

Eikenella corrodens necrotising myositis in an immunocompetent adolescent

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SUMMARY

A case of a rare organism of *Eikenella corrodens* in an immunocompetent adolescent is described. A previously healthy 17-years-old student has a persistent non-healing wound post-operatively following Compartment Syndrome after being diagnosed with a closed right radius styloid fracture. No history of human bite prior to the incident. Tissues sample intra-operatively grew *Eikenella corrodens* identified by Bruker® Maldi-TOF which is sensitive to ampicillin, amoxicillin/clavulanic acid, penicillin, ceftriaxone, imipenem and meropenem. The patient was prescribed intravenous ceftriaxone and responded well to the treatment.

INTRODUCTION

A rare but potentially lethal condition, necrotizing soft tissue infections have a high mortality rate with a death incidence of 25 to 30 %.¹ *Eikenella corrodens* is a bacterium of the HACEK group, belonging to the *Eikenella* of the Neisseria family. Although initially thought to be non-pathogenic as it can be normal commensals of the oral cavity, it has been established that the *Eikenella* species can cause serious human infections.²

Eikenella corrodens are a rare cause of necrotising soft tissue infections. To our knowledge, there were three case reports on necrotising fasciitis following elective inguinal hernia surgery and one retroperitoneal necrotising fasciitis post-endoscopic retrograde cholangiopancreatography caused by *Eikenella corrodens*.^{3,4} Most cases of necrotising soft tissue infections are caused mainly by polymicrobial organisms with Gram-negative aerobe involved more often than Gram-positive organisms. In monomicrobial infection, the causative agent is usually *Streptococcus pyogenes*. Thus, we present a case of necrotising myositis by *Eikenella* following fasciotomy.³

CASE PRESENTATION

A previously healthy 17-year-old gentleman presented to the hospital with a complaint of right upper limb pain for one week that started after a series of 'push-ups'. The pain was associated with swelling over the right wrist. He accidentally hit his right hand on the wall the day before. He denied any animal or human bites. X-ray showed a closed right radius styloid fracture (Figure 1). Right hand above elbow back slab was applied and he was discharged home. Four days later, he

presented with worsening swelling, redness and skin tightness. Otherwise, he had no fever, shortness of breath, or recent fall or trauma.

On examination, he was alert, conscious and afebrile. There was a generalized swelling of the hand extending to the midarm that was tender upon palpation. The compartment is tense with non-palpable brachial, radial or ulnar pulse. The sensation was also reduces over radial and median nerve distribution. He was then planned for emergency right-hand fasciotomy and carpal tunnel release in view of associated Compartment Syndrome. Post-operatively, there was foul-smelling pus discharge with necrotic patches on the skin. He underwent second extensive wound debridement and a necrotizing myositis was diagnosed. Intraoperatively, 600ml seropurulent pus was drained from the intermuscular plane.

Two tissue samples from deep muscle were cultured on Blood Agar (BA), MacConkey Agar (MAC) and Blood Anaerobic Agar (Baano2), in aerobic and anaerobic conditions. The gram-stain of tissue samples showed occasional pus cells with few gram-negative rods. The blood agar showed tiny colorless colonies with pitting appearance and no growth on the MacConkey agar (Figure 2). Colonies were identified as *Eikenella corrodens* by Bruker® Maldi-TOF with a score value of 2.04. The isolate was susceptible to ampicillin, amoxicillin/clavulanic acid, penicillin, ceftriaxone, imipenem and meropenem.

The laboratory examination indicated a normal full blood count but hyponatremia, hypoalbuminemia, mild transaminitis and elevated erythrocyte sedimentation rate (ESR) (Table 1). These findings are possibly due to the underlying ongoing muscle inflammation. Infective screenings for Hepatitis B, Hepatitis C, Human Immunodeficiency Disease (HIV) and syphilis were non-reactive. The blood culture for aerobes and anaerobes revealed no growth after five days of incubation.

The patient was initially started on intravenous piperacillin/tazobactam 4.5g QID and intravenous clindamycin 600mg QID. Upon identification of the tissue culture, intravenous ceftriaxone was commenced and he was transferred to another referral facility for the continuation of care. After another wound debridement, his condition improved and the limb was able to be salvaged.

