



Case report

Breast rescue after necrotizing fasciitis

Hadhami Rouiss^{a,c}, Hajer Bettaieb^{a,c,*}, Nesrine Souayah^{a,c}, Hichem El Aifi^a, Raja Jouini^{b,c},
Imen Helal^{b,c}, Hedhili Oueslati^{a,c}, Chaouki Mbarki^{a,c}

^a Department of Obstetrics and Gynecology, Ben Arous Hospital, Tunis, Tunisia

^b Department of Pathology, Hbib Thameur Hospital, Tunis, Tunisia

^c University of Tunis El Manar, Faculty of Medicine of Tunis, Tunisia



ARTICLE INFO

Keywords:

Breast
Necrotizing fasciitis
Management

ABSTRACT

Necrotizing fasciitis is a dangerous and rapidly spreading infection of soft tissue involving skin, subcutaneous tissue and fascia; muscles can be concerned but often omitted. It's considered as emergency due to its fulminant nature. The necrotizing fasciitis of the breast is exceptional. Management is based on surgical debridement and, in the case of breast, mastectomy in most cases is inevitable. We describe a case-report of breast necrotizing fasciitis with prompt management and with satisfactory cosmetic result owing to dermal autograft.

1. Introduction

Necrotizing fasciitis (NF) is a rare life-threatening condition characterized by a local infection but with systemic toxicity [1]. It is a serious progressive infection with a widespread necrosis of subcutaneous tissue and fascias, the muscle is often spared because of the thick breast tissue between the skin and deep fascia, so the muscle is reached tardily [2, 3, 4]. The soft tissues' infection affects rarely the breast as the most commonly affected sites are extremities, abdominal wall and perineum [2, 5].

2. Case presentation

This is a case report of a 36-year-old woman who presented to emergency department with a spontaneous painful swelling breast. she was a smoker and with no personal comorbidities. The patient was treated initially with antimicrobial agents (Amoxicillin 1g*3 per day), but the symptoms worsened progressively with high grade fever and deteriorated local condition. The physical examination showed necrotic tissue with pus discharge in the left upper inner quadrant (Figure 1). A breast NF was suspected, explored by an ultrasound that revealed a fluid deep collection. This rare condition was confirmed on surgical exploration and at debridement. We performed an aggressive excision of the devitalized skin and the subcutaneous infected tissue, leaving only macroscopic viable parenchyma which was preserved (Figure 2). To cover the polymicrobial nature of this infection, we opted for a broad-spectrum intravenous empiric antibiotic. The patient received a combina

tion of Amoxicillin/clavulanic acid (6g/Day) and aminoglycoside (gentamicin 8 mg/kg/day). The duration of total antibiotic regimen was 5 days for gentamicin and 14 days for Amoxicillin/clavulanic acid with a good clinical response.

The microscopic examination showed a necrotizing inflammation (Figure 3). This extensive necrosis interested the epidermis, dermis and the subcutaneous layers and with no signs of malignancy. The bacteriologic sampling harvested during the surgery showed a polymicrobial infection.

We used a hydro-responsive wound dressing to facilitate the healing progression. The wound was examined every day. After 48 h, we needed to perform another debridement of necrotic tissue and adherent fibrin slough. Then, the wound was cleaned every day with hydro-responsive wound dressing applied. Ten days after starting the treatment, the wound was fully debrided. In the absence of signs of infection and granulating tissue, we started to space out dressing changes to every 48 h, with the hydro-responsive wound dressing. After three weeks of exudative management, the wound was completely clean and granulating. The wound bed was well-vascularized so we opted for split thickness skin graft. To match the breast skin in color and appearance, we chose the lumbar region as a donor site of the skin graft. So, a dermal autograft by a split-thickness graft was performed one month after the first consultation (Figure 4). One week later, the graft was examined to assess its viability. The graft was adherent and viable and showed successful engraftment with an uneventful postoperative course. The results were cosmetically favorable (Figure 5).

* Corresponding author.

