

## Case Report

Open Access, Volume 3

# Necrotizing Fasciitis of Breast: A Rare but Fatal Entity

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## Abstract

Necrotising fasciitis is a rapidly developing, fatal bacterial infection of deep subcutaneous tissues. It may occur at any site in the body; breast being a rare site. We describe a case of necrotizing fasciitis in the breast that was diagnosed on the basis of ultrasound and CT scan findings. Ultrasound examination revealed diffuse skin thickening, subcutaneous edema and bright echoes likely to represent gas microbubbles. CT scan revealed air pockets in the glandular parenchyma confirming the diagnosis of necrotizing fasciitis. Subsequently the patient underwent mastectomy due to advanced necrotizing fasciitis of breast parenchyma.

**Keywords:** Necrotising fasciitis; Breast.

## Introduction

Necrotising Fasciitis (NF) is a bacterial infection of fascia leading to necrosis of skin, subcutaneous tissue and superficial fascia. This is a rare, rapidly progressing, potentially fatal infection. It spreads rapidly across fascial planes. In spite of newer diagnostic tools and management, the mortality rate is still high in the range of approximately 25% [1]. Most commonly involved areas are groin, abdomen and extremities [2]. Necrotising fasciitis of perineum and genitalia is referred to as "Fournier's gangrene." Necrotising fasciitis of the breast is extremely rare. Mortality rates have been reported as high as 73%, but can be reduced with early diagnosis and prompt institution of appropriate management strategies [3]. Late presentation as well as misdiagnosis, often leads to a total mastectomy or life-threatening outcomes.

## Case report

A 37-year-old patient on vacation to India developed left breast pain with tenderness of a short duration. A diagnosis of breast abscess was made after appropriate evaluation. Incision & Drainage of the abscess was done and she was put on antibiotics. She continued to have symptoms with rapid progression and discoloration of skin. On examination, left breast was enlarged, tender, oedematous with erythema and necrotic patches on the skin. Left axillary lymph nodes were enlarged. She was a diabetic, on oral hypoglycaemic agents. Lab investigations showed elevated total count  $14.03 \times 10^9$  with neutrophil count  $4.3 \times 10^9$ , ESR of  $10^3$  mm/hr and CRP was positive (427).

**Manuscript Information:** Received: Apr 15, 2023; Accepted: May 24, 2023; Published: Jun 01, 2023

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**Citation:** Jacob D, Pratap T, Pai M, Mathew IL, Jalal MJA. Necrotizing Fasciitis of Breast - A Rare but Fatal Entity. *J Surgery*. 2023; 3(1): 1106.

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Ultrasound scan revealed diffuse skin thickening, subcutaneous oedema and bright echoes in the glandular parenchyma possibly due to air pockets degrading the image quality and hence the visualization of deeper tissues was suboptimal.

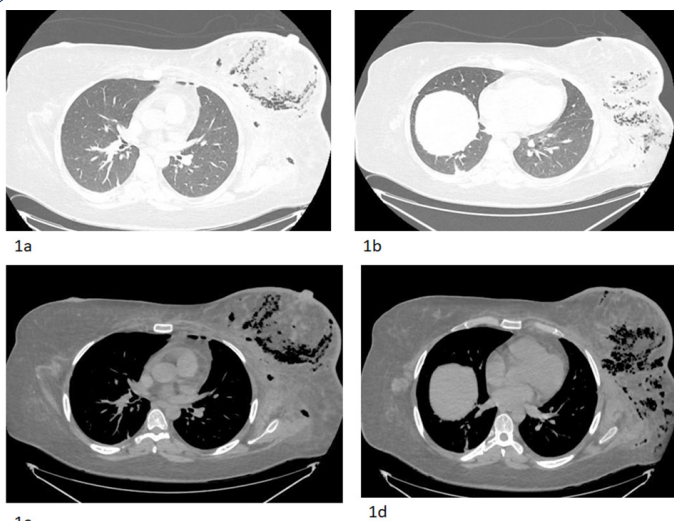
CT scan was done to assess the extent of involvement, which revealed diffuse air pockets confined to the glandular parenchyma of left breast with minimal air in the superficial intermuscular plane. There was no involvement of chest wall muscles. CT scan along with clinical examination confirmed the diagnosis of necrotising fasciitis. Surgical exploration showed extensive necrotic tissues, spreading into the abdominal wall and hence total mastectomy was done.

Gross specimen showed blackish discoloration on the skin surface measuring 9 x 6 cm with another area of ulceration measuring 5 x 2.5 cm. Serial sectioning of the breast showed scattered ill-defined necrotic areas.

