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Rare Presentation of Postsurgical Pyoderma Gangrenosum Presenting as Necrotizing Soft Tissue Infection

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ABSTRACT

Pyoderma gangrenosum (PG) is a rare inflammatory neutrophilic dermatosis believed to be mediated by an autoimmune reaction. Typical treatment includes autolytic debridement, management of exudate, protection from trauma, and steroid therapy. A diagnosis of exclusion, PG is frequently mistaken for a wound infection, but antibiotics do not alleviate the condition. Incision and debridement has been observed to cause further spread of the lesions because of pathergy resulting from the additional trauma. This case report describes a patient who was misdiagnosed with necrotic soft tissue infection that was actually postsurgical PG.

KEYWORDS: antibiotics, antimicrobial dressings, cellulitis, colorectal surgery, necrotizing soft tissue infection, negative-pressure wound therapy, pyoderma gangrenosum, steroids, surgical debridement, tissue necrosis

ADV SKIN WOUND CARE 2019;32:507–11.

INTRODUCTION

Abdominoperineal resection (APR) is the primary procedure for many anorectal malignancies. This surgery involves resection of the rectum, anus, and a portion of the pelvic floor. In the following case report, a laparoscopic hand-assisted approach was used to resect a low-lying rectal adenocarcinoma involving the anorectal sphincter complex. Data over the past decade demonstrate a theoretical advantage to performing this procedure in a minimally invasive fashion. One of the many potential benefits is a shorter hospital stay, as well as a lower incidence of wound infection.

Although this procedure mainly involves intra-abdominal dissection through a mini-incision, a relatively sizeable perineal incision is needed to extract the anorectum. For this reason, the perineal wound is at high risk for local wound healing difficulties. In addition, this area may receive collateral radiation in patients who require neoadjuvant chemoradiation therapy, further reducing regional blood flow and impairing wound healing after APR.

Pyoderma gangrenosum (PG) is a rare inflammatory neutrophilic dermatosis believed to be mediated by an autoimmune reaction often seen in rheumatoid arthritis, ulcerative colitis, and Crohn disease.[1,2] This atypical wound occurs in 1 in 100,000 patients annually in the US; 50% of cases are associated with an underlying systemic disease. Typical treatment includes autolytic debridement, management of exudate, protection from trauma, and steroid therapy.[3–5] Potential complications include superficial skin separation, granulation tissue, and chronic perineal sinus. However, problems arising from autoimmune processes or inflammation without an offending organism are unusual findings in this situation, and there are few reported cases of such complications after APR.

Postsurgical PG (PSPG) initially presents approximately 1 to 2 weeks postoperation. The initial symptoms are surgical site erythema and extreme pain out of proportion to the physical examination followed by wound dehiscence or the development of punctate ulcerations that coalesce into larger ulcers. Common sites of involvement are the breasts and abdomen.[6] Frequently mistaken for a wound infection, antibiotics do not alleviate the condition. Any incision and debridement performed in response usually cause further spread of the lesions because of pathergy resulting from the additional trauma. Similar to psoriasis, PG often presents with erythematous papules, painful ulcers, and pustular lesions.[7] As many as 70% of comorbid conditions are highly associated with PG, with no clear pathophysiology or etiology and no universally effective therapy.[8]

This is a case report of a 48-year-old man who underwent a laparoscopic-assisted APR after chemoradiation therapy for a low-lying rectal adenocarcinoma. He developed postoperative wound complications that presented a diagnostic and therapeutic

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dilemma. The patient provided written informed consent to republish this case and the associated images.

CASE REPORT

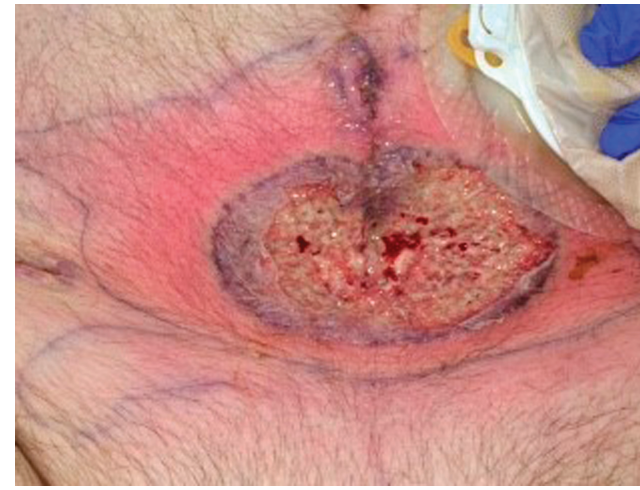
A 48-year-old man presented to the authors' facility with adenocarcinoma of the rectum. The patient initially presented to his primary care physician with a chief complaint of pain during bowel movements and bloody stool. A colonoscopy revealed a rectal mass approximately 1 cm from the anal verge, and biopsy was consistent with moderately differentiated adenocarcinoma. A pelvic MRI showed the tumor to be at least a T2 classification, and the patient underwent chemoradiation. Following this treatment, a sigmoidoscopy revealed evidence of an abnormality at the dentate line, which was suspicious despite a negative biopsy. The APR was therefore recommended and performed.

