised to have weekly follow-up appointments in the outpatient clinic to evaluate the vitality of the graft. Similarly, the infectious disease department also cleared the patient, as no signs of infection were present, confirmed by a culture showing no bacterial presence. The patient was discharged with a 30-day course of ciprofloxacin. The traumatology department also authorized the patient's discharge, with regular follow-up in the outpatient clinic. Over the next two weeks, graft monitoring showed adequate integration, with no signs of infection and clear improvement. Finally, the patient was given definitive discharge and advised to begin physical rehabilitation. Fig. 13, 14, 15 y 16].

Figure 1:

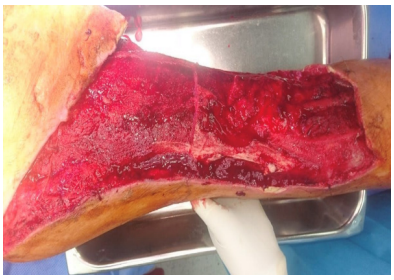

Figure 2:

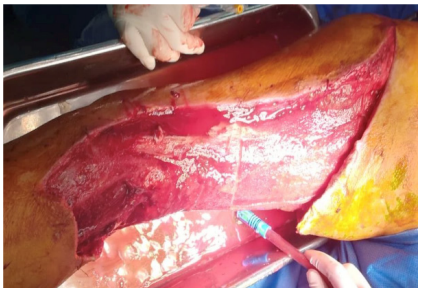

Figure 3:

Figure 4:

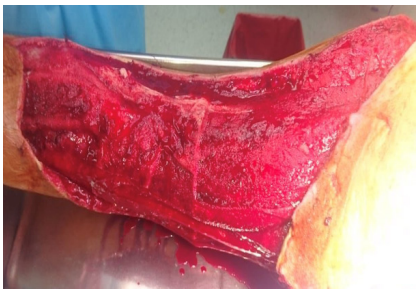

Figure 5:

Figure 6:

Figure 7:

Figure 8:

Figure 9:

Figure 10:

Figure 11:

Figure 12:

Figure 13:

Figure 14:

Discussion and Conclusion

The management of soft tissue infections caused by Raoultella planticola is a novel and rare entity. Treatment yields good results when a multidisciplinary approach is employed, with emphasis on clinical compensation of the patient, both systemic-somatic and psychological. Additionally, the involvement of the Infectious Disease department through antibiotic therapy based on culture and antibiogram results is crucial. Furthermore, the planning of surgical procedures, including systematic debridement and the use of Negative Pressure Wound Therapy (V.A.C.®), is essential. These procedures are used to control and delineate the infection by removing fluids, stimulating granulation tissue formation, and creating bridges to allow the wound to close promptly and appropriately. [2]

The second phase stimulates granulation through the instillation of antiseptic-proteolytic agents, such as Undecylenamidopropyl Betaine 0.1%, Polihexanide (Prontosan®) 0.1%, and later with collagen matrix to enhance granulation and fill defects.

With this approach, we have been able to achieve recovery in a shorter time and with better aesthetic and functional outcomes for our patients with severe infectious lesions. In the case described, the application of Raoultella planticola demonstrated the success of the protocol for this type of injury. It is important to note that a short period of management without negative pressure therapy is required. The absence of germs is confirmed with the lysis of epidermal-reticular grafts after demonstrating adequate granulation, through advanced wound healing, which should be placed as soon as the appropriate conditions are available.

Conflicts of Interest

The authors declare no conflicts of interest.

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