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Case Report of Rare Necrotizing Fasciitis with Pseudomonas in a Healthy Infant

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ABSTRACT

Necrotizing fasciitis is a rare and lethal bacterial infection of the subcutaneous tissue and fascia in pediatrics, particularly when Pseudomonas Aeruginosa is involved. The similarity between cellulitis and Necrotizing fasciitis can lead to misdiagnosis. A 5-month-old male is introduced, presenting with fever and ecchymoses on his left thigh, which was treated as cellulitis. However, the diagnosis was changed to necrotizing fasciitis due to rapid progression in infection and pseudomonas growth in cultures. The antibiotics were leveled up, and the surgeon debrided and grafted the skin. Finally, the patient was discharged in good condition. In the early stages of soft tissue infections, it is not possible to distinguish Necrotizing fasciitis from cellulitis, so empirical antibiotics should be started to cover poly-microbial infections, and the patient should be observed closely. When the infection does not respond to the antibiotics appropriately over 24 hours, the surgeon.

Introduction

Necrotizing fasciitis (NF) is a rare bacterial soft tissue infection in children, with an incidence of 0.08 cases per 100,000 population. It expands rapidly in the subcutaneous tissue and fascia, causing necrosis in tissue and fulminant sepsis. Therefore, it can be fatal due to septic shock or lead to amputation [1-3]. Early symptoms are nonspecific, such as edema, induration, and erythema. Necrosis in the skin occurs in the late stages. As a result, NF can be misdiagnosed as other skin infections like cellulitis, leading to a delay in treatment, which is the most common mistake in managing NF [4]. The treatment includes appropriate intravenous (IV) broad-spectrum antibiotics and repeated surgical debridement. Other treatments that can be helpful are intravenous immunoglobulin (IVIG) and hyperbaric oxygen [5-7]. In contrast to adults, most children are immunocompetent and affected secondary to minor trauma or skin puncture, such as injections, insect bites, laceration, circumcision, inguinal hernia repair, umbilical vein catheterization, or secondary to varicella or herpes infection, etc. [4,7]. The most affected part of the body in children is the trunk [5].

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Necrotizing fasciitis is categorized into two types: first, polymicrobial, with aerobic and anaerobic bacteria; second, monomicrobial. Unlike adults, monomicrobial has more prevalence in children, in which Group A Streptococcus is the most common cause, and Pseudomonas aeruginosa is extremely rare [8-10]. Pseudomonas aeruginosa often infects children with predisposing factors such as malnutrition, chemotherapy, acute lymphoblastic leukemia (ALL), neutropenia, and juvenile rheumatic arthritis (JIA) [3,8]. A case report of necrotizing fasciitis with pseudomonas in an immunocompetent infant with no predisposing factors who was initially treated for cellulitis is presented. There are two good reasons to introduce this case: the rarity of the case and how to differentiate NF from cellulitis.

Case Presentation

The patient was a 5-month-old previously healthy male infant. He had been bitten by an insect (probably a fly) in his neck and left lateral thigh a night before visiting - about 24 hours - and his grandmother had tried to remedy the two insect bites with herbal preparations (turmeric spice). Following the use of spices, ecchymosis and swelling appeared only in his left lateral thigh within a few hours and expanded rapidly. When he was brought to the emergency department of the hospital, he was stable but irritable and febrile, with a temperature of 38˚C, and was admitted to the hospital. On physical examination, the region of the ecchymosis was not tense and measured 10*5 cm without crepitation or tenderness in place (Figure 1A). The neurovascular examination, active movement, distal peripheral pulses, and other systems were normal. Initial laboratory data on day 1 is shown in Table 1.

Soft tissue and Doppler sonography reported severe swelling and an increase in fat echo with no collection, abscess, hematoma, thrombosis, deep vein thrombosis (DVT), or subepidermal gas. Also, no bone involvement was seen based on the left femoral bone x-ray; therefore, the first differential diagnosis was cellulitis. The immunity system and metabolic disease were examined due to the severity of sepsis and a history of urinary tract infection (UTI) with the culture of Klebsiella when the patient was 35 days old. Tests were conducted for flow-cytometry, immunoglobulins, arterial blood gases (ABG), ammonia, and lactate, all of which were normal [Table 1]. The whole-exome sequence was also normal.

Empirical IV antibiotics Amikacin + Penicillin + Clindamycin were started as cellulitis, but the diagnosis was changed to NF after three days because the lesion became tense, necrosis formed in the borders, and the central lesion expanded rapidly. Additionally, the result of both blood and soft tissue culture after 72 hours was positive for Pseudomonas aeruginosa sensitive to Amikacin, as well as a rise in WBC despite appropriate antibiotics. Hence, the antibiotic regime was leveled up to Meropenem + Vancomycin + Amikacin. Intravenous immunoglobulin (IVIG) was also transfused, and dressings were done regularly. Although surgeons were consulted several times, they refused to debride until day 25 (Figure 1C). A rise in liver function test (LFT) and coagulation test and a decrease in protein S&C were found. Abdominal sonography was ordered first, which was normal, so gall bladder disorders like acalculia cholecystitis and hydrops were ruled out. Therefore, all of these were related to severe sepsis. Fresh frozen plasma (FFP) and VIT k concerning recurrent debridement were transfused.