The procedure was completed without complication, and the patient's early postoperative course was without incident. However, on postoperative day (POD) 8, the patient noted a new onset of extreme fatigue, as well as increased perineal pain. The perineal incision presented with erythema and showed early signs of dehiscence along with small serous drainage but no malodor or purulence. At this time, xeroform dressings along the incision were discontinued, and alginate, abdominal pad, and mesh underwear were initiated and changed every 12 hours by nursing staff.

The patient had low-grade tachycardia as well as erythema along a small region of his 6.5-cm incision. The inferior portion of the incision was opened and released a few milliliters of purulent material. The patient then developed leukocytosis with low-grade fever, leading to an infectious disease consult. Cultures taken on POD 8 were negative for pathogens in the blood or urine. A POD 9 computed tomography (CT) scan of the abdomen and pelvis showed no evidence of an abscess. Levofloxacin and metronidazole were started prophylactically to treat any potential infection. Aerobic and anaerobic swab cultures taken from the abdominal wound on POD 10 were also negative for infectious organisms. On POD 11, epidermolysis and erythema were found around the abdominal wound site, as well as cellulitis on the abdominal wall region. Further, neither wound was healing properly, and both perineal and abdominal incisions were fully dehiscent with fibrogranular beds with erythematous borders (Figure 1).

These problems persisted, and on POD 13, the patient was taken back to the OR because providers suspected necrotizing soft tissue infection (NSTI). The patient underwent incision and debridement of both wounds, along with deeper soft tissue cultures. Superficial epidermal necrosis was observed on the anterior abdominal wound, and epidermal lysis was seen on the anterior and posterior aspects of the perineal wound. Infectious Disease recommended continued antibiotics including vancomycin, levofloxacin, and metronidazole, as well as an antifungal therapy, caspofungin. Aerobic cultures showed light growth of perineal flora in the preliminary test, but the final results showed no growth. Anaerobic cultures showed no organism growth, although the presence of rare epithelial cells was noted.

Figure 1.
INITIAL ABDOMINAL WALL PRESENTATION, POSTOPERATIVE DAY 8



On POD 15, the patient underwent additional debridement of the perineal wound, along with a deep tissue biopsy of the leading edge of this wound. The biopsy revealed ulcerated skin with severe acute inflammatory infiltrate, devitalized tissue, and foci of necrosis and abscess formation with underlying panniculitis. Clinical presentation of fever, leukocytosis, and erythema had continued thus far. Based on the light Gram-positive growth on the preliminary culture test, the possibility of a vancomycin-resistant enterococcus infection was considered. The antibiotic and antifungal treatments were continued using linezolid instead of vancomycin. A POD 19 CT scan again showed no evidence of abscess. Levofloxacin and metronidazole were discontinued, and imipenem was started, with continuation of caspofungin and linezolid.

On POD 20, the patient returned to the OR for further biopsy of the abdominal wound sites and placement of negative-pressure wound therapy to the perineal wound. Because of the unknown etiology, uncontrolled pain, and degree of wound necrosis, initial wound management and care were performed under anesthesia in the OR using advanced wound care products such as antimicrobial foams, alginates, and negative-pressure wound therapy. It was observed that the area of epidermal necrosis had extended to the pericolostomy region.

Given the persistence of symptoms despite antibiotic treatment and debridement, with concurrent absence of evidence of infection

in both the cultures and the CT scans, a noninfectious etiology was considered, leading to high suspicion of PG. The POD 20 histology and pathology results were supportive of and consistent with POD 15. Although these pathologic findings were not specific for PG, this entity was still within the differential diagnosis. Therefore, all sharp debridement was discontinued (Figure 2).

