Necrotizing Fasciitis of the Male and Female Breast: A Case Series

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Abstract

Background: Necrotizing fasciitis (NF) is a severe, fulminant infection characterized by necrosis of subcutaneous tissue and fascia with associated systemic toxicity.

Methods: A retrospective review of breast NF cases (January 2007 to December 2018) which originated primarily in breast tissue (PNF), or spread to the breast secondarily (SNF).

Results: Five (63%) males and 3 (37%) females had an overall age (mean ± sd) of 46.4 ± 18 years, hospitalization 46.5 ± 20.3 days, and 10.4 ± 5.0 debriding/grafting. Females were older than males (median 51 vs 38 years). Six (75 %) patients had SNF and two (25%) had PNF with 5 partial, 2 unilateral, 2 bilateral and 1 simple mastectomies. Median age for PNF vs SNF patients was 72 vs 38 years. Bacteriology indicated: 3 cases of Group A Streptococcus pyogenes; 2 polymicrobial; 1 each of multi-resistant Staphylococcus aureus, Pseudomonas, and Coagulase negative Staphylococcus. Overall mortality was 37.5%. Survivors were younger than the deceased 36.0 ± 10.3 (median 37) versus 63.7 ± 13.7 (70) years. Two patients with PNF had 100% mortality; only one of 6 (17%) SNF patients died.

Conclusions: Although extremely rare, this institutional series had more males with breast NF than reported in the literature. Patients who developed breast NF secondarily were younger, with more partial mastectomies and lower mortality.

INTRODUCTION

Necrotizing fasciitis (NF) is a rapidly spreading and sinister infection characterized by necrosis of subcutaneous tissue, fascia, and muscle with associated systemic toxicity. [1, 2] Predisposing conditions include diabetes, alcoholism, obesity, advanced age, comorbidities, drug abuse, and immunosuppression. [1] Despite advances in care, mortality from NF remains high, estimated between 20% and 30%. [2] Based on 2003-2013 National Center for Health Statistics, NF has an incidence of 4.8 deaths per 1,000,000 and affects males more frequently, (extremities and torso). [3] The breasts are rarely affected, with most cases presenting after trauma, infection, or surgical intervention and in female patients.

Shah et al [4] are credited with the first report of NF occurring in the adult female breast. NF can either originate from the breast parenchyma (primary-PNF) or involve the breast as a direct extension from an adjacent area (secondarily-SNF) such as the upper extremities, axilla, or face/neck. [5] Primary breast NF is commonly misdiagnosed as an abscess, mastitis, cellulitis, or inflammatory breast cancer, leading to treatment delays. [6] Regardless of the etiology, mastectomy has been the main treatment in the majority of published cases. [1, 2] Rapid clinical identification of NF, and emergent surgical debridement of necrotic tissue are critical; delays to surgical intervention result in increased mortality. [7, 8] The aim of this retrospective study was to analyze patients with either primary or secondary breast NF at our center and to identify factors contributing to either a partial or total mastectomy.

MATERIALS AND METHODS

Sample Population

Cases with necrotizing fasciitis of the breast were identified

through the Burn Center Registry between January 2007-December 2018. A retrospective hospital chart review was performed on eight cases occurring in 5 males and 3 females. Primary breast NF (PNF) was defined as the presenting disease process. Secondary breast NF (SNF) was defined as breast tissue involvement, as a result of proximity to the necrotic tissue, muscle, and fascia spread from an adjacent anatomical region. The study was approved by the Institutional Review Board.

Statistical Analysis

Statistical Analysis was performed utilizing Statistica® (StatSoft, Tulsa, OK) descriptive statistics with ANOVA-one way and chi-squared. Patient demographics included: age, gender, primary (PNF) or secondary (SNF) breast necrotizing fasciitis, location, presentation as an abscess, cellulitis, source of initial injury, pre-hospital treatment, initial white blood count, C-reactive protein, sodium chloride, creatinine, glucose, calcium, hemoglobin, arterial blood gases, lactate levels, base deficit, positive blood, urine or bronchoalveolar lavage (BAL) cultures, type of microorganism (type I –IV), admission blood pressure, tachycardia, antibiotics, symptoms for number of days prior to admission, length of Stay (LOS), days in the ICU, days ventilated, operations, reconstructive procedures, breast surgery, death, renal failure, use of dialysis (any kind), days on dialysis, steroid therapy, insulin drip, negative pressure wound therapy (NPWT), tracheostomy, Respiratory Quotient (RQ), Resting Energy Expenditure (REE), albumin, pre-albumin, and initiation of appropriate antibiotics. Due to the small numbers, only the basic statistical analyses were performed.

