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Neglected Abdominal Wound Complicated by Necrotizing Fasciitis of the Pelvic Region: Case Report

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ABSTRACT: Penetrating abdominal injuries (PAIs) often lead to severe complications, including necrotizing soft tissue infections (NSTIs) such as Fournier's gangrene, which typically involve the perineum and genitalia. However, NSTIs may also present atypically, involving the abdominal wall, flank, and lower extremities, particularly when complicated by bowel perforations. This article examines a case of a 47-year-old male who developed NSTIs following a stab wound to the left flank, with subsequent peritonitis, abscess formation, and necrotizing infections extending to the scrotum and pelvis. Despite aggressive surgical management, including Hartmann's procedure and extensive debridement, the patient succumbed to septic and hemodynamic shock. This case underscores the importance of early detection and intervention for NSTIs in the context of abdominal trauma and the need for timely surgical exploration, debridement, and appropriate antimicrobial therapy to improve survival rates. This paper further explores the pathogenesis, clinical presentation, and management strategies for NSTIs resulting from bowel perforation in abdominal trauma, aiming to enhance early diagnosis and reduce mortality.

KEYWORDS: Penetrating abdominal injury, necrotizing soft tissue infection, abdominal trauma, Bowel perforation, Trauma surgery

1. INTRODUCTION

Penetrating abdominal injuries (PAIs) represent a significant challenge in trauma care, particularly when they involve complex injuries that compromise multiple compartments, such as the pleural cavities, mediastinum, retroperitoneal space, and peritoneal cavity. These injuries often present with diagnostic difficulties due to their multisystem involvement and require rapid intervention to avoid life-threatening complications. Although the North American and Anglo-Saxon literature on PAIs is extensive, studies from France remain relatively limited. French studies, such as those conducted by Monneuse et al., have explored the diagnostic and therapeutic management of abdominal wounds, particularly in cases of penetrating trauma [1]. However, with increasing urban violence and the rise of assaults involving weapons, the incidence of PAIs continues to grow in various regions, including Isère, France, where the police report between 5000 and 6000 cases annually [3]. As a result, the number of PAIs managed by trauma units is increasing, highlighting the need for standardized management protocols.When dealing with penetrating abdominal injuries, one of the most concerning complications is the development of necrotizing soft-tissue infections (NSTIs). These infections, which compromise the vascular supply to the affected tissues, can lead to the necrosis of skin, fascia, subcutaneous tissue, and muscle [2]. Fournier's gangrene (FG), a form of NSTI involving the perineum, genitalia, and anus, was first described by Fournier in 1883 and has since become synonymous with a rapidly progressing, polymicrobial infection [6]. The pathogenesis of FG is often linked to bowel perforation, allowing the escape of enteric flora into the soft tissues, which spreads through fascial planes and causes widespread necrosis [5]. This type of infection typically presents with symptoms such as intense pain, fever, and rapid tissue necrosis, and it has a high mortality rate if not diagnosed and treated promptly [2]. Early surgical intervention is critical to reducing mortality, as delays of more than 24 hours have been associated with significantly increased risk of death [2].Fournier's gangrene is most commonly seen in men aged 50 to 60 years, many of whom have underlying conditions such as diabetes mellitus [6]. While FG traditionally involves the genitalia and perineum, recent cases have identified similar infections extending into the abdominal wall, flank, and lower extremities, typically as a result of bowel perforation [4]. These atypical presentations complicate the diagnosis and can lead to delays in appropriate treatment. The rapid spread of the infection along fascial planes often leads to extensive tissue destruction and can result in septic shock if left untreated.Furthermore, the lack of perineal involvement in some of these cases may cause clinicians to overlook the potential for a necrotizing infection, thus delaying proper intervention [4]. Given the high mortality associated with these infections, especially in cases that involve the abdominal wall or adjacent structures, it is

crucial to have a high index of suspicion and to initiate treatment without delay.In this paper, we explore cases of NSTIs resulting from bowel perforations that involve primarily the abdominal wall, flank, and lower extremities, rather than the typical perineal and genital areas. Previous studies have documented several such cases, but the literature remains limited, with fewer than 70 cases reported to date [4]. These infections may not be immediately recognized as NSTIs due to their atypical presentation, which leads to delayed diagnoses and worse outcomes.

2. AIM OF THE ARTICLE

This paper aims to further elucidate the pathogenesis, clinical presentation, and management strategies for NSTIs in the context of abdominal wall and flank injuries, with a focus on improving early diagnosis and reducing mortality through more timely surgical intervention.