Full-thickness ulceration completely encompassed the peristomal plane and did not allow for standard application of an ostomy wafer and pouch, which significantly increased the level of complexity. The use of an antimicrobial silicone contact layer on the abdominal wound bed was paramount in addressing the needs of this patient. Goals of care focused on protecting the wound bed from trauma, pain reduction, exudate control, bioburden reduction within the wound bed, and supporting autolytic debridement while trying to maintain a seal around the stoma to reduce contamination of effluent into the wound bed and ensure sufficient pouch wear time (Figure 3).

Because of the lack of an infectious etiology of this rapidly propagating erythematous process, a rheumatology consultation was obtained, and providers decided to treat the patient empirically with systemic steroids. On POD 21, IV methylprednisolone was initiated, and within hours, the patient reported improved abdominal pain. The abdominal wall erythema stabilized with no further progression. The patient was afebrile, and his white blood cell count quickly improved to near-normal levels. Based on the skin ulceration, mild epidermal hyperplasia, marked acute inflammation, and necrosis throughout the dermis, steroid treatment was continued and antibiotic treatment was discontinued.

Over the next few days, the patient continued to improve, with resolution of the fever, leukocytosis, and erythema at the wound site. On POD 35, the patient was cleared for transfer to a rehabilitation facility. On discharge from the hospital, the patient returned weekly for dressing changes in the outpatient clinic. The abdominal wound was fully epithelialized and healed within 13 weeks (Figure 4). No systemic signs of infection were noted throughout the course of treatment. The perineal treatment regimen upon hospital discharge included the use of an enzymatic debriding agent along with alginate rope application, abdominal pad, and mesh underwear. Treatments were carried out in the rehabilitation facility and three times a week upon the patient's discharge home. Once the wound bed was without necrotic slough, the patient was transitioned to a collagen dressing. Full epithelialization was achieved in 51 weeks.

Figure 2.
ABDOMINAL WOUND AT POSTOPERATIVE DAY 20

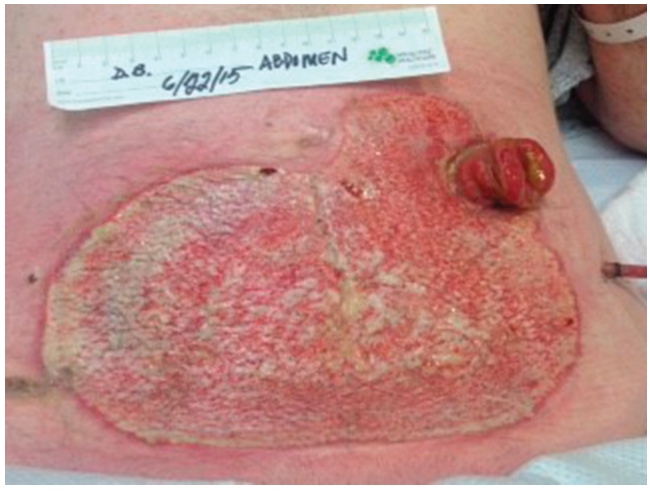
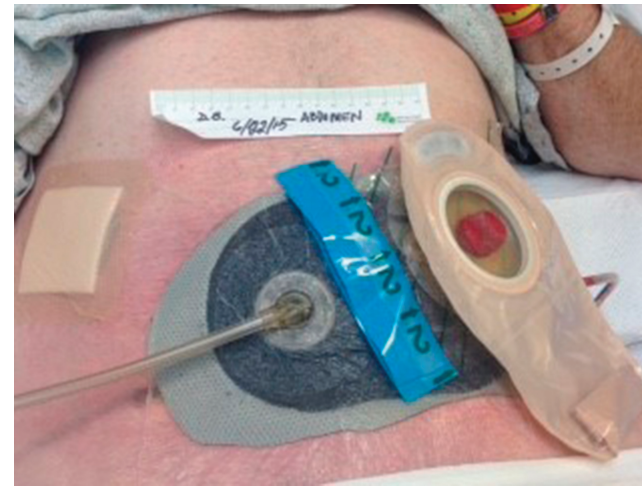


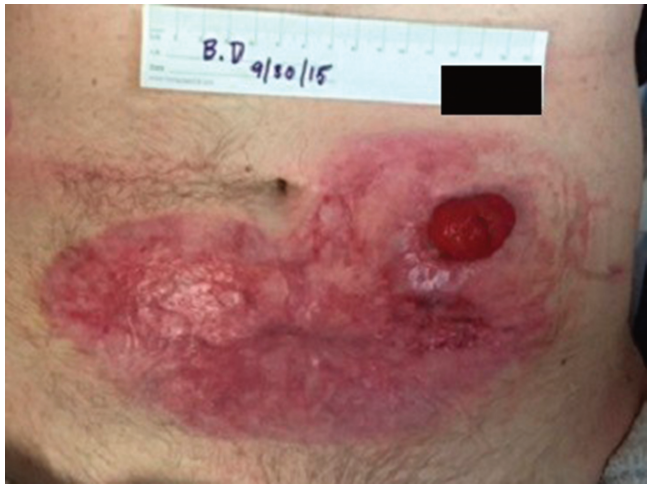
Figure 3.
ANTIMICROBIAL SILICONE CONTACT LAYER, NEGATIVE-PRESSURE WOUND THERAPY SYSTEM, AND TWO-PIECE FLAT DRAINABLE OSTOMY SYSTEM



