

Case report

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# Necrotizing fasciitis of the breast with extension to the chest wall myofascial layer in a lactating mother: a rare case report

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ARTICLE INFO	A B S T R A C T
Keywords: Necrotizing fasciitis Necrotizing fasciitis of the breast Breast infection Debridement Case report Reconstruction	Introduction and importance: Necrotizing fasciitis is one of the deadliest forms of infection to affect human kind. It usually happens in the presence of risk factors and often involves the trunk, the limbs and the perineum. Primary breast involvement is quite rare. Early diagnosis and management is of paramount importance to decrease morbidity and death. <i>Clinical presentation</i> : A 35 years old female patient presented to our facility with progressive left breast swelling and pain of 05 days. She also had discoloration of skin, anorexia and high grade fever. She was lactating mother to a 1 year old baby. She was clinically diagnosed with necrotizing mastitis with chest wall extension and underwent total mastectomy and chest wall debridement. Chest wall wound defect is managed by doing split thickness skin graft. The biopsy result confirmed the diagnosis of necrotizing mastitis. <i>Discussion</i> : Necrotizing fasciitis is a subset of aggressive skin and soft tissue infections that cause muscle fascia and subcutaneous tissue necrosis. It can affect any area of the body. Breast is, however, rarely affected. In the breast it typically occurs after trauma to it in the form of surgery or biopsy. The diagnosis of necrotizing mastitis can be delayed because of its rarity and atypical presentation. <i>Conclusion</i> : Necrotizing fasciitis of the breast is very uncommon; hence diagnosing it requires a high index of suspicion. Once diagnosis is made the cornerstones of treatment include aggressive surgical debridement, initial broad spectrum antibiotics, and supportive care. Post-debridement wound reconstruction should be individualized.

## 1. Introduction

Necrotizing fasciitis can affect any area of the body, but they primarily target the belly, limbs, and perineum [1]. They are also known to have a high fatality rate. A number of comorbidities are strongly linked to NF, including vascular illnesses, Human Immune Deficiency Syndrome, immunosuppressive medications, obesity, DM, and chronic alcohol use [1–4]. Rarely is the breast affected unless there are certain risk factors, such as trauma, or surgical procedures, such as core needle biopsy and FNAC. However, it can also happen extremely rarely when there are no risk factors [5–8]. Necrotizing Fasciitis of the breast can be misdiagnosed more frequently than other body regions because of its distinct etiologic pattern and clinical presentation (6). As this disease is deadly, complications and death must be avoided by prompt surgical intervention, antibiotic administration, and holistic supportive care. Here, we report from Ethiopia a lactating mom with no known risk factor who presented with necrotizing fasciitis of the breast. And, the SCARE criteria have been followed in reporting this case report [16].

## 2. Case presentation

A 35 years old female patient presented to our emergency department with progressive left breast pain and swelling of five days duration. She had associated darkening of skin overlying same breast. She also had high grade fever and anorexia. She had no history of nipple discharge. She had no history of breast lump, trauma or recent procedure on the same breast. She was breast feeding her one year old child. She has no any comorbidity, no history of medications and no smoking history.

Up on physical examination she was acutely sick looking with the following vital signs: BP = 85/60, PR = 134(regularly regular), RR = 22 and T = 39.9 c. Her oxygen saturation was 89 % with room air and 99 % on intranasal oxygen. She had dry tongue and buccal mucosa. The conjunctiva was pink and the sclera is non-icteric.

On examination the left breast was grossly swollen and exquisitely

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tender upon palpation. There was no area of fluctuation. There was no isolated mass palpated in the breast. The overlying skin was darkened with areas of blistering. The darkening extends to clavicle area superiorly, infra-mammary fold inferiorly, medially to left lateral border of the sternum and laterally to lateral edge of pectoralis major muscle. Some blisters were ruptured oozing serous discharge and exposing underlying dark erythematous skin layer Fig. 1. There was no subcutaneous crepitus. There were tender non-matted lymph nodes in the left axilla. The contralateral breast was normal.

