

# Gastric Ulcer and Perforation due to Mucormycosis in an Immunocompetent Patient

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## ABSTRACT

Mucormycosis is a rare and life-threatening fungal infection that is associated with high mortality in immunocompromised individuals. Although it most commonly affects lungs and paranasal sinuses, cases of invasive mucormycosis of the gastrointestinal tract have also been reported. Gastrointestinal mucormycosis (GIM) is most commonly found in the stomach, colon, and ileum. Etiologies of GIM include ingestion of spores and penetrating abdominal trauma, causing mucocutaneous disruption. We present a case of an immunocompetent man who presented to our hospital after a gunshot wound to the abdomen. His hospital course was complicated with the development of invasive GIM in the form of a large gastric ulcer, which caused gastrointestinal bleeding and eventually perforation.

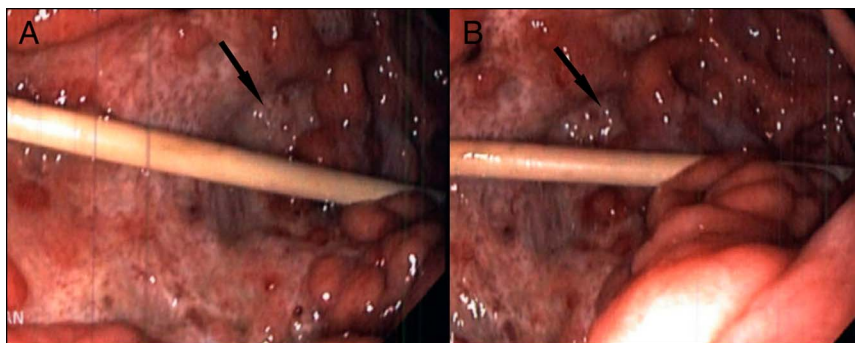
## INTRODUCTION

Mucormycosis is a well-recognized fungal disease with high mortality in immunocompromised patients. Commonly associated conditions with mucormycosis include diabetes mellitus, hematological malignancies, solid organ transplant, and immunosuppression. Mucormycosis typically involves the nasal sinuses, orbit, and brain, but other organs can also be involved. Although rare, gastrointestinal involvement of mucormycosis has also been reported. In immunocompetent patients, gastrointestinal mucormycosis (GIM) can be seen after penetrating trauma.<sup>1</sup> Treatment includes a combination of early systemic intravenous antifungals and surgical debridement.

## CASE REPORT

A 48-year-old healthy man presented to our hospital with a transpelvic gunshot wound to his right lower quadrant of the abdomen. The patient was hemodynamically unstable on arrival, with a blood pressure of 82/63 mm Hg and a heart rate of 120 bpm. He was taken to the operating room promptly where an exploratory laparotomy revealed small bowel and rectosigmoid injury with multiple areas of hemorrhage. Affected areas of small bowel and rectosigmoid were resected. The small bowel was anastomosed, and a colostomy with a rectal stump was created.

Postoperatively, the patient was admitted to the intensive care unit for ongoing medical care. After an initial period of stabilization, on day 13, the patient was noted to have coffee-ground output from the nasogastric tube with a significant drop in hemoglobin from 8.9 to 7.1 g/dL. The patient was transfused with 2 units of packed red blood cells and underwent esophagogastroduodenoscopy, which revealed a large ulcer at the body and fundus of the stomach (Figure 1). The ulcer appeared to have irregular borders along with a vessel at the ulcer edge. A greyish coating and a large amount of exudate were seen in the ulcer bed. A tissue biopsy from the ulcer was obtained and the patient was started on intravenous pantoprazole and oral sucralfate. Thirty-six hours later, the tissue pathology results revealed necrotic exudate containing fungal aseptate hyphae, confirming the diagnosis of invasive gastric mucormycosis (Figure 2). At this point, intravenous liposomal amphotericin was initiated for the treatment of mucormycosis. No further bleeding was noted, and the patient experienced stabilization of hemoglobin, and no surgical intervention was performed.