DISCUSSION

Postoperative wound infections are common after a complex procedure, such as an APR, which includes two wound sites. Further, perineal wounds are predisposed to difficult healing. This patient's perineum had been extensively treated with external beam radiation, which caused fibrosis and devascularization of both the perineum and the pelvis. Because of the location of this patient's rectal tumor low within the pelvis and with the theoretical possibility of microscopic perforation, some degree of bacterial contamination within the pelvis and perineal region was almost inevitable. Bacterial contamination combined with relatively low blood flow and an anaerobic environment created an ideal situation for a postoperative infection. Given these significant risk factors, providers must be observant following an APR, especially when there is redness in the area of the incision. Delayed healing of perineal

Figure 4.
ABOMINAL WOUND FULLY EPITHELIALIZED AT 13 WEEKS



wounds is a significant possibility; however, investigating a draining wound with either exploration or scanning the pelvis should be approached with caution.

Although relatively uncommon, NSTI is a potential cause of morbidity and mortality in any surgical patient, with mortality ranging from 25% to 35%.[9,10] Key features in considering an NSTI diagnosis include but are not limited to wound appearance, vital signs, and electrolyte abnormalities.[9] Various observational manifestations include erythema, swelling, and pain out of proportion to the wound appearance; crepitus and gross tissue necrosis are often late findings.[9] Mortality is directly proportional to time to intervention, and in cases where a diagnosis is made, prompt surgical exploration and debridement provide the best chance of survival.[9,10]

A high index of suspicion must be maintained to avoid misdiagnosis of cellulitis or a nonnecrotizing infection. Although the initial diagnosis of NSTI may present a challenge to many surgeons, they are surgical emergencies, and often lead to multiple incisions and debridements.[9] Patients often require skin grafting to cover the resulting defect.[9] The potential consequences of a misdiagnosis include the extensive destruction of local skin and soft tissues and must be balanced with overly aggressive exploration.

This case initially presented as a typical wound infection often encountered with extensive gastrointestinal surgical procedures. The patient's abdominal incision had the appearance of classic cellulitis, often treated with IV antibiotics in the absence of a suspected abscess. When the skin erythema did not improve with antibiotics, despite CT scan revealing no evidence of subcutaneous fluid collection, it seemed prudent to open part of the wound in the event there was a subclinical wound abscess. Upon opening, the drainage was unimpressive and subsequently proved to be sterile.

Persistent leukocytosis and tachycardia, along with the precipitous increase of abdominal wall erythema, raised concern of a potential NSTI and indicated an urgent surgical wound exploration. The goals of exploration were to (1) look for any evidence of devitalized tissue, (2) obtain Gram stains and cultures of soft tissue samples, and (3) perform skin and soft tissue biopsies to rule out a pathologic process not suspected based on clinical presentation. In addition to biopsies of the grossly pathologic surgical areas, biopsies of skin remote from the surgical sites were also performed. These were performed in areas that were becoming erythematous, but otherwise not clinically evident of an NSTI. The optimal procedure is an elliptical incisional biopsy that incorporates both the inflamed lesion border and ulcer edge and extends vertically into the subcutaneous fat.[10] A tissue specimen that includes the inflamed border should be sent for routine histopathologic examination and microbial stains. In addition, a specimen from the ulcer should be cultured to evaluate for bacterial, fungal, and atypical mycobacterial infections.[10]

Often presenting as a rapidly progressing erythema at the surgical site that does not respond to conventional antibiotics or wound opening, PSPG poses a significant conundrum for surgeons.[11] Many surgeons would urgently operate, suspecting an NSTI, as in this case. However, with PSPG, this approach will lead to an unexpectedly worse outcome, because debridement exacerbates this condition.[12] This case did not present with signs and symptoms similar to ulcerative PG, bullous PG, pustular PG, and/or vegetative PG. The abdomen ulceration is and was classified as PSPG versus peristomal PG because of its initial presentation.

