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Case Report

Vulvar necrotizing soft tissue infection: A review of a multi-disciplinary surgical emergency and management in the modern era☆

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Introduction

Necrotizing soft tissue infection is a rare and rapidly progressive bacterial infection characterized by widespread necrosis of subcutaneous tissue and adjacent organs. Necrotizing fasciitis of the vulva was first reported by Roberts and Hester (1972). Several other series have been published emphasizing these findings; early and aggressive surgical resection is critical to minimizing the morbidity and mortality of this life-threatening infection. The reported mortality rate varies widely in the literature, ranging from 13% to 50% (Roberts and Hester, 1972; Roberts, 1987; Nolan et al., 1993; Stephenson et al., 1992; Gallup et al., 2002).

Historically, risk factors for vulvar necrotizing infection include age >50, hypertension with arteriosclerosis, diabetes, renal failure, obesity, smoking, immunosuppression, previous radiation, and operative trauma (Roberts, 1987; Nolan et al., 1993). As Americans become more obese with associated increasing rates of diabetes and heart disease, gynecologists and gynecologic oncologists will likely encounter more episodes of life-threatening necrotizing vulvar infections; thus it is crucial that all providers are familiar with the entity and its management.

The study objective was to describe the outcomes of women with necrotizing fasciitis of the vulva treated by the gynecologic oncology and gynecology services at the University of Virginia (UVA); specifically to examine the time from presentation to debridement in the operating room and the role of multidisciplinary care in the treatment of these women.

Materials and methods

Study approval was obtained from the UVA Institutional Review Board. We identified all women who were treated for a vulvar necrotizing soft tissue infection by the gynecologic oncology or gynecology services between January 1st, 2007 and March 31st, 2012. Women were identified by department operative logs or admission to the gynecologic oncology or gynecology services with International Classification of Diseases (ICD) 9 coding for the diagnosis of necrotizing fasciitis.

Information abstracted from the medical records included: demographic information; weight; height; medical comorbidities; presence of risk factors thought to incite vulvar infection; imaging and laboratory results; surgical details; time from presentation to operative debridement; involvement of other services; need for Intensive Care Unit (ICU) stay; and mortality in the hospital or within 30 days of discharge.

Results

Fourteen women were treated for necrotizing soft tissue infection involving the vulva or perineum and had medical records available for review during the study time period. Ten patients had necrosis of the deep fascia and 4 had necrosis confined to the skin and subcutaneous tissues. Patient demographics are presented in Table 1. The mean patient age was 54.9 years (range 34–74 years) and 9 women (64%) were post-menopausal. Body mass index (BMI) was available for 13 women. The majority of women (11/13, 85%) were obese (BMI > 30 kg/m^2) and the mean BMI was 34.7 kg/m^2 (range 21.3–46.1 kg/m^2). All women had at least one risk factor for necrotizing soft tissue infection, the most common being obesity (11/14), hypertension (11/14) and diabetes (7/14).

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The clinical details for each patient are presented in Table 2. The majority of women presented with vulvar or labial swelling and/or pain. Most (79%) women had a white blood cell (WBC) count greater than 15 k/μL and 43% presented with serum glucose greater than 200 mg/dL. Seven women (50%) had a CT scan prior to surgical debridement. Of the women who had a pre-op CT scan, 4 occurred at an outside facility and 3 occurred at UVA. The three women who had a CT scan at UVA all had subcutaneous gas concerning for a necrotizing infection and were taken to the operating room urgently. The impact of the CT scan results is less clearly documented for those patients who were imaged at an outside facility however, each had subcutaneous gas and this information potentially prompted urgent transfer.

Due to the wide catchment area of our institution, most patients initially presented to an outside facility and were transferred to the UVA for surgical management. The time from initial presentation to initial surgical debridement was broad, ranging from 4 to 124 h (mean, 25 h). Once transferred to the University of Virginia, all patients were taken to the operating room for surgical debridement within 15 h (range: <1–15, mean 5.4 h). Among this group of patients 6/14 (43%) had tissue cultures with mixed flora. Other common microbes included *Bacteroides fragilis* and Methicillin resistant *Staphylococcus aureus*.