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Table I: Summary of patient’s investigations. Blood parameters show features of underlying inflammation

Indices	Value	Normal value
Haemoglobin (g/dL)	13.0	1.5 - 15.5
White blood cell (x10 ⁹ /L)	12	5.00 - 13.00
Absolute Neutrophil (x10 ⁹ /L)	10.42	2.00 - 8.00
Platelet (x10 ⁹ /L)	178	170 - 450
Erythrocytes Sedimentation Rate (mm/hr)	51	0 - 10
Sodium (mmol/L)	124	136 - 145
Potassium (mmol/L)	3.7	3.5 - 5.1
Urea (mmol/L)	9.7	3.2 - 8.2
Creatinine (umol/L)	114	62 - 115
Albumin (g/L)	27	32 - 48
Total Bilirubin (umol/L)	42	5 - 21
Direct Bilirubin (umol/L)	30	0 - 5
Aspartate Transaminase (U/L)	104	0 - 34
Alkaline Phosphatase (U/L)	182	46 - 116
Alanine Transaminase (U/L)	58	10 - 72
HbA1C (%)	5.7	< 5.7
HBsAg	Non-reactive	
Anti-HCV	Non-reactive	
HIV-Combo	Non-reactive	
Syphilis serology	Non-reactive	



Fig. 1: X-ray of right wrist joint show a closed right radius styloid fracture as marked by the orange circle

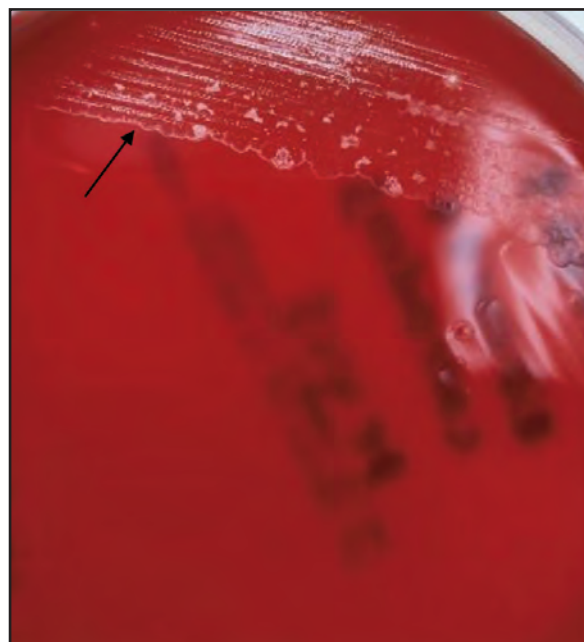


Fig. 2: Tiny irregular colourless colonies with pitting appearances (black arrow) of *Eikenella corrodens* on blood agar

DISCUSSION

Necrotizing soft-tissue infections (NSTIs) are rare, life-threatening bacterial infections with a high morbidity and fatality rate. It is estimated that between 0.3 and 15 cases of necrotizing fasciitis occur per 100,000 people.⁵ Necrotizing soft tissue infections can be divided into three types based on the depth of the tissue necrosis and infection. Necrotizing cellulitis affects the dermis and subcutaneous tissue, necrotizing fasciitis affects the fascia, and necrotizing myositis affects the muscle layer with intact overlying skin.¹ Necrotizing fasciitis and clostridial myonecrosis, are more easily diagnosed than necrotizing myositis, which requires a high index of suspicion. The infection spreads along the

fascial planes, eventually affecting deeper muscles, causing myositis and myonecrosis.⁵

Certain variables increase a patient's risk for NSTIs, such as any skin or mucosal break and many surgical procedures.⁵ In this case, the patient initially had a closed fracture that was complicated with compartment syndrome causing him to undergo fasciotomy and carpal tunnel release. Once there was a break in the skin integrity, the risk for any organism to invade the muscle is high. Immunosuppression conditions, cancer, vascular disease, diabetes, alcoholism, and obesity enhance the risk of NSTIs leading to severe sepsis and septic shock.⁵ However, in this case, the patient did not have any

comorbidities but he had a persistent non-healing wound that required multiple wound debridements. However, he did not progress to fulminant sepsis due to early surgical intervention.