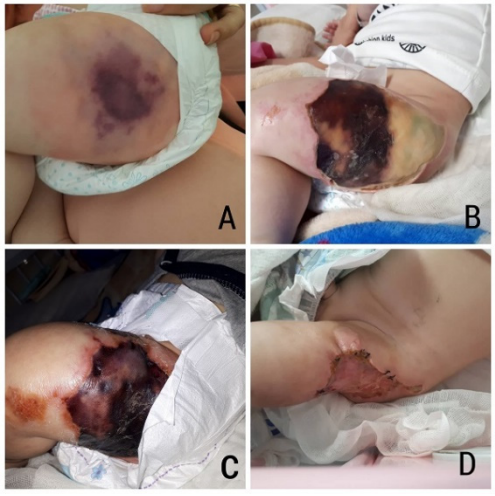

Fig. 1. stages of NF presentation (A: day 1, B: after two weeks, C: day 25, D: after debridement and skin graft)

Table 1. The comparison of laboratory data on primary (Day 1) and definitive diagnosis (Day 3)

DATA	DAY 1	DAY 3
BS [a] (mg/dl)	128	90
BUN [b] (mg/dl)	6	2
Cr [c] (mg/dl)	0.5	0.2
Na [d](m eq/l)	130	135
K [e] (m eq/l)	4.1	4
CRP[f] (mg/l)	33	7
ESR[g] (mm/h)	6	4
WBC[h] (*10^3/UL)	13	18/5
ANC[i] (*10^3/UL)	5.270	7.770
Hb[j] (gr/dl)	9.1	11.1
PLT (*10^3/UL)	525000	242000

[a]Blood sugar
[b] Blood Urea Nitrogen
[c] Creatinine
[d] Sodium
[e] Potassium
[f] C-reactive protein
[g] Erythrocyte Sedimentation Rate
[h] White Blood Cell
[i] Absolute Neutrophil Count
[j] Hemoglobin

The surgical team performed a skin graft on week 4 after stopping the progression of necrosis and inflammatory data (Figure 1D).

Finally, the patient was discharged after 5 weeks in good condition and with close follow-up.

Discussion

Patients with Necrotizing fasciitis (NF) are often initially treated as cellulitis because NF is a rare bacterial infectious disease in pediatrics, and its early symptoms are nonspecific. These symptoms are similar to other skin infections like cellulitis in the early stages, and NF has less prevalence than them. As a result, it is often misdiagnosed and treated as cellulitis [3-4]. Goh's study estimated that three-quarters of patients were misdiagnosed [1]. In your case, there was a challenge in diagnosing and treating NF on time because starting debridement within 24 hours is very important to decrease mortality [1,7-10]. Some studies introduce surgical or clinical ways to distinguish NF from other skin infections.

From cellulitis, the study of Pfepile and his colleagues suggested tissue exploration in suspected NF patients. If there is necrosis and gray-nonbleeding subcutaneous tissue, the surgeon should remove those from the fascia easily and biopsy the fascia to approve NF. Also, Cheung's study recommended the "finger test". In this way, one should probe the fascia after cutting 2 cm from the skin to deep fascia under anesthesia with a gloved finger. Some signs like foul-smell, lack of bleeding, discharge pus, and decrease in fascial resistance in the tough show the NF. As well, using some tools like computed tomography (CT) or magnetic resonant imaging (MRI) are mentioned in some studies but they take time and make delays. Some studies, like a Canadian study, introduced some features presenting NF like generalized erythematous rash and toxic appearance, decrease in platelet counts, thrombosis in skin vessels, and extreme pain that shows necrosis in the nerve.

In this case, there was a challenge in diagnosing NF from cellulitis. The symptoms were in the early stages and were not specific. The gas in soft tissue did not exist, so it was decided to treat the patient with cellulitis. Since loose gas in soft tissue is not an essential point to diagnose NF and the necrosis expanded extremely fast, the diagnosis and treatment changed to NF. The surgeon explored soft tissue in the operation room according to consultation, and the subcutaneous and deep fascia were affected, so necrotic tissues were debrided. As well, in primary cultures, Pseudomonas aeruginosa, which is a rare mono-bacterial cause of NF, was found. In the study of Saz and Morales, they introduced pseudomonas as one of the important organisms which is the cause of infection in pediatrics who especially often have predisposing factors like immunocompromised children. Despite this healthy

case, and even if the cultures resulted in mono-bacterial causes, broad-spectrum antibiotics should be used, especially for Pseudomonas; because it is always a coinfection with other organisms. Broad-spectrum antibiotics were also administered but after changing diagnosis to NF and growing Pseudomonas in cultures, the broad-spectrum antibiotic regime was leveled up to coverage better Pseudomonas infections and debridement was done.

Conclusion

In the early stages of severe soft tissue infections, it is not possible to distinguish NF from cellulitis by physical examinations or soft tissue sonography. Empirical antibiotics should be started to cover poly-microbial infections and the patient should be observed closely for 24 hours. When the infection does not respond to the antibiotics appropriately in this period, the infection expands or the signs of sepsis appear despite the treatment, the surgeon should explore the wound and debride all the necrotic tissues.

A question that needs to be investigated more in the future is mentioned: The Turmeric was used on both of the insect bite sites on the neck and left thigh by the patient's family, why was the NF affected only the thigh?

Ethical Considerations

Compliance with ethical guidelines

There were no ethical considerations to be considered in this article.

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Conflict of Interests

The authors have no conflict of interest to declare.

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