Case Report

Necrotizing Soft Tissue Infection of the Breast during COVID-19 Pandemic

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Necrotizing soft tissue infection has been historically recognized as a severe, rapidly spreading soft tissue infection associated with a very high risk of mortality. Cases of primary necrotizing fasciitis of the breast are rarely described but often fatal. We present a case of necrotizing soft tissue infection of the right breast extending to the anterior abdominal wall in a 39-year-old obese female, with a history of tobacco use. The patient presented 10 days after symptom onset due to concerns and anxiety related to COVID-19 exposure. This delay allowed for further extension and smoldering of the breast infection. The treatment of this aggressive disease process begins with early diagnosis, where a high index of suspicion is vital. Once diagnosed, the treatment regimen should be composed of emergent surgical debridement, which can include breast salvage debridement or total mastectomy, in addition to antibiotic therapy.

1. Introduction

Since the beginning of the coronavirus (COVID-19) pandemic in the US in March of 2020, many states including Ohio implemented orders to assist in limiting the spread of the virus and preservation of personal protective equipment (PPE). COVID-19 mandates included statewide stay-at-home orders and cancellation of nonessential or elective surgeries. Several studies have demonstrated that the coronavirus pandemic also led to rising anxiety and stress levels worldwide [1]. During this time, many emergency departments reported a startling decrease in the number of patients presenting with serious non-COVID-related medical issues. Due to fear of viral exposure, many patients choose to avoid seeking medical attention, resulting in delay of presentation and an associated increase in morbidity and mortality [2]. Additionally, as shown by Rubulotta et al., the challenges related to the sensitivity and specificity of testing for prompt diagnosis of the SARS-CoV-2 infection caused significant delays in recognizing and treating COVID-19 during the first wave of the pandemic [3].

Necrotizing soft tissue infections are considered an aggressively severe soft tissue infection associated with increased mortality. Historically, this infection mainly affects the abdominal wall, extremities, and perineum (commonly referred to as Fournier’s Gangrene). Necrotizing soft tissue infections of the breast are quite rare, with very few cases reported in the literature. The key point in treating this disease process relies on early diagnosis and prompt surgical debridement, where any form of delay can have severe consequences.

2. Case

A 39-year-old female with a history of obesity and tobacco use presented to the emergency department with a 10-day history of increased swelling, redness, drainage, and pain of the right breast and upper abdomen. The patient reported
-associated fever, chills, nausea, and emesis. There was no his-
tory of trauma or previous surgery. She also stated she was
reluctant to visit her primary care physician or any emer-
gency department when her symptoms began due to anxiety
related to COVID-19 viral exposure.

On clinical examination, the right breast was noted to
have a $12 \times 14$ cm area of skin sloughing along the inferior
inner aspect of the breast. A necrotic open wound was also
seen within the lower outer quadrant with foul-smelling
drainage surrounded by edema, erythema, and crepitus
extending onto the right anterior abdominal wall
(Figures 1(a) and 1(b)) The patient was noted to be hypoten-
sive with mild tachycardia.

Pertinent laboratory findings revealed a leukocytosis of
$16.9 \times 10^9/L$ with neutrophilia, thrombocytosis of $608 \times 10^9/L$, and mild hyponatremia of $133 \text{ meq/L}$. Mild anemia was
present, but renal function and lactic acid were found to be
within normal limits.

A chest computer tomography (CT) ordered by the
emergency room physician revealed the right breast wound
with several locules of gas within the superficial subcutane-
ous tissues of the right lateral and posterior breast with min-
imally increased attenuation of the subcutaneous tissues.
(Figures 2(a)–2(c)) These findings were consistent with a
necrotizing soft tissue infection, and general surgery was con-
sulted. After surgical evaluation, a decision was made to pro-
ceed with emergent surgical intervention to provide source
control. Prior to surgery, resuscitative intravenous fluids
were administered in addition to vancomycin, clindamycin,
and aztreonam, due to an unknown reported allergy to
cephalexin.

The patient was taken to the operating room for an emer-
gent wide excision and debridement of the infected tissue
within the inferior right breast and the upper portion of the
abdominal wall including the fascia overlying the pectoralis
major muscle and external oblique. An attempt was made
to obtain adequate source control while preserving as much
breast tissue as possible, leaving the nipple areola complex
intact. Cultures were obtained intraoperatively approxi-
mately 90 minutes after antibiotics had been administered.
The wound was packed with wet-to-dry gauze and managed
with daily dressing changes. An infectious disease consulta-
tion was performed, and the decision was made to replace
aztreonam with piperacillin-tazobactam.

