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Case Report

Necrotizing fasciitis of the breast: case report and brief review of literature

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ABSTRACT

Necrotizing fasciitis of the breast is a rare entity, with very few cases reported in the literature. It is rapidly progressive and can lead to sepsis and multi-organ failure without prompt medical and surgical management. In this particular case, a 71-year-old diabetic female presented with primary necrotizing fasciitis affecting her right breast. Upon arrival, she was in septic shock, exhibiting noticeable breast necrosis and nipple discharge. Immediate resuscitation was administered, followed by a muscle-sparing mastectomy. A vacuum-assisted closure (VAC) device dressing was applied during the procedure, and the patient was subsequently managed in intensive care postoperatively. As of now, the patient is free from the disease, and her wound has completely healed.

Keywords: Necrotizing fasciitis, Breast, Case report

INTRODUCTION

Necrotizing fasciitis (NF) is an uncommon yet swiftly advancing and potentially fatal condition marked by extensive tissue necrosis. The latter impacts subcutaneous tissue, superficial fascia, and the skin above, accompanied by systemic toxicity.¹ Although it frequently targets extremities, the abdominal wall, and the perineum, it has the potential to affect any part of the body. Breast involvement is exceptionally rare, with most cases arising post-surgery or trauma.

The pectoral muscle is often spared because of the thick breast tissue between the skin and deep fascia, so the muscle is reached tardily.²

Underlying conditions that increase susceptibility include diabetes, chronic alcoholism, advanced age, vascular disease, and immunosuppression, often preceding incidents of injury or invasive procedures. In this instance, we present a case of necrotizing fasciitis of the breast in a

71-year-old woman who arrived at our hospital in a state of systemic septic shock. She was admitted to the surgical intensive care unit, where she underwent treatment involving resuscitation, intravenous antibiotics, and mastectomy. We elaborate on the case particulars, our treatment strategy, and the outcome, and also provide a brief review of relevant literature.

CASE REPORT

This was a case report of a 71-year-old woman, gravida 5, para 4, 1 miscarriage, menopausal for more than 20 years, presented to her general practitioner with a 2-week history of a painful right breast lump (Figure1). She denied any history of trauma. Her past medical history included a poorly controlled type 2 diabetes (HbA1c 10%) put under both insulin and oral anti-diabetes, abdominal splenectomy for a fractured spleen, and a non-documented renal intervention; The patient was treated initially with antimicrobial agents (Ciprofloxacin 500g×3 per day), but the symptoms worsened progressively with high grade

fever and deteriorated local condition in less than two days (Figure 2). She came back to the emergency department of our facility in a septic shock and the physical breast examination revealed a grossly swollen and markedly tender right breast with discoloration and erythema to the margins extending to the nipple, along with associated central necrosis. Peau d'orange changes were also present. No axillary lymphadenopathy was appreciated. A breast necrotizing fasciitis was suspected, explored by an ultrasound that revealed a fluid deep collection in the two inner quadrants of the right breast with hyper-vascularization on a Doppler examination. Her white cell count was elevated at $19.0 \times 10^9 / l$ and her C-reactive protein was 472 mg/l. Her blood sugar level on presentation was elevated to 25.2 mmol/l.



Figure 1: Initial lesion showing blistering on a swelled, tender and erythematous of the inner quadrants of breast.



Figure 2: Appearance of the breast preoperatively, showing a large area of necrosis.

The patient underwent an emergency radical excision of the breast along with the debridement of the necrotic tissue all around (Figure 3). The necrosis extended down to the level of pectoralis fascia. Once adequately debrided, the wound was extensively irrigated with normal saline. A vacuum-assisted closure (VAC) device was placed over the wound to aid with healing, then the wound was covered with petrolatum gauze and iodine. The patient was referred to the intensive care unit and was put on intravenous (IV) ceftriaxone-metronidazole and amikacin, along with

supportive measures such as aggressive IV fluid resuscitation and vasopressor support for septic shock; Recurrent wound checks and VAC replacement were also performed.