With the assessment of necrotizing fasciitis of the breast plus shock (? septic) based on history and physical examination findings double large bore IV lines were secured and resuscitation was started. She was catheterized and kept NPO. She was started also on broad spectrum septic dose antibiotics (vancomycin, ceftriaxone and metronidazole). The empiric antibiotics choice was made based on availability of the drugs as well as their cost otherwise there are many combinations of antibiotics options, including ours, to choose from in case of necrotizing fasciitis. Meanwhile samples were collected for laboratory investigations and the result were as depicted in Table 1 below showing significant leucocytosis with left shift and thrombocytosis both commonly seen in patients with severe sepsis. Other lab investigations were within normal range. Serum CRP was not done because it was not available in our facility. Blood culture and sensitivity was sent and didn't grow any organism after 48 h. We didn't do breast imaging because we had high index of suspicion for necrotizing fasciitis of the breast and didn't want delay patient management.

Once the patient was adequately resuscitated and responded well she was taken to the operation theatre after informed written consent was taken (possibility of total mastectomy was discussed). Under GA and ETT the patient was put supine. The left hemi chest and supraclavicular area, left upper abdomen and upper extremity were cleaned. While we were draping the surgical site the left breast fall off the chest wall by itself without making any incision. This exposed underlying necrotic pectoralis major muscle and fascia, serratus anterior and part of



Fig. 1. Intraoperative picture before surgery showing grossly swollen left breast with darkened and oedematous overlying skin with areas of sloughed off blisters.

Table 1

Laboratory investigations result of the patient.

Туре	Result
CBC	$WBC = 20.24*10^3/uL$
	Neutrophil = $82.6$ %
	Platelet = 574*103/uL
	Haematocrit = 32 %
RFT	Cr = 0.9 mg/dL
	BUN = 22 mg/dL
LFT	AST = 23  mg/dL
	ALT = 25  mg/dL
	ALP = 174  mg/dL
RBS	124 mg/dL
Serum Electrolyte	Na = 134 mmol/L
	K = 5.2  mmol/L
	Cl = 104  mmol/L
	tCa = 2.08  mmol/L

lattismus dorsi muscles. We thoroughly debrided the necrotic tissues and irrigated the wound with copious amount of normal saline and hydrogen peroxide. Finally, we put limiting incisions on all borders over the wound. The patient had stable vital signs intraoperatively and she was successfully extubated and transferred to PACU with stable vitals. The breast and other surgical specimen were sent for biopsy as well as culture and sensitivity. Subsequently the patient was transferred to surgical ward. The wound was relooked after 48 h of the first surgery in operation theatre Fig. 2A and any remaining necrotic tissue was debrided and wound irrigated. There was no extension of the infection.

On subsequent days wound care was given in the ward twice daily. Meanwhile the biopsy result was collected and it showed mixed inflammatory cells mainly neutrophils with coagulative necrosis involving the whole breast and tissue with few lobules of bland ducts with no malignant cells, concluding with consistent with necrotizing fasciitis of the breast, while the microbiologic examination became negative for microorganism. Also CBC and OFTs were repeated and they were normal.

Once she is nutritional rehabilitated well and the wound granulates well as seen in Fig. 2B she was taken to the operation room and split thickness skin graft was done Fig. 3A. We didn't consider breast reconstruction mainly because of great loss of chest wall musculature. She had uneventful postoperative course after the graft. The graft took well. On next follow-ups the wound has healed well and patient had no compliant except for some limitation of left shoulder movement for she was started on physiotherapy. Fig. 3B.

#### 3. Discussion

Necrotizing fasciitis (NF) was first described by Wilson in 1952 as superficial necrosis of the epidermis and the muscle-protecting subcutaneous tissue. This potentially lethal condition is characterized by the rapid spread of subcutaneous tissue and fascia necrosis. Although it can affect any area of the body, it typically involves the extremities, abdominal wall, and perineum/genitalia (Fournier's gangrene) [1,6]. These Patients are usually critically ill and present with multiple organ failure and septic shock. Comorbidities associated with NF include obesity, diabetes mellitus, peripheral vascular disease, alcoholic liver disease, and immunosuppression [1,9,10]. The onset of NF is independent of age [3]. Our patient had no risk factors and came with NF in an unusual place—the breast.

Necrotizing infections are frequently linked to insignificant incidents like injections, traumatic injuries, and bug bites that result in invasion of the subcutaneous tissue by bacteria (3, 6). Endotoxins and exotoxins are produced by bacteria introduced in the subcutaneous tissue that move very fast along the fascial tissue planes inducing thrombosis of cutaneous perforating vessels [3,5,6,11]. The vicious cycle of mortal infection, toxin excretion, cytokine cascade, thrombosis of small blood vessels and ischemia, tissue dysfunction and death, and hence, faster

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Fig. 3. A. Intraoperative picture showing split thickness graft applied to the defect. B. A well healed chest wall wound.

spread of infection is central to the rapidly propagating ischemia seen in NF and separates it from other simple skin and deep tissue infections Fig. 4 [17].