During the second operative debridement approximately
36 hours later, findings of advancing cellulitis extending
superiorly on the right breast, encompassing the entire areo-
lar complex, were identified. A completion mastectomy was
performed in order to obtain adequate source control. Again,
the wound was packed with planned daily local wound care
and a return to the operating room for potential delayed pri-
mary closure. A third operation with minimal debridement
of the lateral aspect of the right breast was performed and
the wound, measuring $25 \times 15 \times 8$ cm, underwent delayed
primary closure in a multilayer fashion over closed suction
drains.

Histopathologic evaluation of all tissue excised during all
three operations was noted to be negative for malignancy and
showed extensive acute suppurative inflammation, multiple
abscesses, and tissue necrosis. The final tissue cultures grew
Corynebacterium with negative blood cultures. The patient
was discharged home 12 days after presentation on a 5-day
course of ertapenem and daptomycin via a PICC line. Drains
were removed during outpatient follow-up visit (Figure 3).
The patient was offered plastic surgery consultation for pos-
sible reconstruction, but refused. The case underwent a mul-
tidisciplinary breast conference review two weeks after
discharge, and no further recommendations were made.

3. Discussion

Necrotizing soft tissue infection (NSTI) is a rare severe dis-
ease characterized by a rapidly progressing infection causing
fulminant tissue destruction with associated systemic toxic-
ity. The aggressive nature of this disease process corresponds
to its high mortality rate, which is 25-35% and has remained

![Figure 1: (a) Open right breast necrotic wound, with skin sloughing. (b) Erythema extending from the areolar complex to the superior aspect of the right anterior abdominal wall.](image-url)
unchanged over the last 30 years. The high incidence of mortality in affected patients is directly proportional to the time to surgical intervention, where a delay in surgical debridement of 24 hours or more increased mortality to 70% [4]. In the US, the incidence of NSTI has been estimated to be 0.4 cases per 100,000 [5].

Characterization of NSTI has been based on anatomic location, depth of infection, and more commonly based on microbial source. When based on microbial sources, NSTI are classified as Type I, II, or III. Type I NSTI is typically due to a polymicrobial infection, including both aerobic and anaerobic microbes. These microbes include Group A beta-hemolytic streptococcus, Staphylococcus aureus, Escherichia coli, and Clostridium species. This is the most common class and is usually secondary to trauma or surgical insult. Type II NSTI consists of monomicrobial infections, with Group A beta-hemolytic Streptococci being the most common culprit. Type III NSTI is less commonly described as an infection caused by Vibrio vulnificus transmitted to humans by marine insects.

The pathophysiology of NSTI has been well established as an overwhelming subcutaneous infection with thrombosis of cutaneous perforating vessels resulting in necrosis. Common risk factors for the development of NSTI include trauma, burns, recent surgery, and comorbidities such as obesity, smoking, diabetes, peripheral vascular disease, liver disease, renal failure, and immunosuppression [4].

NSTI can occur anywhere in the body but commonly involves the lower extremities, perineum, and abdominal wall. Primary NSTI of the breast was first reported in 2001 by Shah et al. [6], and few cases have been described since then. Some cases have been described after breast surgical procedures, including simple and partial mastectomy, as well as core needle biopsies.

Within the breast, NSTI can be difficult to recognize and are commonly misdiagnosed as cellulitis, mastitis, abscess, or inflammatory breast cancer. This is thought to be secondary to the thickness of subcutaneous tissue between the skin and underlying deep fascia, in addition to the vast blood supply to the breast, which can both lead to delay in the presentation of common cutaneous changes [7]. Delays in diagnosis and or misdiagnosis both lead to delayed treatment and intervention, which can lead to fatal outcomes.