The genera *Haemophilus* (except for *H. influenzae*), *Aggregatibacter*, *Cardiobacterium*, *Eikenella*, and *Kingella* (HACEK) comprise a group of gram-negative bacteria that are normal flora of the oral cavity and gastrointestinal tract and are known to cause infective endocarditis.⁶ *Eikenella* is a tiny, non-sporulating, facultatively anaerobic, and non-motile bacterium. It grows slowly in blood agar or chocolate agar at 35 to 37°C and 5% carbon dioxide and is able to grow under aerobic conditions. The colonies are rough with irregularly shaped, grey and non-hemolysis.²

Eikenella corrodens is most associated with head and neck infections even though some of the literature also did report bite wound infections, respiratory tract infections, abdominal infections, gynaecologic infections, meningitis, spinal infection, endocarditis, osteomyelitis and urinary tract infections.^{2,6} It can cause infection in susceptible individuals with aspiration, alcoholism, immunosuppression, cardiovascular disease, and diabetes, among others. However, in this case, the patient was a healthy young man with no previous hospitalization. He had surgery that led to an open wound that allowed this fastidious organism to invade his muscle tissue. Most likely the source of the infections would be the oral cavity or saliva. This organism led to a chronic non-healing wound despite multiple wound debridements and consistently produced pus collections.

Even so, *Eikenella corrodens* as a causative agent for necrotising soft tissue infection is quite uncommon. A literature review of *Eikenella corrodens* infections in children and adolescents revealed that head and neck infections account for the majority of causes which are mostly abscesses in nature followed by extremities abscesses and central nervous system abscess.⁷ None of the cases reported a necrotising infection. However, there was a reported case of necrotising fasciitis that occurred after the elective inguinal hernia repair in a middle age man without no obvious cause of contamination during the surgery.³

Diagnosis of these fastidious organisms was previously difficult because they need prolonged incubation time with specific temperatures and environments. Because of their complex nutritional requirements, they only grow on blood agar and chocolate agar. Not able to grow on differential media or MacConkey agar. They are biochemically inactive, do not ferment glucose or carbohydrate or produce any acid. This makes the microbiological diagnosis challenging. However, the introduction of Bruker® Maldi-TOF, an identification tool that uses a laser to vaporize and ionize molecules in the organism and generate mass spectrum using spectrometry that would be compared to a database and identified the unknown organism. The score value of 2.00 to 3.00 gives a high confidence identification up to the species level.⁸

The preferred treatment for *Eikenella corrodens* infection suggested by the National Antimicrobial Guideline would be

oral amoxicillin/clavulanic acid 625mg TDS for mild infections or intravenous ceftriaxone 2mg OD for severe infections.⁹ For this patient, he was started with piperacillin/tazobactam which according to Sanford Guide to Antibiotic Therapy 2022 had shown some activity towards this organism.¹⁰ However, as in vitro antibiotic testing, piperacillin/tazobactam was not included in the panel for primary testing as suggested by the Clinical & Laboratory Standards Institute (CLSI).¹¹ According to the literature review of six reported cases by Li et al (2), two out of six reported cases were treated with piperacillin/tazobactam before the identification of *Eikenella corrodens* was made.² Both cases presented with abscesses in different locations that were not resolved solely with antibiotics and surgical intervention. After a change of antibiotic according to the susceptibility tested in the laboratory, the patient's condition improved and was able to be discharged from the hospital.

CONCLUSION

Eikenella corrodens can be associated with severe non-healing necrotizing myositis despite no apparent cause in this case. Maldi-TOF is an excellent tool to identify the rare fastidious organism that can be missed due to inherent difficulties in culture and biochemical tests. Timely results are important to guide treatment decisions apart from prompt wound debridement and compartment release to prevent the extension of the disease. More studies in the diagnostic field of the organism are needed so that these organisms were not under-identified due to its fastidious characteristics.

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CONFLICT OF INTEREST

There was no competing interest exists between authors.

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Case Report

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