The challenge for surgeons and the medical community is to look for clinical conditions, such as psoriasis, that may predispose certain patients to PSPG. However, as with this presentation, PG does not always have a clear association with common concurrent conditions such as inflammatory bowel disease, arthritis, and hematologic disease or malignancy.[6] Providers must be aware of PG's link to autoinflammatory disorders and (although infrequent) to pulmonary disease, systemic lupus erythematosus, thyroid disease, solid organ cancers, viral and autoimmune hepatitis, sarcoidosis, major depression, and diabetes.[6]

When a patient develops a postoperative scenario as in this case, a local wound infection should be suspected and duly ruled out. If the traditional measures (including antibiotics and incision drainage) do not achieve the expected results, an NSTI should be suspected and further investigative steps taken. If the intraoperative findings and culture results do not comport with NSTI, then PSPG should be suspected. Ultimately, in patients presenting with rapidly progressive skin erythema and signs of systemic

infection, surgeons should consider a conservative incision and drainage, with plans to pursue a biopsy if this does not lead to a rapid clinical improvement or the pathologic process rapidly progresses.

Because the histopathologic findings of PG are nonspecific, biopsies are most useful for excluding other disorders with a similar presentation. A biopsy is indicated both in patients without a preceding history of PG and in patients with established PG who present with lesions with atypical features or that fail to respond as expected to therapy. Similar to tissue biopsies, there are no laboratory studies that provide a definitive diagnosis of PG. Nonspecific findings such as leukocytosis, elevation of the erythrocyte sedimentation rate, and elevation of C-reactive protein levels may be present. Laboratory testing narrows the differential diagnosis and may identify the presence of PG-associated diseases.[6] Recommendations for the workup of these patients vary; tests may include complete blood count, comprehensive metabolic panel, antinuclear antibody titer, antineutrophilic cytoplasmic antibodies, hypercoagulability studies, hepatitis panel, and rheumatoid factor.[6]

A significant challenge exists in that treating an infection with steroids can exacerbate the infection, whereas treating PSPG with aggressive debridement can lead to unnecessary tissue loss and worsen the patient's condition. Surgery may be necessary in select cases of PG, including those in which tissue necrosis presents a risk for infection or exposure of vital tissues such as tendons or ligaments is present. However, because of the potential for pathergy, unnecessary trauma and/or surgery should be avoided when possible.

One of the major challenges beyond identifying the etiology in this case was management of the abdominal ulceration around the ostomy. Pain control, risk of trauma, stabilization of dressings and appliance, cross-contamination, moist wound healing, and infection were all considered in the clinical approach. Wound care measures in PG are intended to optimize the environment for wound healing. Dressings that maintain a moist wound environment are preferred.[13] Hyperbaric oxygen may improve wound healing in a few patients with PG, but data are insufficient to recommend the routine use of this therapy.[13]

In patients with mild PG (a few superficial ulcers or vegetative PG), the local administration of corticosteroids or a calcineurin inhibitor can be sufficient. In contrast, systemic therapy is typically necessary for patients with more extensive PG. Glucocorticoids are the most common systemic drugs prescribed because a rapid response is often observed, and the drugs are relatively low in cost and are easily administered. Systemic cyclosporine is an alternative first-line treatment for patients who cannot tolerate systemic glucocorticoid therapy.[2,14]

Various other systemic immunomodulatory drugs can be prescribed as alternative or adjunctive treatments for PG that fails to respond sufficiently to first-line therapies, including biologic drugs, conventional immunosuppressants, dapsone, and minocycline.[2,14] Infliximab has demonstrated efficacy for PG in a randomized trial, and its concomitant utility in Crohn disease favors its use in patients with both diseases. In patients with mild PG that is resistant to local therapy, a trial of dapsone or minocycline is often prescribed and generally well tolerated prior to treatment with immunosuppressive therapies.[14] Intravenous immune globulin and alkylating agents are options typically reserved for patients with severe, refractory disease.[14]

CONCLUSIONS

In conclusion, PG can present in various clinical forms. Diagnosis can be very difficult pending the initial clinical presentation, such as the misdiagnosis of PSPG as NSTI in this case. It is usually a diagnosis of exclusion. Implementing a thoughtful, systematic, and proactive approach for this diagnostic dilemma can help reduce unnecessary pathergy, trauma, pain, and additional adverse events. It is important to enlist input from experienced dermatology and wound care teams, rheumatology, pain management, infectious disease, and a dermatopathologist. With puzzling clinical cases such as this, the larger the investigative team, the more quickly an accurate diagnosis can be reached. ●

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