3. PRESENTATION OF CASE

The case concerns a 47-year-old male with a history of diet-controlled diabetes, a 10 pack-year smoking history, and a past cannabis use disorder (now abstinent). He was the victim of a stab wound to the left flank during an assault. At the time of injury, there was no exteriorized blood or feces, no signs of intestinal evisceration, no transit disturbances, and no overt gastrointestinal bleeding. However, the patient refused hospital care, and the superficial wound was sutured before he left against medical advice.

Ten days later, he presented to the emergency department with generalized abdominopelvic pain and a grayish facial complexion, prompting immediate hospitalization in the intensive care unit (ICU). On examination, he was tachycardic (140 BPM) and hypotensive (110/60 mmHg). Inspection revealed a large erythematous, tender plaque over the left flank and iliac fossa. (Figure 1)

Figure 1: Preoperative images showing the large erythematous lesions with the sutured wound.

A 2 cm linear wound (previously sutured) was noted over the left iliac fossa, which, upon reopening, revealed fecal discharge. Additionally, both scrotal sacs were swollen, indurated, and crepitant, suggesting necrotizing soft tissue infection. (Figure 2)

Figure 2: Preoperative images showing the swollen scrotal sacs.

The patient was immediately stabilized with vasopressors, and urgent laboratory and imaging studies were conducted without delaying surgical intervention. Laboratory results revealed severe leukocytosis (17,830/mm³), an elevated CRP (363.1 mg/L), coagulopathy (prothrombin time of 37%), and acute kidney injury (urea 0.72 g/L, creatinine 18.2 mg/L).A full-body CT scan identified dissecting pneumomediastinum, bilateral moderate hydro-pneumothorax with underlying lung collapse, and extensive subcutaneous emphysema extending from the cervical to the scrotal region. In the left iliac fossa, a 16 mm lateral abdominal wall defect (entry wound) was associated with a 155×55 mm fusiform collection containing fluid and air, tracking into adjacent pelvic soft tissues and the scrotum. Additionally, a second intra-peritoneal collection (48×27 mm) with air bubbles and a third collection (38×22 mm) within the left iliacus muscle were identified. A mild pneumoperitoneum was also noted. (Figure 3)

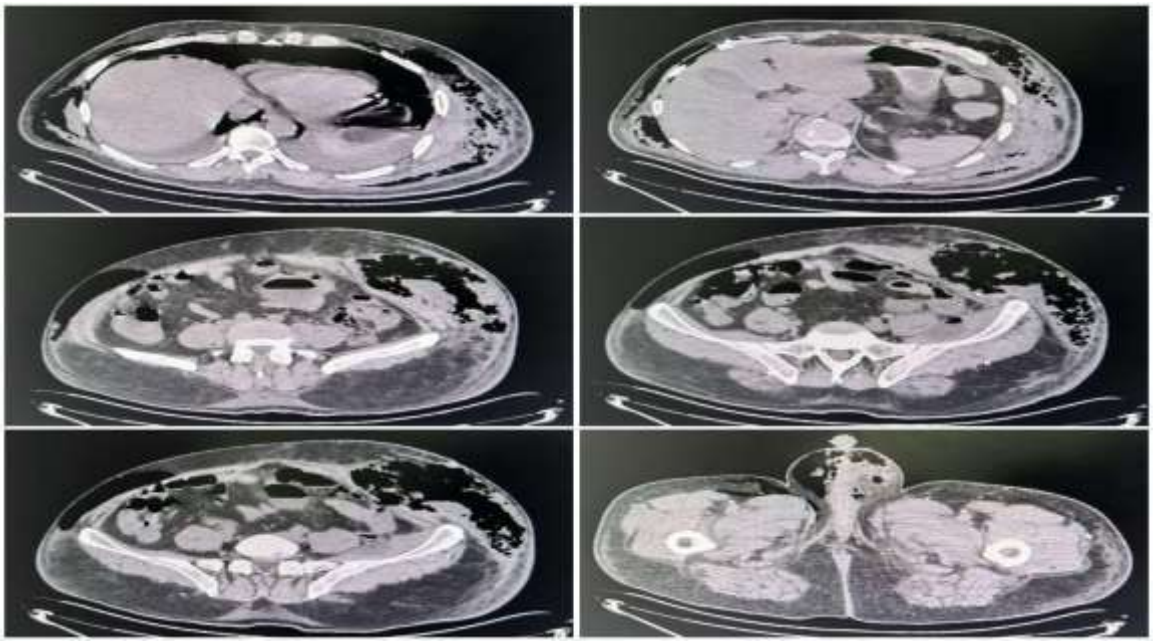

Figure 3: full-body CT scan slides showing the different lesions.

