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Case Report

Monobacterial Necrotizing Fasciitis Following Caesarean Section for *Escherichia coli* Chorioamnionitis: A Case Report

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Abstract

A 27-year-old pregnant woman underwent cesarean section for chorioamnionitis due to *Escherichia coli*. Later, she presented local signs of necrotizing soft tissue infection (NSTI) around the surgical scar and developed signs of circulatory shock requiring supportive therapy, intravenous ceftriaxone and early extensive surgical debridement. The patient fully recovered after multiple surgeries. All the bacteriological samples showed the presence of *Escherichia coli* with the same antibiotic resistance profile than in the amniotic fluid. Gynecological procedures are known to be risk factors for NSTI but, to our best knowledge, no monomicrobial infection due to *Escherichia coli* was reported in that setting.

Keywords: Necrotizing fasciitis; Monobacterial; *Escherichia coli*; Caesarean section; Case report

Abbreviations: NSTI: necrotizing soft tissue infection; EUCAST: European committee on antimicrobial susceptibility testing; ICU: Intensive care unit; LRINEC: laboratory risk indicator for necrotizing fasciitis; IVIG: intravenous immune globulin.

Introduction

Necrotizing fasciitis is a rare but highly fatal disease characterized by rapidly progressive tissue destruction associated with signs of systemic toxicity that could evolve to a circulatory shock. Prevalence ranges from 0.3 to 15 cases per 100,000 population [1]. Necrotizing fasciitis belongs to the group of necrotizing soft tissue infections (NSTI) along with necrotizing cellulitis and necrotizing myositis. Treatment is urgent and based on extensive debridement combined with broad-spectrum intravenous antibiotic therapy. Most of NSTI are caused by polymicrobial infection (type I) by both anaerobic and aerobic bacteria, usually Bacteroides, Clostridium, or Peptostreptococcus in combination with *Escherichia coli*, Enterobacter, Klebsiella or Proteus [2]. Monomicrobial NSTI (type II) is usually caused by Group A Streptococcus or other beta-hemolytic streptococci [3]. Staphylococcus aureus can also be isolated. In half of the cases, there is a clear entry point on the skin. In the other half, it is probably a hematogenous translocation from a pharyngeal infection. Pregnancy and gynecological procedures are known to be risk factors for NSTI and necrotizing fasciitis has already been reported as a rare but serious complication of caesarean section [4,5] but, to our knowledge, no monomicrobial infection due to *Escherichia coli* has been reported in this setting.

Figure 1: Picture of the lower abdomen of the patient at day 1 of admission in ICU: the patient presented intense pain around the surgical scar and purple discoloration of the skin on the right side of the scar. There was no collection on palpation of the area and no flowing liquid from the scar.

Figure 2: Picture of the lower abdomen of the patient taken during the initial surgery performed on the day of admission in ICU. This picture shows the large debridement that was required due to extensive soft tissue necrosis. The resection area included the entire caesarean section scar and was extended from the labia majora to the umbilicus as well as on the right flank. The lower part of the right external oblique muscle was also removed.

Figure 3: Picture of the lower abdomen of the patient taken at the end of the initial surgery, after placement of a vacuum-assisted closure device.

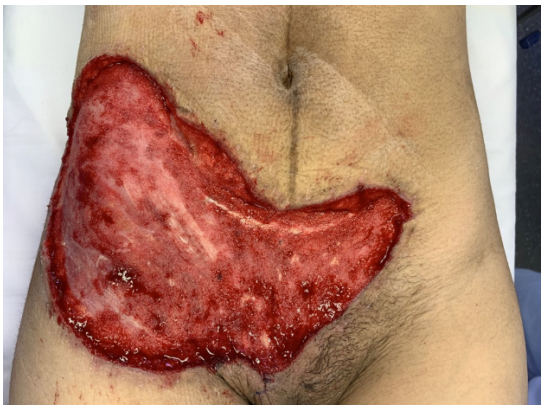

Figure 4: Picture of the lower abdomen of the patient taken after multiple days of vacuum-assisted closure, showing granulation tissue.