RESULTS

Series Demographics

Tables 1 and 2 show the individual demographic characteristics of the male and female patients. Eight cases were identified: five (63%) males and 3 (37%) females. Patient ethnicity was 50% Caucasian and 50 % Hispanic. The overall age was a mean ± sd of 46.4 ± 18 years, length of stay was 46.5 ± 20.3 days, intensive care days of 43 ± 17 days with 10.4 ± 5.0 debriding and grafting operations of a size on average of (2033±1222 cm2) and 3.2 ± 1.5 reconstructive procedures. The median age was 43 years, with females older than males (51 vs 38 years). Diabetes, renal disease, and Intravenous Drug Abuse (IVDA) were the most common comorbidities. The etiologies varied: an underarm cut, elbow laceration, infection on the anterior chest wall, tooth and peritonsillar abscesses, intravenous drug injection abscesses, and unknown. There were 5 transfers from other hospitals. All patients had erythema, and pain disproportionate to the symptoms on presentation to the admitting hospital. Six (75 %) patients had SNF and two (25%) patients had PNF. The median age for PNF vs SNF patients was 72 vs 38 years. Partial mastectomies were performed in 5 patients (4 males and 1 female, all with SNF). Unilateral simple mastectomy was required for 2 patients (male with SNF and female with PNF), and 3 bilateral mastectomies were performed in 3 patients (1 male and 1 fema1e with PNF; 1 male with SNF). The microbial cultures were 3 cases of Group A Streptococcus pyogenes (2 SNF, 1 PNF), 1 multi-resistant Staphylococcus aureus (PNF), 1 Pseudomonas (SNF), 1 Coagulase negative Staphylococcus (SNF), and 2 polymicrobial (SNF). There were six Type II (monobacterial) and two Type I (polymicrobial).

Overall mortality was 37.5%. Survivors were younger than the deceased 36.0 ± 10.3 (median 37) versus 63.7 ± 13.7 (median 70) years. Two patients with PNF had 100% mortality; they were septic on arrival with multiple comorbidities and an advanced age. The 6 patients with SNF were younger and had a morbidity of 17% (1 patient). If they survived, the patients required multiple debridements prior to final reconstruction. Negative Pressure Wound therapy (NPWT) was used to heal the viable tissue and grafts. Integra® was utilized to fill in the defects created by the debridement of necrotic tissue.

As a small group of eight patients, they were very heterogeneous in their presentations, hospital course, and outcomes. Table 3. evaluates and compares the demographic characteristics and laboratory values of these patients on the basis of gender. Comparing the men to the women with breast NF, they were younger, had similar pre-admission symptoms, and BMI. Table 4 compares patients on the basis of PNF or SNF. The patients with PNF were older on admission with more comorbidities and had an earlier demise (19 vs 56 days) for the patient with SNF who went on to have more surgeries and reconstruction. Laboratory values were similar on admission for the two groups.

If one compared the patients transferred to the Burn Center compared to those directly admitted, they had substantially normal protein, albumin, sodium chloride (Na), magnesium, partial thromboplastin time, with decreased prealbumin, and calcium. Laboratory parameters that were elevated included CRP, HgA1c, liver enzymes, base excess, BUN, Creatinine,

glucose, and PT.

The LRINEC score was not useful for our patients because the majority were transfers from other institutions and had already been treated clinically, and in some cases surgically at the original treating hospitals. A recent systemic review and meta-analysis by Fernando et al currently recommended that the LRINEC score had poor sensitivity, and should not be used to rule-out necrotizing soft tissue infection. [7]

Table 1

Demographic Characteristics of Male Patients with Necrotizing Fasciitis of the Breast