An urgent exploratory laparotomy was performed via a midline incision. Intraoperative findings included moderate peritoneal effusion with turbid fluid, extensive omentum and bowel adhesions, and three small intra-abdominal collections (30 cc each). A larger 100 cc abscess was found in the left iliac fossa, covering a 2 cm rectosigmoid perforation. A 2 cm anterior abdominal wall defect was discovered, allowing fecal matter to track through the soft tissues of the left flank and into the scrotum.

Approximately 3 liters of fecal material were evacuated from the abdominal wall thickness. A 1 cm defect in the posterior parietal peritoneum exposed the retroperitoneal space, although no direct organ injuries were noted. (Figure 4) Upon further dissection, multiple pelvic abscess pockets were found,

Resembling Fournier's gangrene. (Figure 5)

Figure 4: Intraoperative images showing the entry point of the wound and the mirror-image sigmoid lesion.

Figure 5: Intraoperative image of the scrotal lesions and the immediate postoperative image.

A Hartmann's procedure was performed, involving sigmoid colostomy after resection of the perforated rectosigmoid junction. Extensive peritoneal lavage was conducted, with drain placement in the Douglas pouch and abdominal wall collections. A necrotic debridement was performed in the pelvic region, followed by copious irrigation of the scrotal sac.

Despite aggressive postoperative resuscitation, the patient remained hemodynamically unstable, requiring high-dose norepinephrine (up to 13 mg). His renal function deteriorated, leading to persistent anuria. Unfortunately, he succumbed to septic and hemodynamic shock on postoperative day 5.

4. DISCUSSION

Penetrating trauma, especially abdominal stab wounds, constitutes a significant portion of traumatic injuries presenting to emergency departments. These injuries range from simple, non-lethal punctures to severe, life-threatening cases, often resulting in complications that require immediate intervention. Stab wounds in the abdominal region may involve vital structures, including the gastrointestinal tract, major blood vessels, the liver, pancreas, and other organs, potentially leading to hemorrhagic shock, peritonitis, or septic conditions. However, in cases where the wound is improperly treated or neglected, subsequent infections such as necrotizing soft tissue infections (NSTIs) can develop. The progressive nature of NSTIs, often associated with abdominal trauma, highlights the necessity for early and aggressive intervention.

Stab wounds to the abdomen can involve a variety of anatomical structures, depending on the location, depth, and trajectory of the wound. These injuries typically affect the gastrointestinal (GI) system, such as the stomach or intestines, but can also damage blood

vessels, causing both internal bleeding and potential peritoneal contamination. A breach of the intestinal wall can lead to spillage of contents such as bile or fecal material, introducing a significant risk of infection. The risk of bacterial contamination is a key factor in the development of serious complications. Uncontrolled infections in the peritoneum or retroperitoneal space can lead to the formation of abscesses, peritonitis, and the subsequent development of severe soft tissue infections such as necrotizing fasciitis. Delayed diagnosis or mismanagement of abdominal stab wounds can create a pathway for these infections to spread rapidly.

Necrotizing soft tissue infections, including necrotizing fasciitis (NF), are characterized by the widespread necrosis of soft tissues, usually secondary to a mixed infection involving both aerobic and anaerobic microorganisms. In abdominal trauma, particularly pelvic stab wounds, contamination by both gastrointestinal and urogenital flora can facilitate the rapid onset of these infections. Pathogens such as Clostridium species, Streptococcus spp., and Staphylococcus aureus are often isolated from infected tissues in the setting of necrotizing infections [7]. As the infection progresses, the surrounding tissues begin to break down, creating an environment conducive to further bacterial proliferation and toxin release. If left untreated, this cascade of events can rapidly evolve into septic shock, multi-organ failure, and death.

The early clinical manifestations of NSTIs often include pain that exceeds what would be expected based on the initial wound size or appearance, with rapid progression to swelling, redness, and erythema.

Fever and systemic symptoms, such as tachycardia, hypotension, and altered mental status, often follow as the infection spreads and becomes systemic. One of the hallmark signs of NSTIs is "disproportionate pain" that seems unaligned with the extent of the wound, often presenting hours after the injury occurs [8]. The development of skin changes such as blisters, discoloration, or crepitus (a crackling sound or sensation caused by gas-producing bacteria) can indicate the progressive spread of infection to deeper tissues [9].

The diagnosis of NSTIs requires a high index of suspicion, especially in the setting of penetrating abdominal injuries. Physical examination, along with imaging studies such as computed tomography (CT) or magnetic resonance imaging (MRI), plays an essential role in identifying the extent of soft tissue involvement. However, clinical judgment remains paramount, as NSTIs can progress rapidly even without significant radiographic findings. Early identification and intervention are critical to improving patient outcomes and preventing widespread tissue necrosis.