Because many dermal capillary beds must undergo thrombosis

before skin alterations suggestive of necrosis can develop, skin findings are much smaller than the real extent of the disease, which may delay the diagnosis of NF [6]. By the time patients manifests with obvious skin lesions like darkening, blister formation and skin sloughing the disease



Fig. 4. The vicious cycle of necrotizing soft tissue infection (From Bonne and Kadri et al).

has progressed much. Clinical characteristics of the NF can be classified into three stages Table 2 [15]. Our patient presented with stage 3 disease.

Necrotizing fasciitis can be divided into four primary categories based on the etiologic agents Table 3 [2,3,8]. In our case, even though, we sent blood culture and culture from surgical specimen we were not able to determine the causative agent.

Necrotizing fasciitis of the breast is quite rare; with only a few documented cases. This is the second case documented from our country Ethiopia so far. It is typically unilateral like in our patient. It typically occurs after trauma to the breast in the form of surgery or biopsy. In a lactating mother microtrauma at the nipple can predispose to simple mastitis which may progress into NF. Diagnosis might be difficult to make because of the following two main reasons. First, the varying thickness of the breast tissue beneath the skin and fascia causes a delayed cutaneous reaction, which in turn causes extensive infection before detection and treatment with surgery [5]. Despite the presence of necrotizing fasciitis, the overlying skin may look normal or show localized inflammatory reaction/erythema like that seen in simple mastitis resulting in a diagnosis dilemma. The physical finding may sometimes be mistaken with inflammatory breast cancer, breast abscess, eczemas, or granulomatous mastitis [2,6].

The second reason is due to extensive blood supply system that includes internal thoracic and internal mammary arteries, lateral thoracic and lateral mammary branches, and thoraco-acromial branches supplying the breast functions as a barrier against infection and delays the cutaneous manifestations the necrosis delaying the clinical presentation. So that, majority of the cases was presented weeks after the initial symptom [5]. Our patient presented after 5 days of her initial symptoms with obvious skin findings which helped us in diagnosing the condition without delay.

The clinical examination, which includes subcutaneous crepitation, systemic toxicity, and symptoms of inflammation such as skin color change and discomfort that is out of proportion to local findings, is used to make the diagnosis [6]. However, diagnosis can be quite difficult and requires a high index of suspicion because there are few skin signs early in the course of the disease. Sometimes the only way to make a conclusive diagnosis is during surgery, as evidenced by the tissues adhering to the fascia not resisting blunt dissection [6,12]. In case of breast necrotizing fasciitis due to the above challenges of diagnosis, diagnosis may need imaging like US, CT-scan or MRI [5]. The above mentioned imagings can also be used in other site necrotizing fasciitis.

Necrotizing fasciitis is characterized sonographically by generalized thickening of the fascia, irregularities in the fascia, and aberrant fluid collections along the fascial planes. Patients without necrosis did not show these results. Gas in the fluid collection indicates that the problem is becoming worse. Although the speed and portability of point-of-care US in the ER are appealing in theory, there is currently just a small amount of data to support this claim, and further research is required before it can be considered a common diagnostic method for NF. A Computed Tomography scan with contrast that demonstrates lack of enhancement of the fascia, along with involvement of the fascia in the infectious process which is more specific for NF than just presence of air or edema alone. Because of its greater soft tissue resolution, MRI is also a useful diagnostic technique for necrotizing fasciitis (specificity 46-86 % and sensitivity 89-100 %). Greater thick signal intensity on T2-weighted images and focal nonenhancing patches of aberrant signal intensity in the deep fascia are two imaging findings in the case of MRI that are Table 3

Т	vpes	of	necrotizing	fasciitis	based	causative	organism	(2,	3,	8)	)
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Туре	Causative organism
I (70–80 %) II (20–30 %) III	Polymicrobial, synergistic Often monomicrobial like Group A Streptococci Gram-negative like <i>Vibrio vulnificus</i> : often marine-related organisms
IV	Fungal, usually post-trauma

compatible with a diagnosis of NF. MRI should be utilized carefully because it might be extremely sensitive and time-consuming, and it can definitely postpone necessary surgical management [4,6,14]. Imaging employed varies from case to case depending on patient presentation and clarity of the diagnosis Table 4. Imaging was not done in diagnosing our patient's necrotizing breast infection because she had straight forward symptoms and signs along with laboratory evidences suggesting the condition.