Each patient was cared for by several provider teams following initial debridement. The wound management service was involved in the care of all women and provided a range of services; assistance with wound V.A.C.® placement, bedside wound debridement and recommendations regarding optimal wound management. Eleven patients (79%) were transferred to an ICU during their hospitalization. The majority of those who had an ICU stay required a higher level of care immediately post-operatively secondary to sepsis and its end organ effects. The average length of ICU stay was 6 days. Infectious disease specialists were involved with antibiotic management in 10/14 (71%) cases. The plastic surgery service was consulted for assistance with secondary wound reconstruction in 10/14 (71%) cases. Other surgical services involved included general surgery, orthopedic surgery and vascular surgery for assistance with extensive debridement. Due to the extent of tissue involved, 4/14 (29%) women required skin grafting and 3/14 (21%) required colostomy. A single patient required above the knee lower extremity amputation and hip disarticulation as well as a posterior based muscle flap for hip wound coverage.

Among these 14 women, there were two deaths during hospitalization or within 30 days of discharge from the hospital resulting in a mortality rate of 14%. One such case is described in detail. Case 10 was a 64 year-old obese woman with type II diabetes mellitus and peripheral vascular disease who presented with labial swelling. At presentation she had a labial abscess, a WBC of 15 and a glucose of >500 mg/dL. She was immediately started on broad spectrum antibiotics. She had a CT scan which revealed enlargement of the right labia majora with a large amount of gas and inflammation within the fascial planes, extending superiorly into the mons pubis (Fig. 1). She was taken to the operating room for debridement within 24 h of presentation. Despite multiple debridements, broad spectrum antibiotics and multiple ICU admissions during her 77-day hospital course she continued to suffer from intermittent bacteremia and fungemia. During the third month of her hospitalization she had overwhelming sepsis due to her difficult to control hyperglycemia and extensive open wounds. Her family opted for comfort care only and she passed away on the palliative care service after a 77-day hospital stay.

Table 1
Patient demographics (N = 14).

Case	Age	Ethnicity	Insurance status	BMI (kg/m^2)	Risk factors
1	54	Black	Private	40.3	Obesity, DM, HTN
2	36	White	Medicare	36.1	Obesity, DM, HTN
3	74	Black	Medicare	45.1	Obesity, HTN
4	59	Black	Medicare	33.9	Obesity, DM, HTN, tobacco use
5	34	White	Self-pay	35.4	Obesity, HTN, prior vulvar infection, tobacco use
6	73	White	Medicare	32.2	Obesity, HTN, prior vulvar infection, tobacco use
7	65	White	Medicare	N/A	DM, HTN
8	44	White	Worker's compensation	30.4	Obesity, tobacco use
9	70	White	Medicare	23.5	Obesity, HTN, history of cervical cancer treated with radiation therapy
10	64	Black	Medicare	41.6	Obesity, DM, HTN, former smoker, chronic kidney disease
11	34	White	Private	31.7	Vaginal delivery
12	47	White	Medicare	46.1	Obesity, DM, HTN, prior vulvar infection
13	63	White	Medicaid	21.3	Tobacco use, history of cervical cancer treated with radiation therapy
14	51	White	Self-pay	24.0	Obesity, DM, HTN

BMI = body mass index, DM = diabetes mellitus, HTN = hypertension.

Discussion

One of the earliest descriptions of necrotizing soft tissue infection was written by Joseph Jones, a surgeon in the confederate army and reported a mortality rate of almost 50%. Meleney then provided further description of the entity, establishing *Streptococcus* as the frequent inciting organism and advocated early and extensive surgical debridement (Meleney, 1924). He later presented evidence of a similarly serious infection with a longer time course and a polymicrobial etiology (Brewer and Meleney, 1926). The first vulvar cases were described in 1972 by Roberts and Hester (1972).

