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LETTER TO THE EDITOR

Necrotizing myonecrosis secondary to hematogenous spread of gas gangrene following colonic perforation

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Dear Editor:

Invasive soft tissue infections with *Clostridium* species have been reported sporadically in the literature. Patients present in extreme pain with rapidly evolving violaceous discoloration of the skin and subsequent bullae formation due to necrotizing fasciitis or myonecrosis. Typically, this associated devastating gas gangrene has been described in association with traumatic wounds or postoperative infections. However, there is also an acknowledged atraumatic association particularly with colonic malignancy. These atraumatic causes of *Clostridium* infection are also seen in the immunocompromised or diabetic patient and in those with gynecologic and hematologic malignancies.

Previous literature has described numerous methods of spread of gas-forming organisms from intra-abdominal locations to the extremities, most explanations involving routes across anatomic planes. Hematogenous spread with transient bacteremia secondary to translocation emanating from advanced colorectal malignancy has been suggested but not demonstrated radiographically.

We present the first case providing radiological evidence reinforcing the previously postulated hematogenous route of spread of intra-abdominal *Clostridium septicum* infection to distant sites such as the contralateral extremities resulting in necrotizing fasciitis and myonecrosis.

Case presentation

A 57-year-old, obese female with poorly controlled diabetes mellitus presented with nausea, vomiting, and abdominal pain. Laboratory tests revealed severe hyperglycemia with a leukocytosis of $13.6\times10^3/\mu L$. She had mild abdominal tenderness on exam but no diffuse peritonism. A computed tomography (CT) scan of the abdomen showed free air within the abdomen focused around the right colon with an associated tumor, with intravascular air seen in the femoral vein. Shortly after admission, the patient began to complain of increasing pain in the left thigh. Examination revealed severe left thigh tenderness with palpable crepitus from the thigh to the ankle. There was no evidence of trauma or ulcers on the extremity or perineum. A CT of the lower extremities showed extensive subcutaneous and intramuscular air from the gluteus maximus to the ankle. Shortly after completing CT scan, it was noted that violaceous bullae had begun to develop precipitously around the knee region. A diagnosis of necrotizing fasciitis was made at this point.

The patient underwent emergent extensive debridement of the skin, subcutaneous tissue, fat, and muscle of the left lower extremity. Tissue cultures isolated *C. septicum* as the primary organism. Four days later, the patient underwent right hemicolectomy for the ascending colon perforated mass diagnosed on admission, later confirmed to be invasive poorly differentiated adenocarcinoma on histopathology. With no improvement in soft tissue viability, a left hip disarticulation with reconstruction was performed on day 8. The patient has since been discharged to rehabilitation with eminent plans for adjuvant therapy of her colon malignancy.

Discussion

Invasive soft tissue infections from *Clostridium* species have been reported sporadically in the literature. Patients present in extreme pain with rapidly evolving violaceous discoloration of the skin and subsequent bullae formation due to necrotizing fasciitis or myonecrosis. Although typically associated with previous skin ulcers or trauma, there is also a reported

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association with colonic malignancy, with *C. septicum* being the most commonly associated culprit. *C. septicum* is typically found in the cecum and ileocecal area, where poor vascular supply and anaerobic conditions provide an environment conducive to proliferation. This would explain its association with, as in our case, ascending colon malignancy perforation. Few reports in the literature discuss the pathophysiology of infections that begin as perforated intra-abdominal malignancies and result in distant necrotizing fasciitis. Previously, the psoas sheath, femoral canal, and obturator canal were proposed routes of spread of gastrointestinal pathology into the ipsilateral lower extremity anterior compartments, and the sacrosciatic notch to the posterior compartments. However, for cases presenting with gas gangrene in anatomic locations remote from associated bowel tumor perforation, the hematogenous route has been suggested as the method of translocation. A previous explanation was that the bowel perforation results in transient bacteremia allowing for seeding of the culprit clostridial bacteria at distant locations.

Although many reports of *C. septicum*-induced necrotizing fasciitis and myonecrosis from colorectal cancer exist, no report to date has demonstrated radiographic evidence of gas within the vasculature, supporting the proposed hematogenous spread of these gas-forming organisms. In our case, the finding of gas in the contralateral femoral vein on the coronal views of the abdominal CT would have been an important warning sign of eminent distant soft tissue infection. The radiographic findings were later confirmed microbiologically with *C. septicum* isolated within blood cultures. With this in mind, the presence of air in the vasculature of cases presenting with bowel perforation should alert the physician to be watchful for distant necrotizing soft tissue infection which may be present in any of the four extremities.

Conclusion

Necrotizing soft tissue infections continue to have devastating effects in patients. Hematogenous spread of gas-forming organisms from sites of bowel perforation can result in necrotizing soft tissue infection at sites remote from the abdominal cavity including the extremities. Therefore, radiologic findings of gas within the vasculature in association with a suspected perforated colorectal malignancy could be an important warning sign of pending distant soft tissue infection.

Conflict of interest The authors have no conflicts of interest to declare in the formulation of this article. Our patient consent and maintenance of confidentiality was obtained using our Institutional protocol in the formulation of this manuscript.

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