The most crucial aspects of managing NF involve prompt surgery, vigorous debridement of non-viable tissue, and early administration of broad-spectrum antibiotics followed by adjustments based on culture and sensitivity findings, and repeated debridement procedures until no more necrotic tissue is visible. As soon as we diagnosed necrotizing mastitis in our patient we promptly employed the above measures. The extent of debridement depends on the extent of the disease. In NF of the breast the surgery can range from localized debridement to radical mastectomy. In our case because of whole breast necrosis we did total mastectomy with debridement of involved chest wall muscle and fascia [3,6,14]. The extent of surgery may vary from case to case Table 5.

After the wound is well granulated and patients are rehabilitated, split-thickness skin grafts were the most often used reconstructive procedure like we did. Pedicle flap reconstruction, full thickness skin grafts, local tissue rearrangement, and delayed primary closure were among the other choices, but any of the approaches on the reconstructive ladder may be applied and the reconstruction should be patient-specific [12–14].

## 4. Conclusion

Necrotizing fasciitis of the breast is very uncommon; hence diagnosing it requires a high index of suspicion. Though necrotizing mastitis usually happens in patients with known risk factors it can happen in individuals who do not have any risk factors. The diagnosis of necrotizing mastitis can be delayed because of its rarity and atypical

#### Table 4

Comparing the type of imaging used to reach on diagnosis of necrotizing fasciitis of the breast in some of the reported cases.

Author	Imaging employed
Basem et al	None
Fadaee et al	Mammography, US, MRI
Lee et al	US
Stoeckl et al	Contrast enhanced CT scan
Molla et al	None
Islam et al.	Contrast enhanced CT scan
Tariq et al	US, Contrast enhanced CT scan, MRI
Kamagate et al	Contrast enhanced CT scan
Pote et al	None
Won et al	CXR, US, CT with contrast

#### Table 2

Staging of the necrotising fasciitis clinical examination findings (15).

Stage	Clinical features
I (early)	Extreme tenderness to palpation (even beyond the apparent area of dermal involvement), redness, oedema, warmth of overlying skin
II (intermediate)	Blister or bullae formation, skin fluctuation
III (late)	Crepitus, skin loss of sensation, dead skin with black discoloration, tissue necrosis progressing to gangrene

#### Table 5

Comparing the extent of surgery performed for necrotizing fasciitis of the breast in some of the reported cases.

Author	Extent of Surgery
Basem et al	Bilateral simple mastectomy
Fadaee et al	Debridement and secondary wound closure using VAC
Lee et al	Debridement and secondary wound closure using VAC
Stoeckl et al	Bilateral simple mastectomy
Molla et al	Debridement and secondary wound closure
Islam et al.	Mastectomy
Tariq et al	Debridement then MRM after biopsy
Kamagate et al	Mastectomy and delayed primary closure
Pote et al	Debridement and STSG
Won et al	Debridement

presentation. Once diagnosis is made the cornerstones of treatment include aggressive surgical debridement, initial broad spectrum antibiotics, and supportive care which significantly decreases morbidity and mortality related to the condition. Post debridement wound management should be patient specific [11–14].

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### CRediT authorship contribution statement

Dr. Birhanu Abdisa Tesso: Participated in patient evaluation, diagnosis and operative management and data collection, contributed the interpretation of the case and wrote the first and final draft of the manuscript.

Dr. Gutu Ganati Tola: Proofread and critically reviewed the manuscript and approved the final manuscript as submitted.

Dr. Abraham Teshome Sahilemariam: Participated in patient management, development of draft manuscript and critically reviewed the manuscript and approved the final manuscript as submitted.

#### Consent

Written informed consent was obtained from the patient for publication of this case report and accompanying images. A copy of the written consent is available for review by the Editor-in-Chief of this journal on request.

## Ethical approval

For the publication of a case report at our centre, consent is required and ethical approval is exempted by Institutional review board (IRB) of the university.

#### Guarantor

Birhanu Abdisa Tesso will take the primary responsibility of the study.

### Declaration of competing interest

The authors declare that they have no competing interests.

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