Figure 2: (a, b) Axial view of Chest CT depicting increased inflammation of the right breast and associated locules of gas along lateral and posterior aspect of breast. (c) Coronal view of Chest CT image showing increased attenuation of the right inferolateral breast tissue with several locules of gas. Images obtained with patient permission.
The Laboratory Risk Indicator for Necrotizing Fasciitis (LRINEC) scoring system is a useful adjunct that has been shown to aid in the early diagnosis of necrotizing soft tissue infections. The LRINEC score consists of six biologic markers: total white cell count, hemoglobin, sodium, glucose, serum creatinine, and C-reactive protein. A score of 6 or greater is associated with a positive predictor value of 92% [4]. This when used in conjunction with common clinical findings (including edema, erythema, localized pain, presence of fluid filled bullae, signs of hemodynamic instability) should trigger clinicians to initiate aggressive resuscitation with intravenous fluids and broad spectrum antibiotics, in addition to emergent surgical consultation for early operative debridement. Other diagnostic adjuncts include imaging studies such as MRI, ultrasound, chest-computed tomography noting marked tissue inflammation, and possible locules of gas within subcutaneous tissue.

Surgical wide debridement is the main treatment component of all NSTI, including that of the breast. Most previously reported cases in the literature reported single or staged surgical debridement(s), often time resulting in total mastectomy as a means of gaining infection control [8]. Some reports have described potential operative debridement with breast salvage in cases with early detection. In the setting of staged debridement, a second-look operation is typically planned 24-48 hours after index debridement to examine for further infection and or if the patient’s clinical status worsens or fails to improve [9].

4. Conclusion

Although rare, necrotizing soft tissue infections can present in atypical locations such as the breast. Although disease recognition in the breast can be difficult, a high index of suspicion is needed to quickly diagnose and initiate early operative debridement (mastectomy vs. breast salvage debridement) and antimicrobial therapy. This multidisciplinary management approach is the mainstay in combating the high morbidity and mortality commonly associated with this disease process.

In addition, the healthcare issues brought on by the COVID-19 pandemic influence on the delay in presentation of patients resulting in conditions requiring more radical medical and/or surgical intervention. Thus, it is imperative that healthcare systems communicate with the public, the capacity and imperative need to handle all medical emergencies in a timely manner.

Consent

Verbal and written consent were obtained from the patient prior to publication submission.

Conflicts of Interest

The authors declare that they have no conflicts of interest.

References

[1] R. S. G. Limcaoco, E. M. Mateos, J. M. Fernandez, and C. Roncero, “Anxiety, worry and perceived stress in the world due to the COVID-19 pandemic, March 2020. Preliminary results,” 2020, MedRxiv.
[2] S. Masroor, “Collateral damage of COVID-19 pandemic: delayed medical care,” Journal of Cardiac Surgery., vol. 35, no. 6, pp. 1345–1347, 2020.
[3] F. Rubulotta, H. Soliman-Aboumarie, K. Filbey et al., “Technologies to optimize the care of severe COVID-19 patients for health care providers challenged by limited resources,” Anesthesia and Analgesia, vol. 131, no. 2, pp. 351–364, 2020.
[4] B. Sarani, M. Strong, J. Pascual, and C. W. Schwab, “Necrotizing fasciitis: current concepts and review of the literature,” Journal of American College of Surgeons, vol. 208, no. 2, pp. 279–288, 2009.
[5] M. A. da Costa Silva, J. B. S. Filho, R. de Freitas Júnior, E. B. Peleja, R. de Araújo Catão, and L. F. J. Ribeiro, ”Fasceite necrotizante da mama: relato de caso,” Revista Brasileira de Ginecologia e Obstetrícia, vol. 20, no. 4, pp. 221–224, 1998.
[6] J. Shah, A. K. Sharma, A. Johri, B. Mearns, J. M. O’Donoghue, and V. A. Thomas, ”Necrotising fasciitis of the breast,” British Journal of Plastic Surgery, vol. 54, no. 1, pp. 67–68, 2001.
[7] P. Yaji, B. Bhat, and E. Harish, ”Primary necrotising fasciitis of the breast: case report and brief review of literature,” Journal of Clinical and Diagnostic Research, vol. 8, no. 7, pp. ND01–ND02, 2014.
[8] P. Jha and B. K. Jha, ”Case of necrotizing fasciitis of breast in a young lactating mother,” Journal of Institute of Medicine, vol. 40, pp. 134–136, 2018.
[9] C. A. Dodaro, A. Zaffiro, A. M. Iannicelli et al., ”Combined timed surgery & conservative management of primary necrotizing fasciitis of the breast: a case report,” Case reports & clinical practice review, vol. 21, article e922688, 2020.