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Combined Timed Surgery and Conservative Management of Primary Necrotizing Fasciitis of the Breast: A Case Report

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Conflict of interest: None declared

Patient: Female, 53-year-old
Final Diagnosis: Necrotizing fasciitis
Symptoms: Breathlessness • fever • myalgia • septic shock
Medication: —
Clinical Procedure: —
Specialty: Plastic Surgery

Objective: Rare disease
Background: Necrotizing fasciitis is a life-threatening infection that involves the deep fascia and the surrounding tissue, but rarely involves the female breast. The most common treatment for necrotizing fasciitis of the breast is total mastectomy. However, the use of negative pressure wound therapy (NPWT), after surgical debridement, is reported to promote the more rapid development of granulation tissue, before reconstructive surgery. This report presents the case of a 53-year-old woman with necrotizing fasciitis of the breast who underwent combined timed surgery and conservative management.

Case Report: A 53-year-old woman presented with necrotizing fasciitis of the right breast, involving the right lateral chest wall and flank. She was referred to the Intensive Care Unit (ICU) of the hospital with septic shock. After hemodynamic stabilization was achieved, she underwent surgical debridement. Excised breast tissues were sent for histology, and intraoperative swabs were collected and sent for microbiological examination. Intravenous antibiotic therapy and hyperbaric oxygen therapy commenced. The patient was managed with NPWT dressings, followed by reconstructive breast surgery. The right chest and flank completely healed.

Conclusions: This case has shown that early diagnosis and management of necrotizing fasciitis of the breast can be life-saving and may allow for breast conservation. Early aggressive debridement combined with NPWT dressings and reconstructive breast surgery resulted in successful wound healing and preservation of the breast with a satisfactory cosmetic outcome.

MeSH Keywords: Breast • Fasciitis, Necrotizing • Negative-Pressure Wound Therapy • Surgery, Plastic • Wound Closure Techniques

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Background

Necrotizing fasciitis is a rare and life-threatening soft tissue infection caused by pathogenic bacteria that rapidly spread along fascial planes and release enzymes and toxins that destroy soft tissue [1]. If untreated, necrotizing fasciitis can lead to tissue necrosis, sepsis, toxic shock syndrome, and death [1]. Therefore, early diagnosis and management are essential [1]. The risk factors for necrotizing fasciitis include the presence of chronic comorbidities, smoking, alcohol abuse, and loss of skin integrity [1]. Common sites for necrotizing fasciitis are the lower extremities, followed by the trunk and perineum [1]. However, primary necrotizing fasciitis of the breast is rare and is often misdiagnosed as cellulitis, mastitis, breast abscess, or an inflammatory form of breast cancer [2,3]. Necrotizing fasciitis of the breast has been reported following mastectomy, core needle biopsy, and breast augmentation surgery [2,3]. Although the mortality rate from necrotizing fasciitis has recently decreased, the mortality remains as high as 35%, and it is directly related to the time to treatment [1,2]. In children, the mortality rate from necrotizing fasciitis is much lower [4].

During the onset of necrotizing fasciitis, constitutional symptoms may occur with only minimal skin changes due to the presence of deep infection, but skin erythema, swelling, blisters or bullae, and skin necrosis develop [5]. Patients often report symptoms of pain, and septic shock with multiorgan failure may occur [5]. Delays in the diagnosis of necrotizing fasciitis are common. Although the diagnosis is mainly made clinically, imaging show irregular or diffuse thickening of the soft tissue, with fluid or gas collections [1]. The diagnosis of necrotizing fasciitis can be confirmed by intraoperative findings that include the presence of gray necrotic deep soft tissues, lack of bleeding, a lack of resistance to blunt dissection, a foul odor, and the presence of purulent exudate [3]. Histological examination of the tissue is important to confirm the diagnosis of necrotizing fasciitis and to exclude malignancy [3].

Necrotizing fasciitis of the breast is treated by aggressive debridement of the breast tissues, but this can lead to subsequent difficulties with breast reconstruction. Because of the difficulty in achieving good results for the management of necrotizing fasciitis, the use of negative pressure wound therapy (NPWT), which is also known as a vacuum-assisted closure (VAC), was proposed as an auxiliary method for treatment [6,7]. In 1997, Argenta and Morykwas described the use of VAC in wound management [8]. NPWT removes interstitial fluids, necrotic tissue, inflammatory mediators, improves blood supply, and improves tissue oxygenation [8]. Also, NPWT stimulates cell proliferation, angiogenesis, and the formation of granulation tissue and it may be used as a bridge towards surgical closure or for the progress of wound closure by secondary intention, or secondary wound closure [8]. This report presents the



Figure 1. A 53-year-old woman with necrotizing fasciitis of the right breast who underwent combined timed surgery and conservative management. The appearance of the right breast on hospital admission shows a large area of necrosis with involvement of the right chest and right flank.

case of a 53-year-old woman with necrotizing fasciitis of the breast who underwent combined timed surgery and conservative management, including the use of NPWT.