E-mail address: hajer.bettaieb@fmt.utm.tn (H. Bettaieb).

<https://doi.org/10.1016/j.heliyon.2022.e12305>

Received 10 April 2022; Received in revised form 2 October 2022; Accepted 5 December 2022

2405-8440/© 2022 The Authors. Published by Elsevier Ltd. This is an open access article under the CC BY-NC-ND license (<http://creativecommons.org/licenses/by-nc-nd/4.0/>).



Figure 1. Necrotizing fasciitis of the left breast showing edema, inflammation, and an area of necrosis.



Figure 2. Postoperative photograph demonstrating the vitality of the wound tissue after the debridement.

3. Discussion

Primary breast NF, without predisposing factors as trauma, burns, surgical procedures, diabetes or suppressed immune system, is exceptional, in fact only 40 cases has been reported in the literature [3, 4, 6]. It

affects lactating, advanced age, and postmenopausal women, although it can occur to non-lactating young previously healthy women [4, 6, 7]. There are two types of NF, monomicrobial or polymicrobial type [4]. The monomicrobial type is less common but more dangerous because the causative bacteria is mainly group A beta-hemolytic streptococcus with very rapid necrosis, aggressive infection and multiple-organ failure due to streptococcal toxic shock syndrome [5, 7]. On the opposite, polymicrobial type (Type 1) is more frequent and the causative organisms are the normal skin commensals, the gravity of this type is related to the immunosuppression of the host [8].

Clinical examination shows erythema, pain, blisters or bullae formation and necrosis [2, 3]. First, the skin is swelling and erythematous then the lesion presents serous or bluish bullae with inflammatory signs as pain and local fever. Finally the necrosis appears along with the systemic toxicity [3]. Pain is disproportionate to examination findings and typical skin changes indicates a late stage, therefore pain has to be a warning sign [5].

Due to its rarity, this condition is often misdiagnosed and since it is very aggressive, mortality depends mainly on early management. In order to help the diagnosis of this entity, Wong and al have described a biological score: the LRINEC score [9]. Any score >8 is considered high risk (Table 1).

The differential diagnosis are essentially inflammatory carcinoma, cellulitis or breast abscess [2]. NF can initially mimic these conditions which may delay treatment [4]. The diagnosis is clinical but imaging as ultrasound, Magnetic Resonance Imaging (MRI) or Computed Tomography scan (CT scan) can help in this context [4].

The main sonographic features are: irregular fascias, abnormal fluid collections or gas tracking along fascial planes and diffuse thickening of the fascias [4]. Unfortunately, these signs are usually evident at late stage when clinical diagnosis is already obvious [10]. The presence of gas indicates further worsening of the situation [10].

The cross-sectional imaging as CT scan and MRI is carried out especially in early stages in order to ensure optimal management of the disease, it has been reported to be more sensitive than ultrasound imaging [5]. Due to its superior resolution for soft tissue, MRI is an effective tool to diagnose NF, its sensitivity is high 89–100% but its specificity is low 46–86% [10].

Bertram and al, have created a simple diagnostic and management triad for this condition. In the clinical diagnostic, triad pain was the key sign, and for the management triad the early cross-sectional imaging was a cornerstone [5]. Furthermore, cross-sectional imaging demonstrates the extent of infection and can lead the debridement procedure [10].

Treatment is mainly surgical and consisting of early debridement and radical excision of the infected tissue [11]. Through a review of literature, Marongiu found that mastectomy has been reported to be the most common surgical procedure [4]. Breast conservative treatment was performed in few reported cases, and our case is one of the rarest successful operations. In recent reported cases, clinicians have opted to staged debridement rather than mastectomy: Every 24–48 h, the wound is closely inspected and examined to assess the adequacy of the initial debridement. The nonviable tissue is removed, this necrotizing material prevents the healing of the wound and may become a reservoir for bacterial growth. This process should be repeated as many times as necessary, until the surgeon is sure that all necrotic tissue has been properly removed. The repeated debridement and the broad-spectrum antibiotic may prevent the mastectomy [12]. Although in severe cases early radical resection is favorable [7].