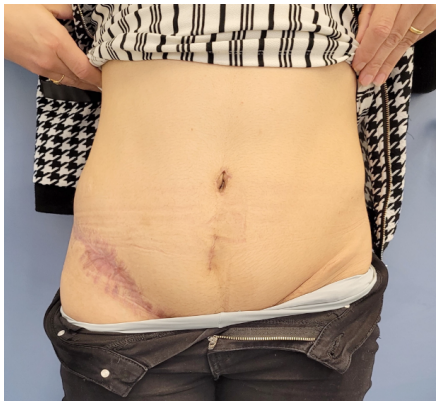

Figure 5: Picture of the lower abdomen of the same patient taken 4 months after initial surgery showing good healing of the wound.

Case Report

A 27-years-old pregnant woman with no medical history underwent cesarean section at 37 weeks of gestation for chorioamnionitis with signs of fetal distress. The surgery took place without any complications, giving birth to a healthy boy. An antibiotic therapy with intravenous amoxicillin-clavulanic acid was administered to the mother. The amniotic fluid cultures showed later *Escherichia coli* with amoxicillin-clavulanic acid intermediate sensitivity according to EUCAST (European Committee on Antimicrobial Susceptibility testing). Four days later, the patient presented intense pain around the surgical scar associated with purple discoloration of the skin on the right side of the scar (Figure 1). No bleeding was observed after needle skin puncture on discolored areas. She quickly developed tachycardia, hypotension, signs of peripheral hypoperfusion and hypoxic respiratory failure. She was immediately transferred to ICU (intensive care unit) and received intravenous crystalloids and noradrenaline infusion. Dobutamine infusion was associated because of impaired left ventricular systolic function demonstrated by transthoracic echocardiography. Bacteriological smears were obtained on the surgical scar, blood cultures were collected and antibiotic therapy with intravenous ceftriaxone was rapidly started. We noticed a very fast extension of the signs of subcutaneous necrosis. Surgical exploration was performed 3 hours after ICU admission regarding severe septic shock and rapidly progressive necrosis. The exploration showed extensive soft tissue necrosis requiring large debridement until bleeding margins were found. The resection area included the entire caesarean section scar and was extended from the labia majora to the umbilicus as well as on the right flank (Figure 2). The lower part of the right external oblique muscle was also involved and removed. The patient rapidly recovered, and catecholamines were discontinued on day 3 of ICU. She was discharged from ICU on day 6 and discharged from hospital on day 35 after vacuum-assisted closure (Figures 3,4) and multiple surgeries to clean the wound. Eventually, a large advancement flap extending over the ribs was performed in order to close the wound primarily. The umbilical stalk was then repositioned as it would be in a traditional abdominoplasty and a closed suction drain was left until the daily drainage was <30mL. Follow-up at 4 months showed good healing of the wound (Figure 5). The preoperative bacteriological smear, the blood cultures as well as the intraoperative bacteriological samples all showed presence of *Escherichia coli* with amoxicillin-clavulanic acid intermediate sensitivity according to EUCAST. Ceftriaxone was effective according to the in vitro tests. This was the only germ isolated in all the samples and it had identical sensitivity spectrum as the *Escherichia coli* found in the amniotic fluid.