Parameters	Case #1	Case # 2	Case #3	Case #4	Case #5
Age (yrs)	70	31	38	23	48
Ethnicity	Caucasian	Hispanic	Hispanic	Hispanic	Hispanic
Etiology	CT Air Tissue	Elbow Laceration Fall	US Air Tissue (Snorting Cocaine for 3 days)	IVDA injection	toothache
Symptoms (days)	1	?	5	3	2
BMI (nl 18.5-24.9)	32.5	26.6	26.5	23.5	19.6
Location	Chest Wall, Breast	Chest Wall, UE, Torso	Neck	RUE	Neck
Extension	Upper abdomen	L toes, L thigh	Chest Wall, Torso,	Chest Wall, Torso	Chest Wall, Torso
Microbe	MRSA	Group A Streptococcus pyogenes	Prevotella Oralis, Fusariobacterium	Pseudomonas	Fusarium,Veillonella ST
Antibiotics	Micafungi,Zyvox	Metronidazole, Zyvox, Ceftriaxone	Vancomycin Zosyn Clindamycin	Vancomycin Zosyn, Zyvox, Clindamycin	Vancomycin, Zosyn, Clindamycin
Type	II	II	I	II	I
# Debridements	5	11	9	13	19
# Reconstruction	0	5	2	2	3
Steroids	+	--	+	--	+
Mastectomy	Bilateral	Partial	R Unilateral; L Partial	Partial	Partial
Transfer	+	+ After 16 days	--	+ After 7 days	--
Admit Sepsis	--	+	--	--	--
LOS (days)	22	69	50	61	46
ICU (days)	22	60	45	61	46
Vent Days	22	53	4	14	46
Adjunct Therapy	NPWT, hemodialysis	L TMP, Tracheostomy,	Tonsillectomy, Integra®, NPWT	Integra, Amputation RUE	Integra, CRRT, PEG/Esophagus
NPWT (days)	22	24	19	30	23
Drugs	Negative	THC-Opiates-Benzodiazepines	Cocaine- THC	Heroin	THC
Diabetes	+	--	--	--	+
COPD	+	--	--	--	--
Cardiovascular	+	--	--	Hypovolemia, Cardiac Arrest	--
Renal	+	+	--	ARF Rhabdomyolysis	+
HTN	+	--	--	--	+
Hepatitis C	--	--	--	--	+
IVDA	--	+	+	+	--
Lemierre's Syndrome	--	--	+	--	--
Mortality	Dead	Alive	Alive	Alive	Dead
LRINEC score (NF at ≥ 6)	7	3	5	8	--

BMI=Body Mass Index; OR= Operation; LOS= Length of Stay; ICU= Intensive Care Unit; Vent=Ventilator; NPWT= Negative Pressure Wound Therapy; COPD= Chronic Obstructive Pulmonary Disease; HTN= Hypertension; IVDA= Intravenous Drug Abuse; NF= Necrotizing Fasciitis; ARF= Acute Renal Failure; RUE= right upper extremity; UE= Upper extremity; CT= computerized tomography scan; US= Ultrasound; CRRT= Continuous Renal Replacement Therapy; L TMP= Left Transmetatarsal-phalangeal amputation; THC= marijuana

Table 2

Demographic Characteristics of Female Patients with Necrotizing Fasciitis of the Breast

Parameters	Case # 6	Case # 7	Case # 8
Age (yrs)	37	73	51
Ethnicity	Caucasian	Caucasian	Hispanic
Etiology	Shaved Underarm	Infection Anterior Chest	IV injection Abscess
Symptoms (days)	3	5	7
BMI (nl 18.5-24.9)	34.9	26.2	36.2
Location	Axilla	Chest Wall, Abdomen	Chest Wall
Extension	UE, Torso, Perineum, Genitals	UE	--
Microbe	Group A Streptococcus *Pyogenes*	Group A Streptococcus *Pyogenes*	Coagulase Negative Staphylococcus
Antibiotics	Vancomycin Zosyn Diflucan Clindamycin	Vancomycin Zosyn Zyvox	Vancomycin Bactrim Zyvox
Type	II	II	II
# Debridements	15	5	6
# Reconstruction	5	--	2
Steroids	--	+	--
Mastectomy	Partial	Bilateral	Unilateral
Transfer	+ After 5 days	+ After 5 days	--
Admit Sepsis	+	+	--
LOS (days)	70	16	38
ICU (days)	57	16	38
Vent (days)	18	16	14
Adjunct Therapy	Integra, Scapula Flap	CRRT	--
NPWT (days)	58	--	10
Drugs	Methadone-Opiates-Benzodiazepine	Negative	Heroin
Diabetes	--	--	--
COPD	--	--	--
Cardiovascular	--	+	--
Renal	--	+	--
HTN	--	+	--
Hepatitis C	--	--	+
IVDA	--	--	+
Influenza A	+	--	--
Depression	+	--	--
Paranoia	--	--	+
Mortality	Alive	Dead	Alive
LRINEC Score	1	4	--

BMI=Body Mass Index; OR= Operation; LOS= Length of Stay; ICU= Intensive Care Unit; Vent=Ventilator; NPWT= Negative Pressure Wound Therapy; COPD= Chronic Obstructive Pulmonary Disease; HTN= Hypertension; IVDA= Intravenous Drug Abuse; NF= Necrotizing Fasciitis; UE=Upper extremity; CRRT= Continuous Renal Replacement Therapy; IV= intravenous

Table 3

Demographics of Gender Characteristics and Laboratory Comparison on admission to the Burn Center