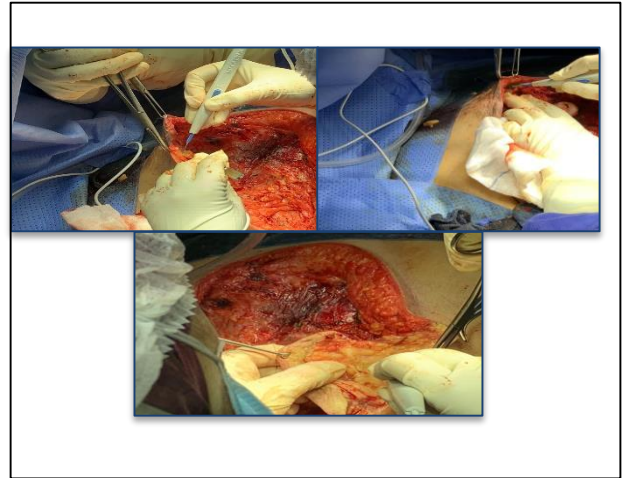


Figure 3: Mastectomy and parage of the suspicious infected tissues.



Figure 4: Appearance of the chest wall post mastectomy.



Figure 5: Appearance of the wound at 24h post-operative.



Figure 6: Appearance of some healthy granulations one week after mastectomy.

A tissue sample was sent to microbiology and was positive for *Klebsiella* spp, histological examination was reported as exuberant inflammatory granulation tissue with suppurative necrosis of connective tissue fascia confirming the diagnosis of necrotizing fasciitis. No features of neoplasm were seen.

The patient showed a spectacular evolution afterwards after the rough initial course she experienced. The wound improved significantly and some healthy granulations started to show up a week later and will be a candidate for a skin graft after a full and healthy granulations appearance (Figure 6).

DISCUSSION

This case report aimed to disseminate information and enhance understanding regarding the clinical presentation, diagnostic strategies, and therapeutic interventions for NF of the breast.

NF was initially described by Hippocrates in the 50th century and later defined by Wilson in 1952 as an aggressive infective process resulting in necrosis of the fascia and subcutaneous tissue with sparing of the muscle.³ It represents a dangerous rapidly progressing, essentially bacterial infection that spreads along fascial planes responsible for the production of bacterial toxins leading to widespread necrosis of tissue adjacent and fascial planes and can subsequently lead to systemic toxicity and sepsis mirroring the condition of our patient.^{4,5}

NF is more frequently observed in individuals with underlying health issues, including immunocompromised states, alcoholism, intravenous drug use, and diabetes mellitus.⁶ *Streptococcus pyogenes* is the most frequently identified causative organism, and is cultured in around one-third of cases.⁷ The infection carries a significant risk of mortality and is higher in patients with comorbidities.

The pathogen gains entry into the subcutaneous space either through a disruption in the overlying skin or through

hematogenous spread from an infection site located at a distance. Polymicrobial NF typically arises from enteric pathogens, while monomicrobial NF is commonly attributed to skin flora.

NF is categorized into four primary types based on its underlying causes: types I, II, III, and IV. Type I NF is most commonly seen and tends to be polymicrobial in nature.⁸ Indeed, it can be triggered by a diverse range of bacterial agents, including Gram-positive cocci like *Staphylococcus* and *Streptococcus* species, Gram-negative bacilli such as *Klebsiella* species and *Escherichia coli*, and anaerobes.⁹

Type I NF commonly occurs in the perineum and abdomen with the etiological bacterial agents introduced through either blunt or penetrating trauma or surgical incisions.⁸

Type II NF is typically monomicrobial in nature and is caused by group A, β -hemolytic streptococcal species such as *Streptococcus pyogenes*.⁴ In some circumstances, it can be associated with concurrent *Staphylococcal* infection.⁶ Unlike type I NF, type II most commonly affects the extremities in healthy, immunocompetent hosts, and is associated with minor injuries or breaks in the skin.⁴

Type III NF is uncommon and is caused by monomicrobial infection with Gram-negative bacteria, such as *Clostridium*, *Klebsiella*, or *Vibrio* species. *Vibrio* species are commonly transmitted to humans by fish or other marine hosts.⁸

Some sources also include type IV NF which is caused by fungal infections and is common following burns or large traumatic wounds.⁴ We classified our case as a type III NF.

