Retroperitoneal Necrotizing Soft Tissue Infection Caused by Pelvic Sepsis

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Abstract

Background: Necrotizing soft tissue infection of the retroperitoneum is an uncommon but serious problem that requires early diagnosis and aggressive treatment.

Case Presentation: A 50-year-old Hispanic female presented to the emergency department with a four-day history of worsening abdominal pain. She was found to have peritonitis, lactic acidosis, leukocytosis, and imaging consistent with a necrotizing soft tissue infection of the retroperitoneum. She underwent multiple extensive surgical debridements. She also required hysterectomy, bilateral salpingo-oophorectomy, and sigmoid colectomy with end colostomy for source control in the pelvis. However, complete surgical debridement of the retroperitoneum was not possible because of proximity to major vessels. Despite maximal medical therapy, she died secondary to multi-organ failure.

Conclusion: A high index of suspicion is warranted for patients presenting with signs and symptoms suggestive of a retroperitoneal necrotizing soft tissue infection. Early surgical debridement is the mainstay of treatment, but delays in presentation and challenges in diagnosis and complete surgical source control result in a high mortality for these infections.

Keywords: necrotizing fasciitis; necrotizing soft tissue infection; retroperitoneal infection; sepsis; septic shock; surgical infection

A 50-YEAR-OLD HISPANIC FEMALE with hypothyroidism presented with a four-day history of abdominal pain. On the day of her presentation to the emergency department, the pain had worsened acutely with associated nausea, diarrhea, and anorexia. At the time of surgical consult, the patient's vital signs were: blood pressure, 95/55; pulse, 114; temperature, 98°F (36.7°C); respiratory rate, 27; and saturation of peripheral oxygen (SpO₂) 99%. She met the quick Sepsis Related Organ Failure Assessment (qSOFA) Criteria for sepsis.

Physical examination revealed diffuse peritonitis. The patient had a leukocytosis of 24.4 k/mm³ and an elevated lactic acid of 5.83 mg/dL. A computed tomography (CT) scan of the abdomen and pelvis revealed pneumoperitoneum, pneumoretroperitoneum, and large pelvic and intra-peritoneal fluid collections (Fig. 1). She was started on broad-spectrum antibiotics and taken emergently for exploratory laparotomy.

Intra-operative findings included extensive foul smelling fluid and necrotic tissue, a right tubo-ovarian abscess, and inflammation of the sigmoid colon. Necrotic fat and muscle extended from the pelvis to the level of the right kidney. She also had purulent fluid posterior to the uterus and an inflammatory mass in the pelvis consistent with a phlegmon. The patient underwent retroperitoneal debridement of fat and muscle. Because of the need for vasopressors and in anticipation of the need for at least one additional second look, a negative pressure wound therapy (NPWT) system was placed, and she was transferred to the intensive care unit (ICU).

Cultures grew *Bacteroides fragilis*, *Escherichia coli*, and *Proteus mirabilis*. Broad-spectrum antibiotics including vancomycin, cefepime, clindamycin, and doxycycline were continued. She underwent three subsequent retroperitoneal debridements. Additionally, on post-operative day one, urology performed cystoscopy and ureteral stent placement

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FIG. 1. Computed tomography of the abdomen and pelvis demonstrates air in the retroperitoneum (arrow) and in the pelvis.

for identification of the ureter during subsequent debridements. A small sigmoid perforation into the retroperitoneum was noted along with a thrombosed sigmoid artery, sigmoid inflammation, and dense adhesions to the uterus. Proctoscopy revealed a colonic-ovarian fistula, so a sigmoid colectomy was performed. Gynecology was consulted intra-operatively for concern of uterine and adnexal involvement. The uterus was noted to be grossly indurated, inflamed, and friable, with bilateral adnexa adherent to the pelvic side walls. A total abdominal hysterectomy and bilateral salpingo-oophorectomy (TAH-BSO) was performed. On post-operative day four, the patient underwent formalization of her end colostomy.

Despite initial improvements in her leukocytosis and vasopressor requirement, the patient deteriorated clinically after her last operation. She developed septic shock with multiple organ failure manifested by coagulopathy requiring multiple transfusions, renal failure, hepatic failure, and respiratory failure. Additional debridement at that time was not deemed feasible because of the proximity of necrotic tissue to the iliac vessels and inferior vena cava. After discussion with the family, care was withdrawn, and the patient died.

Discussion and Literature Review

Retroperitoneal necrotizing soft tissue infections (NSTIs) are rare, with only case reports and small case series being reported in the literature [1]. Necrotizing soft tissue infections can occur anywhere in the body, but are most often seen in the extremities, perineum, and genitalia [2]. The true incidence of retroperitoneal NSTIs is unknown because of the rarity of the disease; analyses of large administrative databases and clinical registries lack information regarding the site of origin [3].