Case Report

A 53-year-old woman presented with necrotizing fasciitis involving her right breast, right chest wall, and right flank and was transferred to the Intensive Care Unit (ICU) of our hospital (Figure 1). She was unconscious and in septic shock with a high temperature of 39.7°C. She also had myalgia and breathing difficulties. Her past medical history included respiratory failure, mild hypertension, and obesity. She was a heavy smoker (>25 cigarettes per day), but she did not have diabetes mellitus or any cause of immunosuppression.

On physical examination, a large necrotic area of skin and soft tissue was present that involved the right breast, right chest wall, and right flank, with a purulent discharge. Palpable right axillary lymph nodes were present. The patient was



Figure 2. A 53-year-old woman with necrotizing fasciitis of the right breast who underwent combined timed surgery and conservative management. The appearance of the patient's right breast shows that a large area of necrotic breast tissue has been widely excised, with sparing of the nipple and areola. Several drains remain in place in the right hemithorax and flank.

tachypneic with a heart rate of 115 bpm and a blood pressure of 80/50 mmHg.

The results of her initial laboratory investigations showed a leukocytosis ($17.6 \times 10^3/L$), an increased erythrocyte sedimentation rate (ESR) (37 mm/hr), and an increased C-reactive protein (CRP) (49.8 mg/L). The hemoglobin level was low (7.6 g/dL), while serum creatine kinase was increased (454 U/L).

The patient was immediately resuscitated with intravenous fluids. Imaging of the breast, chest, and abdomen using X-ray, ultrasound, and computed tomography (CT) was performed. Blood samples for blood culture were taken during spikes in temperature. She was treated with intravenous broad-spectrum antibiotics that included cefazolin 1 gm, and gentamycin 80 mg, every 12 hours.

At 24 hours after hospital admission, as soon as the patient was hemodynamic stable, she underwent surgical debridement. Surgery consisted of a segmental partial mastectomy with subtotal excision of both the outer quadrants of the right breast (Figure 2). The nipple and areola were spared. Intraoperative wound tissue and exudate were collected for microbiological



Figure 3. A 53-year-old woman with necrotizing fasciitis of the right breast who underwent combined timed surgery and conservative management. Six weeks after the use of negative pressure wound therapy (NPWT) following surgical debridement shows pink granulation tissue.

examination. An area of 13×27 cm of excised breast tissue was sent for histopathological examination, and the report described breast tissue with fibrosis, fat necrosis, chronic inflammation, and hemorrhage.

On day 1 following surgery, the patient remained intubated, and her vital signs were stable with a respiratory rate of 18 breaths/min and a heart rate of 71 bpm, blood pressure of 100/70 mmHg, and oxygen saturation of 96%. The abdomen was soft. Hyperbaric oxygen therapy commenced on postoperative day 4. On postoperative day 5, the patient was extubated. Microbiology culture identified *Staphylococcus aureus*, *Klebsiella pneumoniae*, and *Acinetobacter baumannii*. *Staphylococcus epidermidis* was isolated by blood culture. Therefore, the intravenous antibiotic regimen was changed to vancomycin 500 mg every 12 hours and meropenem 1 gm every eight hours.

Postoperatively, the wounds were managed with negative pressure wound therapy (NPWT) dressings at -125 mmHg in continuous mode. The foam dressings were changed every 48 hours for the first week and then every three to four days. Six weeks later, wounds appeared clean, healing with pink granulation tissue present, and reduced in size (Figure 3).

At this stage, the breast defect was surgically repaired using a nipple and areola centralization technique (Figure 4). However,



Figure 4. A 53-year-old woman with necrotizing fasciitis of the right breast who underwent combined timed surgery and conservative management. The preoperative markings include a modified lateral 'fish mouth' skin pattern used to reconstruct the right breast.