Analgesia, intravenous broad-spectrum antibiotics and intensive care, if indicated, are essential. Antibiotic therapy is initially empirical and includes three or more antibiotic agents which cover gram-positive, gram-negative and anaerobic bacterial infections, then antibiotic regimen should be changed with cultural results [6]. The bacteria spread quickly and produce toxins that cause multi-organ failure. For this reason, rapid initiation of the antibiotic treatment is important to prevent adverse outcomes [3, 4], in fact, mortality rate is still high reaching 25–35% [4].

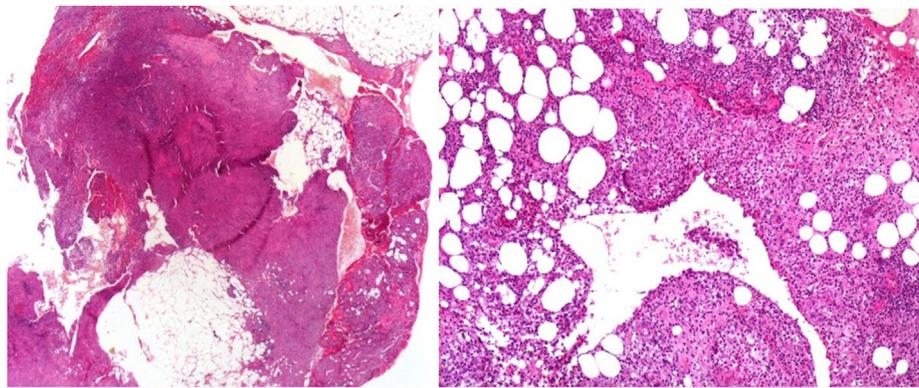


Figure 3. Mammary parenchyma with a fibro-inflammatory shell surrounding a suppurating focus rich in histiocytes.



Figure 4. Postoperative photograph showing a full-thickness skin graft reconstruction taken from the lumbar region.



Figure 5. Plastic surgery result after four months.

In cases with large necrotic areas, skin grafts or local flaps become necessary in order to protect the wound from environment, pathogens and temperature. We opted for skin graft because it can address wide areas of skin loss [11].

Skin grafts are two types, split thickness skin graft (STSG) and full-thickness skin graft (FTSG). The choice between STSG and FTSG depends on multiple parameters. The skin grafts are not supplied with their own blood like flaps. As a result, the wound bed has to be well-vascularized. When it comes to unhealthy wounds, thick grafts are not the best choice because of bad nutrient diffusion. In addition, the STSG has less morbidity for the donor site which regrow fast, therefore, the STSG are versatile. As a result, they seemed to be for us the best choice [13, 14].

STSG can be harvested from any area. When choosing the donor site, skin characteristics, amount of skin needed and scar visibility are important to consider. The donor site should match the recipient site in consistency, color and texture. The most common donor sites in these cases are lateral trunk, abdominal region or even the contralateral breast

[13, 15]. The advantages of these sites, they are more accepted aesthetically because they are hidden parts of the body and, they have broad surfaces so they are easier to harvest from in cases of wide areas of skin loss.

Table 1. Laboratory risk indicators for necrotizing fasciitis (LRINEC).

CRP (mg/dl)	<15/≥15	0/4
WBC(TLC/cumm)	<15/15–25/> 25	0/1/2
Hb(g/dl)	>13.5/11–13.5/< 11	0/1/2
Na(mEq/l)	≥135/< 135	0/2
Creatinine (mg/dl)	<1.6/> 1.6	0/2
Glucose(mg/dl)	<180/> 180	0/1
Total Scores	Score<6	Low risk
	Score 6-7	Intermediate
	Score≥8	High risk