Multiple etiologies have been reported in association with retroperitoneal NSTIs including pyelonephritis; perforations

associated with colon cancer, diverticulitis, and appendicitis; extension of a perineal infection such as post-surgical sepsis after hemorrhoidectomy; gynecologic complications such as intra-uterine instrumentation, intra-uterine death, and caesarean section; and occasionally extra-abdominal infections such as those originating in the extremities [4–6]. The mechanism in this case is believed to be a severe pelvic infection caused by sigmoid colon perforation with uterine and ovarian involvement; direct spread from the extra-peritoneal pelvic space to the retroperitoneum has been hypothesized.

Predisposing factors for NSTIs in general include immunocompromised states such as human immunodeficiency virus (HIV) infection, leukemia, septicemia, chemotherapy, or long-term steroid use. Chronic conditions such as a cirrhosis, obesity, diabetes, and renal disease have also been implicated as risk factors for NSTIs [7]. There are no known risk factors specific to retroperitoneal NSTIs.

Diagnosis of retroperitoneal NSTIs can be more challenging than that of other NSTIs. Traditionally, NSTIs can present with only subtle skin changes. Presence of skin ecchymosis or necrosis, gas in the tissue, or bullae is suggestive of NSTIs, but these classic signs may not be present or may represent advanced disease [2]. Patients with retroperitoneal NSTIs may not present with abdominal wall manifestations such as pain, subcutaneous emphysema, or erythema until late in the disease course. The retroperitoneum consists of three compartments: (1) the anterior para-renal space that includes the pancreas and the right and left portions of the colon, (2) the posterior para-renal space that contains largely fat, and (3) the peri-nephric space that contains the kidneys and the adrenals [8,9]. Communication of infection from the retroperitoneum to other spaces or vice versa may occur either directly (e.g., between the retroperitoneum and the extra-peritoneal pelvic space) or indirectly because of breakdown of fascial planes. Thus, retroperitoneal NSTIs may result in peri-umbilical and flank skin manifestations as a result of these pathways of spread; these manifestations are similar to the Cullen and Grey Turner signs associated with hemorrhagic pancreatitis [8]. Patients with retroperitoneal NSTIs may also present with vague abdominal pain early on or pain out of proportion to examination—this intense pain in other body regions has been attributed to nerve involvement and muscle edema [9].

Given that signs and symptoms on presentation are usually non-specific, a high degree of clinical suspicion is necessary for the diagnosis of retroperitoneal NSTIs. The differential diagnosis includes common conditions such as acute pancreatitis, diverticulitis, and pyelonephritis, all of which can present with symptoms such as abdominal pain and rapid clinical deterioration [9]. However, distinguishing retroperitoneal NSTIs from these conditions is necessary because the other diseases may be able to be managed initially non-operatively. Imaging may be helpful; CT is the imaging modality of choice. Findings suggestive of retroperitoneal NSTIs include multifocal or non-focal fascial fluid collections, tracking of gas along fascial planes, asymmetrical fascial thickening, muscle edema, and fat stranding [9]. Plain radiographs of the abdomen may show non-specific retroperitoneal gas [10]. Ultrasonography is of limited value. Magnetic resonance imaging has been described for NSTIs of the extremities, however, its utility may be limited by availability as well as potential oversensitivity [9].

Whereas the diagnosis of retroperitoneal NSTI can be challenging compared with that for other NSTIs, the principles of treatment are similar. Prompt and aggressive surgical debridement coupled with timely, repeated operations remain the mainstay of treatment [1,2]. In addition, source control should be obtained by treating the underlying pathology. In this case, the patient underwent Hartmann procedure for sigmoid diverticulitis and TAH-BSO for uterine fistula and adnexal abscess. Early administration of broad-spectrum antibiotics is also recommended until targeted cultures and sensitivities are available. Antibiotics should take into account the underlying pathology. For example, coverage of gram-negative bacilli (e.g., *Escherichia coli*) and anaerobes (e.g., *Bacteroides*) should be used when there is underlying colorectal pathology. However, even with aggressive treatment, prognosis may be poor because of advanced stage of disease at diagnosis and anatomic limitations precluding complete debridement of infected tissues in the retroperitoneum. The true mortality associated with retroperitoneal NSTIs is unknown as case series have not included more than 10 patients. Nonetheless, mortality rates for retroperitoneal NSTIs have been reported to be as high as 30%–50% in small case series, higher than the estimated mortality of 10%–20% for NSTIs overall [4,9,10].

Conclusion

Necrotizing soft tissue infection of the retroperitoneum as evidenced in this case is an uncommon but serious problem that requires early diagnosis and treatment. A high index of clinical suspicion is needed given that signs and symptoms are non-specific and the differential diagnosis is broad. Aggressive and prompt surgical debridement and antibiotic therapy are the mainstays of treatment; however, delays in diagnosis and anatomical limitations to complete debridement in this region likely contribute to its high mortality compared with NSTIs in other parts of the body.

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Abbreviations Used

CT = computed tomography
HIV = human immunodeficiency virus
ICU = intensive care unit
NPWT = negative pressure wound therapy
NSTIs = necrotizing soft tissue infections
SpO₂ = saturation of peripheral oxygen
TAH-BSO = total abdominal hysterectomy-bilateral salpingo-oophorectomy

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