Since the initial report by Roberts, several other case series of women with vulvar necrotizing fasciitis have been published. Extensive surgical debridement has continued to be the mainstay of treatment in conjunction with broad spectrum antibiotics and aggressive supportive care. Other early studies published by Nolan and Stephenson confirmed the early findings with mortality rates approaching 50% (Roberts and Hester, 1972; Roberts, 1987; Nolan et al., 1993; Stephenson et al., 1992). In more recently published studies, while mortality rates are still significant, they do seem to be improving and are in the 13–25% range (Gallup et al., 2002; Schorge et al., 1998). Our series confirms that early and aggressive surgical debridement is a critical mainstay to the management of this life-threatening condition. While the mortality rate is still high, 14% is an improvement over the earliest published mortality rates of 40–50%.

We hypothesize that the recent increase in the rate of necrotizing vulvar infections at UVA is related to the increasing rates of obesity and diabetes in central Virginia. Our population is unique in that 93% of our cases were not related to childbirth. Instead our cases are related to medical conditions that represent significant and increasing public health problems in the US: obesity, hypertension, and diabetes. Given that at a single institution we saw 14 cases over a 5 year time period, we can expect the incidence of this clinical entity to escalate as the rates of obesity continue to rise.

Finally, this is the first series to examine the use of a multidisciplinary approach for the care women with vulvar necrotizing soft tissue infection. Perhaps the involvement of specialists in infectious disease, plastic surgery and wound management minimizes late secondary infectious complications and mortality. Aggressive ICU care was a component of care for 11 of 14 women, many of whom had significant medical co-morbidities. The importance of a multi-disciplinary approach, including ICU care, in the management of patients with necrotizing

Table 2
Clinical details.

Case	Primary event	WBC (k/μL)	Glu (mg/dL)	CT scan	Bacteriology	Time to OR (h)	UVA time to OR (h)	ICU days	Additional services	Additional procedures	Outcome
1	Labial pain and swelling	15.5	256	No	Mixed aerobic and anaerobic flora	24	1	0	Wound, plastics	None	Survived
2	Vulvar pain and swelling	16.4	550	Yes	MRSA, *Prevotella disiens*	9	1	8	ID, wound, plastics, general surgery	None	Survived
3	Vulvar itching, pain and swelling	17.3	138	Yes	Mixed aerobic and anaerobic flora	12	2	4	ID, wound, plastics, general surgery	None	Survived
4	Vulvar and labial pain	17.7	845	No	Mixed cutaneous flora	9	9	10	ID, wound	None	Survived
5	History of hidradenitis, labial nodule	25.7	93	No	Mixed aerobic and anaerobic flora	11	3	4	Wound, plastics, general surgery	Grafting	Survived
6	Vulvar swelling	27.8	96	Yes	*Bacteroides fragilis*	124	5	2	Wound, plastics	None	Survived
7	Vaginal discharge	15.3	356	No	*Bacteroides fragilis*	4	4	1	ID, wound, ortho	None	Died
8	Perineal trauma	8.3	159	No	Mixed aerobic and anaerobic flora	4	2	13	Wound, plastics, general surgery	Colostomy, grafting hyperalimentation	Survived
9	Vulvar drainage	15.5	142	No	*Enterococcus faecalis*, *Candida parapsilosis*	33	2	0	ID, wound, plastics, general surgery	Colostomy hyperalimentation	Survived
10	Labial abscess	14.2	544	Yes	MRSA	15	15	18	ID, wound, plastics, general surgery	Colostomy, grafting hyperalimentation	Died
11	2nd degree vaginal laceration	22.1	140	Yes	Group A beta hemolytic strep, *Candida albicans*	N/A	N/A	19	ID, wound, plastics, general surgery, ortho	Above the knee amputation, grafting myocutaneous flap, hyperalimentation	Survived
12	Labial swelling	33.0	245	No	*Bacteroides fragilis*	32	2	5	ID, wound, ortho	None	Survived
13	Vulvar pain and swelling	37.8	69	Yes	MRSA, *Providencia stuartii*	22	8	8	ID, wound, ortho, vascular surgery, plastics	Hyperalimentation, hyperbaric oxygen	Survived
14	Vulvar drainage and erythema	5.3	53	Yes	Mixed cervical and vaginal flora	24	15	0	ID, plastics, wound	None	Survived