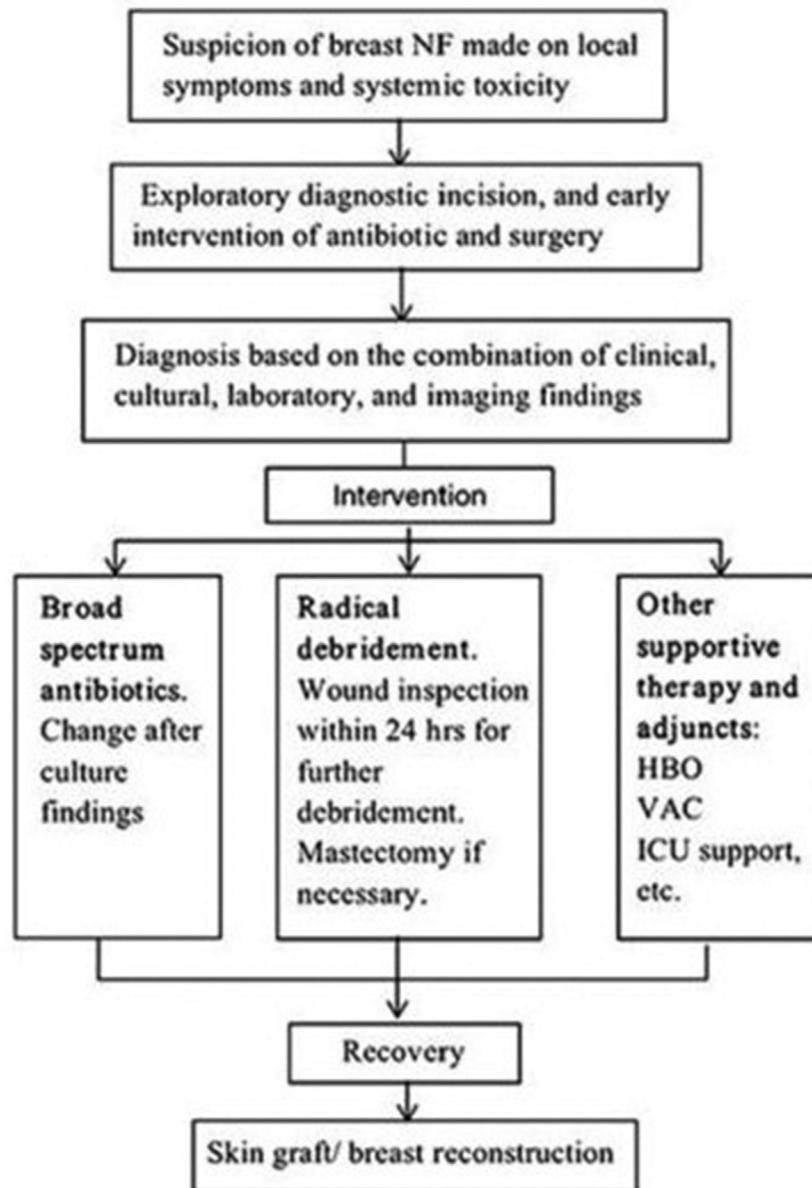


Figure 6. Management algorithm for necrotizing fasciitis in breasts. HBO = Hyperbaric oxygen; ICU = intensive care unit; VAC = vacuum-assisted closure.

The skin grafts need a well vascularized recipient site with no active infection, purulence, exudate or active bleeding. The most crucial step is to ensure a clean wound bed, suitable to apply the STSG [13].

After securing the STSG, both the donor site and the recipient site have to be covered. The petroleum-infused gauze can be placed over the wounds [13].

Hyperbaric oxygen and negative pressure wound therapy can be helpful in the healing procedure [4]. However, additional prospective clinical studies are needed to validate this approach in treatment of such acute fatal diseases. Cai and al, have suggested a six-step management algorithm in their review in 2021 (Figure 6) [6].

4. Conclusion

The necrotizing fasciitis of the breast is a challenging diagnosis. Clinicians have to be vigilant when breast pain is atrocious and disproportionate to the rest of signs. Urgent imaging allows more targeted approach and early management. In our case report, the early diagnosis

and treatment resulted in a conservation of the breast that facilitated its reconstruction with a complete recovery and satisfactory cosmetic result.