The diagnosis of NF can be intricate for many reasons and a high index of suspicion is required to initiate rapid surgical management to decrease morbidity and mortality. Typical early clinical symptoms and signs include swelling, erythema, severe pain out of proportion to the apparent severity of the lesion, and development of fluid-filled bullae should alert the surgeon; As such, it can be misdiagnosed as cellulitis, mastitis, breast abscess, or even inflammatory breast cancer.¹⁰

On the contrary of NF of other organs, the variable thickness of the underlying breast tissue between the skin and the fascia results in a delayed cutaneous reaction and widespread infection before diagnosis and surgical management⁸ which makes the breast not salvageable when it is not suspected and treated promptly.

Systemic manifestations, such as elevated fever, chills, hypotension, and the onset of multiple organ failure, can manifest as bacterial toxins are discharged into the bloodstream. This progression may occur as bacteremia advances to sepsis or becomes compounded by streptococcal toxic shock syndrome.⁴

Table 1: Comparison study.

Author (year)	Patient age	Treatment
Rouiss et al ¹²	36	Debridements
Keune et al ¹³	47	Mastectomy
Soliman et al ⁶	61	Debridements
Yaji et al ⁵	55	Debridements
Yang et al ¹⁰	30	Debridements
Marongiu et al ¹¹	39	Debridements+hyperbaric oxygen
Our case	71	Mastectomy+debridement

The key pathological findings in NF include full-thickness skin necrosis; perivasculitis and vasculitis, often with accompanying fibrinoid necrosis and thrombus formation; and the presence of bacterial or fungal elements on ancillary stains.

Diagnosis primarily relies on clinical assessment, yet imaging modalities such as ultrasound, magnetic resonance imaging (MRI), or computed tomography scan (CT scan) can provide valuable insights. Key sonographic indicators encompass irregularity of the fascias, abnormal fluid collections, or gas tracking along fascial planes, along with diffuse thickening of the fascias.¹¹

Unfortunately, these signs typically become apparent in advanced stages when the clinical diagnosis is already apparent. The detection of gas signifies a further deterioration of the condition.

Another crucial aspect of the diagnosis involves directly examining the fascia through surgical exploration. The identification of pus between the fascial planes or the presence of necrotic tissues, allowing for the separation of fascial planes, is nearly pathognomonic in NF.¹²

When it comes to the treatment strategies, only few cases are published in the literature. The most recent of these reports speculate that a repeated debridement and the broad-spectrum antibiotic may prevent the mastectomy. In cases where a conservative approach is chosen, the wound should be closely inspected and examined to assess the adequacy of the initial debridement every 24-48 hour, if some new nonviable tissues appear during this observation period, additional debridement becomes imperative. The presence of necrotizing material impedes wound healing and may serve as a breeding ground for bacterial growth. The debridement process should be repeated as often as required until the surgeon is confident that all necrotic tissue has been thoroughly eliminated. Although in severe cases, where there's no viable tissue left, and skin conservation is nearly impossible, early radical resection is favorable, hence our choice of an immediate mastectomy in our case since the infection interested the totality of the breast.

Analgesia, intravenous broad-spectrum antibiotics, and intensive care, if indicated, are essential too for a rapid recovery. The antibiotic regimen should be initially empirical and must include three or more antibiotic agents that cover gram-positive, gram-negative, and anaerobic bacterial infections, then switched to meet cultural results according to the antibiogram. The bacteria spread quickly and produce toxins that cause multi-organ failure. For this reason, rapid initiation of antibiotic treatment is important to prevent adverse outcomes the mortality rate is still high reaching 25-35%.^{2,11}

In cases with large necrotic areas, skin grafts or local flaps become necessary in order to protect the wound from environment, pathogens and temperature. Our reconstructive and plastic surgery team is opting for skin graft because it can address wide areas of skin loss.

Marongiu et al reported that a hyperbaric oxygen and negative pressure wound therapy can be helpful in the healing procedure.¹¹ However, additional prospective clinical studies are required to approve this approach in treatment of such acute and fatal diseases.

CONCLUSION

Because NF of the breast is uncommon, it might be initially misdiagnosed. However, if the patient exhibits risk factors and clinical symptoms, necrotizing fasciitis should be considered as a potential diagnosis. Despite its rapid progression and life-threatening nature, prompt identification, surgical intervention, and the administration of broad-spectrum antibiotics can significantly lessen morbidity and mortality. Confirming the diagnosis and ruling out cancer often requires histological examination of the tissue.

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