(Median)	Normal	Male	Female
Number		5	3
Age (yrs)		38	51
LOS (days)		50	38
ICU (days)		46	38
Symptoms (days)		2.5	5
Tachycardia (beats/min)	60-90	102	88
Systolic mmHg	120-90	97	103
Diastolic mmHG	60-80	55	58
Temperature (C°)	36.1-37.2	37.5	36.8
BMI (kg/m^2)	18.5-24.9	26.54	34.9
# Operations		11	6
# Reconstructions		2.5	3.5
Surgery cm^2		865	2500
Vent Days (days)		21	16
NPWT (days)		23	34
Mortality (%)		40	33
Laboratory Values			
Aspartate Aminotransferase µL	14-36	37	192
Alanine Aminotransferase µL	9-52	32	192
Alkaline Phosphatase µL	53-141	74	152
White Blood Count 10^3/µL	4.2-10.2	22	9
Hemoglobin g/dl	11.6-14.8	14	9
Platelets K/µL	141-464	201	94
C-Reactive protein mg/L	≤5.o	331	129
Total Protein g/dL	6-8.3	5.1	3.8
Albumin g/dL	3.5-5.0	1.9	1.7
Prealbumin g/dL	16-38	9	5
Sodium Chloride mmol/L	137-145	137	139
Blodd Urea Nitrogen mg/dL	7-17	24	21
Creatinine mg/dL	0.52-1.04	3.0	1.0
Glucose mg/dL	74-106	138	85
Calcium mg/dL	8.4-10.2	7	7
Magnesium mg/dL	1.6-2.3	2	2
Phosphorus mg/dL	2.5-4.5	5.7	3.4
PT (seconds)	9.8-12.3	15.1	13.3
PTT (seconds)	26.7-35.7	29	33.8
INR	0.9-1.1	1.3	1.2
HgbA1c %	4-5.6	10.8	6.1
Arterial pH	7.35-7.45	7.42	7.29
Base Excess mEq/L	-2.5 to 2.5	0.6	-6.1
Lactic Acid mmol/L	0.7-1.9	2.7	4.1
(RQ) Respiratory Quotient	0.85	0.91	1.0
REE	--	1798	2517

LOS= Length of Stay; BMI= Body Mass Index; Vent= Ventilator; NWPT= Negative Pressure Wound Therapy; PT= Prothrombin Time; PTT= Partial Thromboplastin Time; INR=International Normalized Ratio; REE=Resting Energy Expenditure; REE=Resting Energy Expenditure

Table 4

Demographics of Primary and Secondary Necrotizing Fasciitis Comparison on admission to the Burn Center

(Median)	Normal	Primary	Secondary
		2	6
Age (yrs)		72	38
LOS (days)		19	56
ICU (days		19	52
Symptoms (days)		2.5	5
Tachycardia (beats/min)	60-90	100	94
Systolic mmHg	120-90	63	103
Diastolic mmHG	60-80	37	57
Temperature (Co)	36.1-37.2	36.85	37.5
BMI (kg/m2)	18.5-24.9	29.35	26.57
# Operations		5	12
# Reconstructions		--	2.5
Surgery cm2		800	2500
Vent Days (days)		19	16
NPWT (days)		22	24
Mortality (%)		100	17
Laboratory Values			
Aspartate Aminotransferase µL	14-36	158	37
Alanine Aminotransferase µL	9-52	107	48
Alkaline Phosphatase µL	53-141	85	132
White Blood Count 103/µL	4.2-10.2	20	16
Hemoglobin g/dl	11.6-14.8	11	10
Platelets K/µL	141-464	198	116
C-Reactive protein mg/L	≤5.0	191	130
Total Protein g/dL	6-8.3	4.9	4.4
Albumin g/dL	3.5-5.0	2.6	1.8
Prealbumin g/dL	16-38	12.0	6.0
Sodium Chloride mmol/L	137-145	138	138
BUN mg/dL	7-17	22.5	29.5
Creatinine mg/dL	0.52-1.04	2.7	1.1
Glucose mg/dL	74-106	142	114
Calcium mg/dL	8.4-10.2	8.45	7.0
Magnesium mg/dL	1.6-2.3	2.3	2.0
Phosphorus mg/dL	2.5-4.5	5.2	3.85
PT (seconds)	9.8-12.3	13.2	15.7
PTT (seconds)	26.7-35.7	34.7	32.1
INR	0.9-1.1	1.2	1.35
HgbA1c %	4-5.6	8.25	6.4
pH	7.35-7.45	7.35	7.33
Base Excess mEq/L	-2.5 to 2.5	-2.3	-2.7
Lactic Acid mmol/L	0.7-1.9	4.9	4.4
(RQ) Respiratory Quotient	O.85	1.06	0.85
REE	--	1435	2407