Multiple sections from the breast showed a large abscess cavity with intense inflammation, extensive tissue necrosis with necrotic debris, and prominent intravascular thrombosis. The necrosis extends along deep dermis and adipose tissue with involvement and ulceration of overlying epidermis. The inflammatory infiltrate predominantly consists of neutrophils and macrophages with diminished lymphocytes, plasma cells and eosinophils. The inflammatory cell infiltrate was seen between and enveloping the adipocytes. Dermis shows necrotic collagen. Histopathology was consistent with necrotizing fasciitis, involving almost the entire breast and axillary fat, extending up to the margins.

Pus sample from left breast was sent for microbiological analysis. Gram stain showed plenty of pus cells along with occasional Gram negative bacilli and few Gram positive cocci in clusters which on culture grew *Proteus mirabilis*.

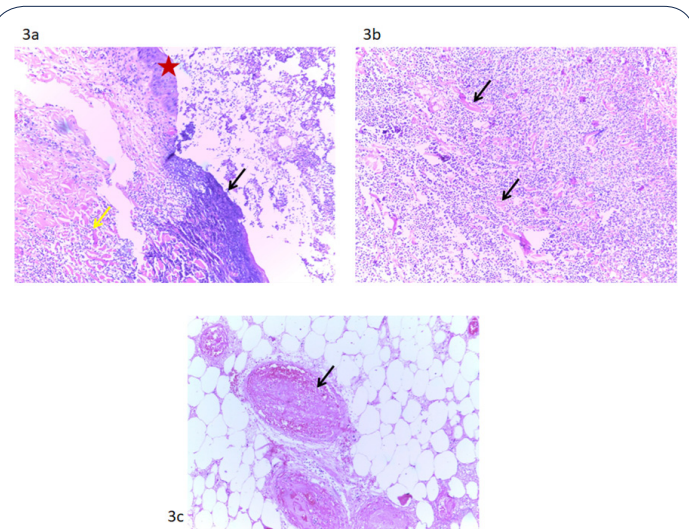
Postoperatively, she was put on IV antibiotics. Her postoperative period was uneventful.



**Figure 1:** Axial CT scan (1 A and B lung window, C and D mediastinal window) showing enlarged left breast with diffuse thickening of skin and subcutaneous tissue. Extensive air noted in the breast parenchyma extending into the posterior third, axilla and upper abdominal wall with minimal air within the superficial intermuscular plane.



**Figure 2:** (a) Preoperative image showing engorged left breast with cellulitis and necrosis. (b,c) Showing necrotic tissue in the deeper tissues close to the chest wall.



**Figure 3:** (a) H&E stain 3a, 3b (low power view), 3c (high power view). Figure 3a showing skin with ulceration and necrosis (arrow). Adjacent epidermis for comparison (asterix). Also seen is dense inflammation (yellow arrow). (b) Sections from deeper breast tissue showing dense acute inflammation with necrotic collagen (arrow). (c) Sections showing intravascular thrombosis (arrow).

### Discussion

Necrotising fasciitis is a rare but serious rapidly progressive infection characterised by widespread necrosis of subcutaneous tissue and fascia with associated systemic toxicity. It is extremely rare in breast and first case of necrotising fasciitis of breast is reported by Shah et al [4]. In the breast, it is usually a unilateral rather than a bilateral infection.

Predisposing factors for the development of necrotising fasciitis include surgical procedures, trauma, minor cuts and burns, and the disease is more common in patients who have diabetes mellitus, peripheral vascular disease or who are immunosuppressed.

It is characterised by widespread fascial necrosis with relative sparing of skin and muscle, and occurs more commonly in patients with comorbidities.

Introduction of the pathogen into the subcutaneous space occurs via disruption of the overlying skin or by haematogenous spread from a distant site of infection. Polymicrobial necrotizing

fasciitis is usually caused by enteric pathogens, whereas monomicrobial necrotizing fasciitis is usually due to skin flora. Tissue damage and systemic toxicity are believed to result from the release of endogenous cytokines and bacterial toxins [5]. Based on aetiology necrotizing fasciitis can be classified as Type I, II, or III [6]. NF is typically a polymicrobial infection, caused by a diverse group of bacteria, both aerobic and anaerobic - including Group A B-hemolytic streptococci, *Staphylococcus aureus*, *Escherichia coli*, *Clostridium* spp, and *Bacteroides* species. Usually the causative agents are introduced via traumatic or surgical insult and this class of NF typically occurs in the perianal and abdominal areas. Type II NF is due to monomicrobial infection with Group A B-hemolytic streptococci, and most often affects the extremities. This type is frequently found in high-risk patients i.e, diabetic, obese, immunocompromised and patients with peripheral vascular disease. The final Type III NF is uncommon and refers to infection caused by *Vibrio vulnificus*, which may be transmitted to humans by fish or marine insect and some authors refer this as necrotizing clostridial infections [7]. The causative organism in our patient was *proteus mirabilis*.