WBC = white blood cell count, Glu = glucose, time to OR = time from initial presentation to operative debridement, UVA time to OR = time from presentation to the University of Virginia to operative debridement, MRSA = Methicillin resistant *Staphylococcus aureus*, ID = infectious disease, Plastics = plastic surgery, Ortho = orthopedic surgery.

soft tissue infections of other sites, such as periocular and head and neck necrotizing fasciitis, has been previously reported (Lanisnik and Cizmarevic, 2010; Tambe et al., 2012).

Of note, our series illustrates the continued need for improvement in the management of these patients. While each patient was taken to the operating room for debridement within 15 h of presentation to our institution, there were 3 patients (21%) who had sought medical care at a community hospital more than 30 h prior to surgical debridement. Clearly, all gynecologic surgeons and emergency department physicians should be familiar with the diagnosis and understand the importance of urgent surgical intervention. Immediate surgical debridement should not be delayed. Transfer after initial debridement for post-operative wound management and ICU care is preferable to delay in initial surgical therapy.

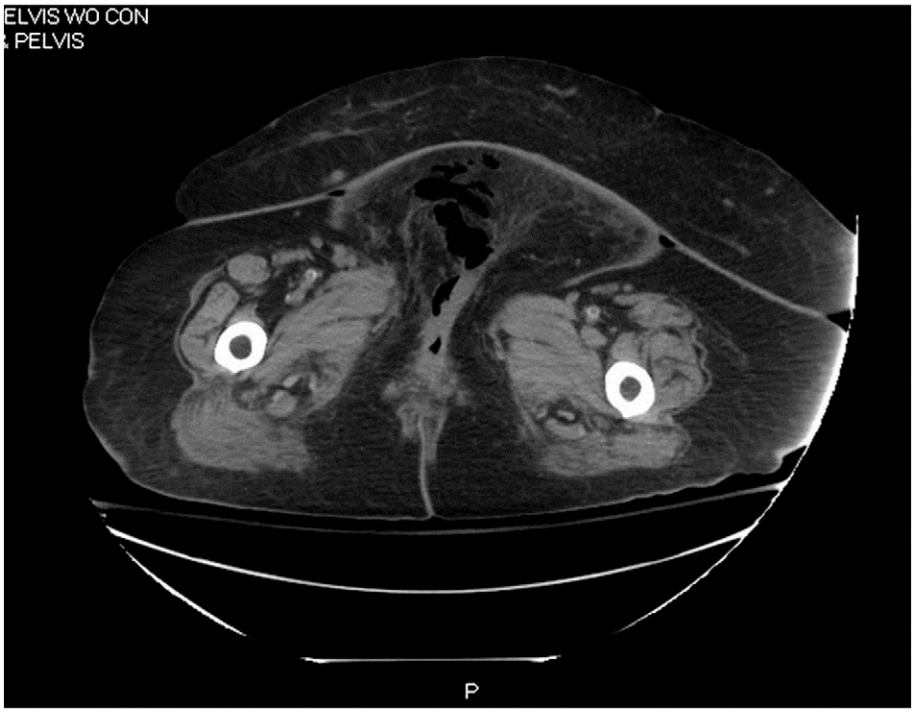

Fig. 1. Case #10 — CT scan of a 64-year-old woman who presented with labial swelling shows subcutaneous gas in the right labia.

Conflict of interest statement

The authors have no conflicts of interest to report.

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