LOS= Length of Stay; BMI= Body Mass Index; Vent= Ventilator;
NWPT= Negative Pressure Wound Therapy; PT= Prothrombin Time; PTT= Partial Thromboplastin Time; INR= International Normalized Ratio; REE=Resting Energy Expenditure

Figure 1

Breast Necrotizing Fasciitis of the Male and Female Breast

Patient 1. 70 yo male with primary NF of bilateral breast, underwent bilateral mastectomy. Defect was reconstructed with split thickness autografting

Patient 3. 38 yo male with secondary NF of the breasts from right peritonsillar abscess. Patient underwent right total mastectomy and left partial mastectomy. Defect was reconstructed with split thickness autografting

Patient 6. 37 yo female with secondary NF of the left breast from axillary NF infection. Patient underwent left partial mastectomy. Defect was reconstructed with split thickness autografting

DISCUSSION

Within a span of 12 years, there were 8 cases of necrotizing fasciitis of the breast: 5 males and 3 females at this institution. To our knowledge, there have been only three reports of male breast necrotizing fasciitis case descriptions in the literature; the majority of this rare condition has been reported in females. In this series, breast tissue was conserved with preservation of the nipple and areolar complex in 4 cases (3 male and 1 female). Shaikh et al [9] compare NF of the extremities and torsos in males and females, but a table lists 8 patients, "2 males and 3.5 females" with chest and breast as the site of the infection (no details were included). In our review of the literature, patient identification as a male in the three NF cases was a result of the published photographs as NF of the chest wall or thorax. [10, 11, 12] It may be possible that reports of patients with anterior chest wall necrotizing fasciitis do not include necrotic breast tissue as a separate entity from the anterior chest wall if the breast were debrided or removed completely or partially, or if the breast tissue was not recognized during debridement because of the necrosis. In 1982, Krol et al [10] reported a 59 year old male who had septic shock and NF on presentation with an extensive skin lesion on the anterior chest wall and no history of trauma; autopsy confirmed NF. Only the report photograph depicted the possible involvement of the breast tissue. [10] In 1997, Banwell et al [11] described a 55 year old male who did not respond to antibiotic treatment for a paronychia and developed sepsis and renal failure two weeks later. With rapid and appropriate treatment, he recovered and was discharged three weeks later. The third male developed NF of the anterior chest wall after cardiac surgery. [12] There was a photograph of the anterior chest wall debridement but no mention of breast debridement; he also recovered. [12]

In our male study patients, the anterior chest wall was affected by the necrosis and required debridement when the breast tissue was primarily or secondarily involved. The involvement of the breast tissue with NF was included in the ICD-9 and ICD-10 coding.

Breast Blood Supply

In breast NF case reports, it is often noted that the breast has a "robust blood supply" and conjectured that this was why breast NF is so rare in occurrence. The main sources are the "internal thoracic (mammary), lateral thoracic, anterior intercostal, and acromiothoracic (thoracoacromial) arteries; posterior intercostal, superficial thoracic, superior intercostal (highest intercostal)," and highest thoracic arteries are considered to be as important. [13] This review indicates that there are many individual variations in the segmental presence and absence of breast area arteries.[13] Since the nipple –areolar complex preservation is of main importance, the one or two segmental branch perforators off the internal thoracic perforators provide an adequate blood supply. [13] This information is important during debridement and partial mastectomies in necrotizing fasciitis.

The majority of breast NF literature consists of case reports. There is one report of a gender comparison on clinical presentations and outcomes of all NF cases: extremities, torso, and rare cases like breast and chest wall [8 (2.4%) of 331 cases]. [9] Of these, two cases (0.6% of the 331) were males. [9] Although many admission and laboratory parameters were similar between genders in that study and our cases, the NF locations were different as we had mainly NF of the breast and the Shiakh et al [9] study did not. Their mean ± sd of 51 ± 15 days was similar to our 46.4 ± 18.0 days in hospitalization length. Similar findings were seen in the Shaikh et al [9] and our study: a higher number of Type II NF (monomicrobial) and fewer Type I (polymicrobial) infections; women were also older than the men; and there was no significant difference in gender longevity. Their study [9] had 25.7% deaths and this series had a mortality of 37.50 % with 2 of 5 men and 1 of 3 women as non-survivors. The mortality difference may be a result of our lower patient number and exclusively breast NF compared to their inclusion of all NF types and larger patient number.

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