Declaration

Author contribution statement

All authors listed have significantly contributed to the investigation, development and writing of this article.

Funding statement

This research did not receive any specific grant from funding agencies in the public, commercial, or not-for-profit sectors.

Data availability statement

No data was used for the research described in the article.

Declaration of interest's statement

The authors declare no competing interests.

Additional information

No additional information is available for this paper.

References

- [1] R.J. Chen, C. Gillespie, K. Jassal, J.C. Lee, M. Read, Delayed presentation of breast necrotizing fasciitis due to COVID-19 anxiety, *ANZ J. Surg.* 13 (juin 2020).
- [2] P. Yaji, B. Bhat, H. E, Primary necrotizing fasciitis of the breast: case report and brief review of literature, *J. Clin. Diagn. Res. JCDR.* 8 (7) (2014). ND01-2.
- [3] J. Shah, A.K. Sharma, A. Johri, B. Mearns, J.M. O'Donoghue, V.A. Thomas, Necrotising fasciitis of the breast, *Br. J. Plast. Surg.* 54 (1) (2001) 67–68.
- [4] F. Marongiu, F. Buggi, M. Mingozzi, A. Curcio, S. Folli, A rare case of primary necrotizing fasciitis of the breast: combined use of hyperbaric oxygen and negative pressure wound therapy to conserve the breast. Review of literature, *Int. Wound J.* 14 (2) (2017) 349–354.
- [5] B. Marks, T. Fasih, S. Amonkar, M. Pervaz, Necrotizing fasciitis of the breast: a rare but deadly disease, *Int. J. Surg. Case Rep.* 65 (2019) 10–14.
- [6] Y. Cai, Y. Cai, W. Shi, Q. Feng, L. Zhu, Necrotizing fasciitis of the breast: a review of the literature, *Surg. Infect.* 22 (4) (2021) 363–373.
- [7] K. Fayman, K. Wang, R. Curran, A case report of primary necrotizing fasciitis of the breast: a rare but deadly entity requiring rapid surgical management, *Int. J. Surg. Case Rep.* 31 (2017) 221–224.
- [8] E. Naamany, S. Shiber, H. Duskin-Bitan, D. Yahav, J. Bishara, I. Sagy, et al., Polymicrobial and monomicrobial necrotizing soft tissue infections: comparison of clinical, laboratory, radiological, and pathological hallmarks and prognosis. A retrospective analysis, *Trauma Surg. Acute Care Open* 6 (1) (2021), e000745.
- [9] C.H. Wong, B.K. Tan, Necrotizing fasciitis of the breast, *Plast. Reconstr. Surg.* 122 (5) (2008) 151e.
- [10] M.A. Hanif, M.J. Bradley, Sonographic findings of necrotizing fasciitis in the breast, *J. Clin. Ultrasound* 36 (8) (2008) 517–519.
- [11] R.D. Konik, G.S. Huang, Management of primary necrotizing fasciitis of the breast: a systematic review, *Plast. Surg.* 28 (4) (2020) 215–221.
- [12] S. Shivalingappa, K. Manjunath, V. Waiker, M. Kumaraswamy, U. Odeyar, Necrotizing fasciitis: appearances can be deceptive, *World J. Plast. Surg.* 10 (1) (2021) 43–52.
- [13] M.E. Braza, M.P. Fahrenkopf, Split-thickness Skin Grafts, 2019.
- [14] C.C. Maduba, U.U. Nnadozie, Breast necrotizing fasciitis following stillbirth managed with nipple areola conservation in a resource-poor setting: a case report, *J. Surg. Case Rep.* 2020 (2) (2020) rjz397.
- [15] M. Nomori, K. Tomita, M. Taminato, K. Yano, T. Kubo, Salvage of mastectomy flap necrosis by skin graft harvested from contralateral breast, *Plast. Reconstr. Surg. Glob. Open* 8 (7) (24 juill 2020), e3022.