Initially, patients generally present with flu-like symptoms, diarrhea, thirst, and gastric symptoms. The lesion appears red, shiny, tense, and oedematous with no clear border. It is not easy to differentiate from cellulitis in the early stage. Severe pain out of proportion to the apparent severity of the lesion should alert the physician to the possibility of NF because early diagnosis and treatment is crucial to increase the chance of survival [8,9].

Systemic findings, such as high fever, chills, hypotension, and multiple organ failure, may appear as toxins are released into the blood and bacteraemia advances to sepsis or when superimposed by streptococcal toxic shock syndrome [10].

The diagnosis is usually challenging and is made based on the combination of clinical, cultural, laboratory, as well as imaging finding.

Laboratory results show normocytic, normochromic anaemia; elevated total count with left shift; elevated erythrocyte sedimentation rate.

Elevated serum creatinine levels along with haemoglobinuria indicates renal involvement; increased serum creatine kinase levels indicate muscle involvement. Extensive fat necrosis may result in hypocalcaemia [11,9].

Blood culture and Gram stain of infected tissue can help identify the causative organisms and aid in the choice of antibiotics.

Biopsy with frozen section shows massive infiltration of fascia by polymorphonuclear leukocytes, which facilitates an early diagnosis and treatment.

Imaging modalities, i.e., ultrasound (USG), CT, and MRI scans are used to aid the diagnosis. Ultrasound findings usually reveal oedematous thickening of the fascia associated with fluid collections or air. Tsai et al. have described the sonographic finding of necrotizing fasciitis as irregularity of the fascia, abnormal fluid collections along the fascial planes, and diffuse thickening of the fascia [12]. On CT, gas within fluid collections tracking along fascial planes is the most specific finding but is not always present [13]. Other, non-specific findings include fascial thickening associ-

ated with fat stranding, oedema extending into the intermuscular septa and the muscle, thickening of one or both of the superficial and deep fascial layers. Although fascial fluid collections are typically non-focal, abscesses may be seen. In 2012, Kaczynski et al. first reported gas in the subcutaneous tissue of the breast in a 75-year-old patient [14]. Although MRI has a low specificity of 46-86%, it can reveal the extent of deep tissue involvement in more detail than any other imaging modality [14]. MRI is superior to CT in differentiating healthy and necrotic tissue. Even though imaging is a useful adjunct in establishing the diagnosis, it should not cause delay in delivering definitive care. Detection of gas in CT has got high specificity but low sensitivity to diagnose NF. MRI is time consuming and may not be readily available [15]. There is difference between the necrotising fasciitis of breast and other organs. Because of thick tissue between skin and deeper tissue, the cutaneous symptoms occurs late and by that time the breast may not be salvageable. Because of bridge between deeper tissue of contralateral breast, infection can rapidly spread to opposite side, this is the reason for bilateral involvement of necrotising fasciitis of breast.

Direct inspection of the fascia by surgical exploration is the fastest way to arrive at the diagnosis [16]. Pus between the fascial planes or necrotic tissue may be seen, and easily separable fascial planes during surgical exploration is almost pathognomonic for NF.

The main principles of treatment are broad-spectrum antibiotics with debridement of the necrotic tissue and supportive care. Emergency surgery is warranted if symptoms are severe, if no response to treatment for presumed cellulitis is observed for 1 or 2 days, or if signs suggesting NF over cellulitis, such as gas in imaging tests, are seen. In the operating room, extensive surgical debridement and fasciotomy are essential [17]. After initial debridement, repeated debridement may be performed as needed. Skin and muscle grafts may be required after the infection is cleared. Supportive care in an intensive care unit should include fluid replenishment and nutritional support with sufficient calories, proteins, and vitamins C and E.

Necrotizing fasciitis of the breast is a rare disease which carries significant morbidity to the patients. Early diagnosis and surgical debridement prevails to be the mainstay of treatment and patients generally respond well with adequate debridement.

## Conclusion

Necrotizing fasciitis of the breast can be a rapidly progressive and fatal entity if appropriate treatment is not initiated at the earliest. Prompt diagnosis and rapid surgical intervention is crucial to prevent mastectomy and fatal outcome. Clinical examination along with imaging finding can guide the clinician to reduce the mortality in these critically ill patients.

## Statement and declarations

**Conflicts of interest/Competing interests:** None

**Financial interests:** The authors have no relevant financial interests to disclose.

**Non-financial interests:** The authors have no relevant non-financial interests to disclose

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**Availability of data and material:** No data available

**Compliance with Ethical standards:** Compliant.

**Author contributions:** All authors contributed to the study conception and design. The first draft of the manuscript was written by Dr Dhanya Jacob and all authors commented on previous versions of the manuscript. All authors read and approved the final manuscript.

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