Discussion

We reported the case of a young patient with severe septic shock due to *Escherichia coli* necrotizing fasciitis secondary to caesarean section for chorioamnionitis. NSTI can occur in healthy patients without any identified portal of entry, at any age. However, there are usually identified risk factors [6]: penetrating trauma, cutaneous or mucosal breach, recent surgery (especially gynecological, urinary and colonic), immunosuppression, diabetes, cirrhosis, malignancy, pregnancy, obesity and alcohol abuse. The relationship between caesarean section and necrotizing fasciitis is well described and several case reports have been published [4,5]. In our case, there is no doubt about the causal relationship between caesarean and the infection. In the previous case reports, the clinical presentation and the need of early and extended debridement are similar to those of our patient but other patients have usually more risk factors for NSTI and especially, the infection is polymicrobial. Streptococcus pyogenes, Clostridium perfringens or Clostridium sordellii are usually observed in this setting. In this case report, as all the specimens showed the same pathogen and as no other grew, the monobacterial origin could be reasonably confirmed. Thus, the interest of this article is to report a post caesarean section monomicrobial NSTI with Enterobacteriaceae which, to our best knowledge, has not yet been reported. Some data report the emergence of Gram-negative bacteria as a common pathogen in necrotizing fasciitis, with series showing up to 15% of cases associated with monomicrobial Gram negative bacteria, mostly *Escherichia coli* [7]. Most patients had recent surgery or were immunocompromised. Mortality is also higher in this setting, reaching 28% according to Kuehl et al. These specificities could suggest to modify the classification and add a type III fasciitis: monomicrobial secondary to Gram-negative bacteria NSTI. This case also highlights the rapid evolution and severity of this pathology, which is often diagnosed late, leading to life-threatening septic shock or functional sequelae related to the need of an extensive surgical debridement. Necrotizing fasciitis should be suspected in any septic shock associated with one of the following signs: erythema or purple discoloration of the skin, warmth and oedema that extend beyond skin discoloration or pain out of proportion in any cutaneous part of the body. Another helpful clinical sign is the absence of blood after needle puncture in an area of subcutaneous necrosis. Laboratory findings can be helpful for early diagnosis too, as the LRINEC (Laboratory Risk Indicator for Necrotizing Fasciitis) score, which includes total white cell count, hemoglobin, sodium, glucose, serum creatinine, and C-reactive protein8. In this case report, the LRINEC score was 6, which has a positive predictive value of 92 percent. Treatment includes early surgical exploration associated with broad-spectrum intravenous antibiotic therapy and supportive measures. The main

findings during surgical exploration are gray necrotic tissue, gross fascial edema, thrombosed vessels, smelling fluid, noncontracting muscles and the ability to dissect the subcutaneous tissue off the deep fascia with minimal resistance. The key of success is to obtain a complete removal of the infected tissues. Thus, surgical debridement should be done until bleeding occurs from adjacent healthy subcutaneous tissues. All necrotic soft tissues, including fascia, must be removed to reduce the bacterial load, stimuli of inflammation, and facilitate recovery. In addition, as it exposes tissues to oxygen, surgery may help to obtain infection control due to anaerobic bacteria. Operative wounds are regularly left open because of the oedema and the quantity of secretions in the operative site. Second look is usually necessary after 24 to 48 hours and reconstructive surgery should be considered after full eradication of the infection and patient's recovery. Determinants of mortality are older age (> 60 years), surgical delay, streptococcal toxic shock syndrome, clostridial infection, NSTI involving the head, neck, thorax and abdomen and immune compromised patients. The time between symptoms and surgery is directly correlated with mortality. A 24 hours delay is associated with a ninefold increase in mortality [8]. Moreover, a recent systematic review of 2123 patients showed a lower mortality rate if surgery is performed within six hours of presentation compared with later (19 versus 32 percent) [9]. In the case reported here, the very short delay between the recognition of the NSTI and the surgery (3 hours) could probably explain the rapid improvement of the organ dysfunction. Intravenous immune globulin (IVIG) could be administered in the setting of streptococcal infection as recent data suggest a reduced 90-day mortality with classic treatment associated with IVIG [10].

Conclusion

NSTI are a very heterogenous entity characterized by frequent delayed diagnosis and rapid evolution leading to life-threatening shock and large debridement surgery sometimes inducing functional sequelae. Gram-negative bacteria could be an emerging type of pathogen in monomicrobial NSTI and this case report suggests chorioamnionitis as a necrotizing fasciitis starting point. Early diagnosis and very early complete removal of infected tissue are the key of success of the treatment when associated to broad-spectrum antibiotic therapy and support measures.

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