The management of stab wounds complicated by NSTIs necessitates a multi-disciplinary approach, involving urgent surgical exploration, antimicrobial therapy, and intensive supportive care. The initial steps of management include stabilization of the patient, particularly with regard to fluid resuscitation and hemodynamic support. In the setting of severe infection, broad-spectrum intravenous antibiotics should be initiated immediately, targeting both gram-positive, gram-negative, and anaerobic organisms. The combination of a beta-lactam/beta-lactamase inhibitor (e.g., piperacillin-tazobactam), clindamycin, and vancomycin is often recommended for initial empiric therapy [10].

Once infection is suspected or diagnosed, urgent surgical debridement is the cornerstone of treatment. The goal of surgery is to remove all necrotic tissue and control any sources of ongoing contamination. In many cases, multiple rounds of debridement may be necessary to fully excise nonviable tissue and allow the wound to begin healing. Because of the progressive nature of NSTIs, timely debridement—within hours of diagnosis—is critical in reducing mortality rates. Furthermore, once the infection is controlled, careful monitoring for complications such as organ failure or sepsis is essential. This may involve intensive care unit (ICU) admission, as patients with severe NSTIs often require advanced supportive therapies including mechanical ventilation, renal replacement therapy, or vasopressors to stabilize blood pressure and organ function.

In certain cases, delayed wound closure may be required to allow for adequate drainage of infectious material. Skin grafts or flap reconstruction may be needed for large tissue defects after successful debridement and infection control. The role of nutritional support in these cases should not be underestimated, as patients with severe infections and large surgical wounds are often catabolic, requiring both enteral and parenteral nutrition to support healing.

The prognosis for patients with abdominal stab wounds complicated by NSTIs depends heavily on several factors, including the severity and extent of tissue damage, the timeliness of diagnosis, and the speed with which appropriate medical and surgical interventions are provided. Early diagnosis and treatment are key to improving survival rates, as delayed intervention is associated with higher mortality and significant morbidity. In particular, mortality rates for patients with NSTIs associated with abdominal trauma have been reported as high as 25-50%, depending on the extent of tissue involvement and the time to treatment initiation [11].

Additional prognostic factors include the presence of underlying comorbidities, such as diabetes mellitus or immunosuppressive states, which may increase the risk of poor outcomes due to impaired immune response. Furthermore, older age, delayed presentation, and involvement of deep, vascular structures are factors that can contribute to the poor prognosis of these cases.

In general, despite advances in medical management and surgical techniques, necrotizing soft tissue infections remain one of the most challenging conditions encountered in trauma surgery. The key to improving outcomes in these patients is a holistic approach that includes rapid identification, aggressive debridement, appropriate antibiotic therapy, and intensive supportive care. In the case of abdominal stab wounds, timely intervention and vigilant monitoring are paramount to preventing catastrophic complications such as septic shock and multi-organ failure, which can otherwise lead to death.

While advances in surgical techniques and antimicrobial therapies have improved outcomes for patients with NSTIs, prevention remains the best strategy. Prophylactic measures in the context of abdominal stab wounds include proper wound care, early recognition of potentially contaminated injuries, and appropriate use of antibiotics in the immediate post-injury period. In cases where the wound is self- contained or superficial, conservative management with observation and close monitoring may be appropriate. However, for deeper or more complicated wounds, early surgical exploration is essential to prevent infection and further complications.

Additionally, ongoing research into the pathophysiology of NSTIs, particularly the role of host immune responses and the microbial dynamics involved, may lead to more effective therapeutic strategies in the future. Investigations into the genetic and molecular basis of these infections could provide insights into the development of targeted therapies, potentially improving outcomes for high-risk patients.

5. CONCLUSION

Necrotizing soft tissue infections (NSTIs) secondary to penetrating abdominal injuries (PAIs) are a life- threatening complication requiring rapid identification and immediate intervention. The case presented in this paper underscores the severity of these infections, which, despite their atypical presentation, can rapidly progress to septic shock and organ failure. Prompt surgical intervention, including debridement, fecal diversion, and broad-spectrum antibiotic therapy, remains the cornerstone of treatment. Early recognition and aggressive management are crucial to reducing mortality and improving patient outcomes. This case highlights the importance of maintaining a high index of suspicion for NSTIs in patients with penetrating abdominal wounds, even in the absence of classic symptoms like perineal involvement, and the necessity of timely intervention to address both the direct trauma and the secondary infection.

PROVENANCE AND PEER REVIEW

Not commissioned, externally peer reviewed. CONSENT

As per international standard or university standard, patient(s) written consent has been collected and preserved by the author(s).

ETHICAL APPROVAL

As per international standard or university standard written ethical approval has been collected and preserved by the author(s).

CONFLICTS INTERESTS

Authors have declared that no competing interests exist. SOUCE OF FUNDING:

None

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