Figure 5. A 53-year-old woman with necrotizing fasciitis of the right breast who underwent combined timed surgery and conservative management. The wound defect in the right breast has been closed using negative pressure wound therapy (NPWT) after breast reconstruction.



Figure 6. A 53-year-old woman with necrotizing fasciitis of the right breast who underwent combined timed surgery and conservative management. At five months following combined treatment, the right breast shows good wound healing.



Figure 7. A 53-year-old woman with necrotizing fasciitis of the right breast who underwent combined timed surgery and conservative management. At five months following combined treatment, the right breast shows preservation of the breast volume and shape.

the defects in the right chest and flank continued to be managed with NPWT dressings (Figure 5). One month later, the patient was discharged from the hospital with a portable NPWT device for home use. She was then seen in the clinic once a week. A CT scan of the soft tissues and breast were performed every 14 days. After five months, the patient recovered well, the wounds had healed successfully, and the breast shape and volume were retained with a good cosmetic effect (Figures 6, 7).

Discussion

Necrotizing fasciitis may be categorized into three types, according to the microbiological findings [2,7]. Type 1 infections are most common and are polymicrobial, caused by two or more infectious agents, and affect patients with comorbidities [2,7]. Type 2 infections are less common and are associated with a single infectious organism, more commonly affect young immunocompetent patients, and results from minor trauma [2,7]. Type 2 infections in necrotizing fasciitis are most commonly associated with infections from beta-hemolytic *Streptococci*, including *S. pyogenes* [2,7]. Therefore, type 2 necrotizing fasciitis is more life-threatening than type 1 necrotizing fasciitis. Type 3 necrotizing fasciitis is less common, more aggressive, and is caused by direct contact of skin wounds with *Vibrio vulnificus* [2,7].

Necrotizing fasciitis can also be idiopathic, of unknown cause, and secondary necrotizing fasciitis can occur following trauma or surgical wounds [4]. In this reported case, necrotizing fasciitis was idiopathic, of no known cause, and was type 1 necrotizing fasciitis of the breast. However, the presence of obesity and the patient's smoking history could have contributed to the onset of necrotizing fasciitis in this patient.

Previously reported cases of necrotizing fasciitis of the breast have shown that by the time that skin lesions are noted, the underlying soft tissue damage is extensive, and patients require surgical treatment with mastectomy [1,3,7]. In the present case, a decision was made to perform aggressive debridement, which included a segmental mastectomy. Because the patient was hemodynamically unstable on initial hospital admission, aggressive wound debridement, and surgery could not be performed. Therefore, after 24 hours, as soon as she was hemodynamically stable, she underwent surgical debridement. Breast reconstruction was performed to ensure a good cosmetic outcome with a customized skin-reducing oncoplastic incision pattern (SROIIP), which resulted in good postoperative breast shape, volume, and healing [9].

There have been few previously reported studies on the optimal method of wound management following debridement

in necrotizing fasciitis. In our experience, initially, all infected wounds should be left open and treated with wet and then dry dressings. Hyperbaric oxygen therapy can help to improve both infection control and wound healing [1]. Therefore, negative pressure wound therapy (NPWT) should be used after aggressive debridement with infection control [2]. Kostaras et al. [5] evaluated 20 studies on the effects of NPWT on breast tissues after surgery and injuries, including necrotizing fasciitis. NPWT was used both alone and in combination with surgical procedures [5]. The findings showed that NPWT resulted in more rapid healing of the breast tissue [5]. From a cosmetic point of view, minimally invasive therapy aids both the preservation of the shape of the breast and the prevention of skin retraction. Furthermore, although the daily cost of NPWT is higher than conventional wound treatments because healing is rapid and the length of hospitalization is reduced, overall healthcare costs may be reduced. Also, NPWT treatment on follow-up can be provided as an outpatient regimen, which might have a positive impact on the psychosocial aspects of this condition.

Although the combination of early aggressive debridement and NPWT as a method to treat necrotizing fasciitis previously been described, this case showed the importance of the use of breast reconstruction and surgical conservation as adjunctive treatment to preserve the shape and volume of the breast.

Conclusions

This report described the case of a 53-year-old woman with necrotizing fasciitis of the right breast who underwent combined timed surgery and conservative management. This case has shown that early diagnosis and management of necrotizing fasciitis of the breast can be life-saving and may allow for breast conservation. Early aggressive debridement combined with negative pressure wound therapy (NPWT) dressings and reconstructive breast surgery resulted in successful wound healing and preservation of the breast with a satisfactory cosmetic outcome.

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