**Figure 1.** (A and B) Large gastric ulcer with exudate within the body and fundus of the stomach. An overlying feeding tube can also be seen.

Two days later (day 15), a necrotic area was seen at the open wound on the left flank (Figure 3). Development of sepsis was also noted with a white blood cell count of 23,000/ $\mu$ L, heart rate of 120 bpm, and lactic acid level of 4.4 mmol/L. Broad-spectrum intravenous antibiotics, vancomycin and piperacillin-tazobactam, were initiated. A repeat exploratory laparotomy revealed a multifocal necrotic bowel around the small bowel anastomosis and the rectal stump. Some areas of perforation were also noted around the anastomotic site. These areas were debrided, and the necrotic bowel was resected. Histopathological evaluation of resected specimen again revealed fungal aseptate hyphae consistent with the diagnosis of invasive GIM.

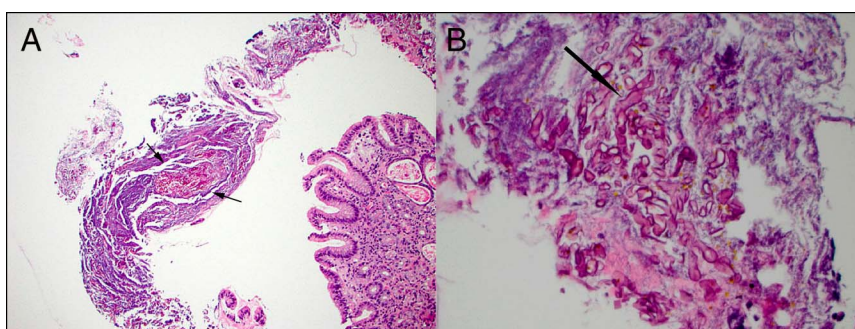
Subsequently, 2 days later (day 17), bloody output was noted from the nasogastric tube and abdominal surgical drains. The patient developed hemorrhagic shock refractory to blood transfusion, intravenous hydration, and inotrope therapy. Immediate laparotomy was performed, revealing an 8 × 4 cm area of perforation with necrosis at the previously seen gastric ulcer site along with active bleeding. Attempts to control the bleeding remained unsuccessful and the patient eventually died in the operating room.

## DISCUSSION

Mucormycosis is a life-threatening, opportunistic, angioinvasive fungal infection. Most commonly it occurs in

immunocompromised patients with predisposing conditions, including uncontrolled diabetes mellitus, hematologic malignancies, and solid organ transplant.<sup>2</sup> Angioinvasion provides a pathway for the hematogenous spread for mucormycosis. It can also cause local ischemia and infarction, which leads to tissue necrosis.<sup>3</sup> The mechanism of transmission of mucormycosis includes inhalation or ingestion of spores and direct inoculation into disrupted mucocutaneous surfaces.<sup>4</sup> Although most commonly seen in rhinocerebral and pulmonary forms, mucormycosis can present as gastrointestinal, cutaneous, central nervous system, and disseminated forms.<sup>5</sup>

GIM accounts for 7% of the total reported cases and has a very poor prognosis with a mortality rate of 85%.<sup>6</sup> In the gastrointestinal tract, the stomach is the most common site, followed by the colon and ileum.<sup>7</sup> Predisposing risk factors for GIM include malnutrition, uremia, typhoid fever, and penetrating trauma.<sup>1,8</sup> The clinical features of GIM vary, including fever, abdominal pain, nausea, vomiting, diarrhea, gastrointestinal bleed, or gastrointestinal perforation.<sup>9</sup> Diagnosis is confirmed with direct microscopy and histopathological evaluation from a tissue biopsy, which can be obtained endoscopically or during surgery.<sup>10</sup> Recommended management of GIM is a combination of surgical debridement and intravenous antifungal therapy. Rapid initiation of antifungal therapy has been noted to improve survival, but a delay in treatment greater than 6 days has shown to double the mortality rates.<sup>11</sup>



**Figure 2.** (A) Hematoxylin & eosin (H&E) stain of gastric ulcer biopsy at low magnification showing necrotic exudate containing fungal aseptate hyphae, morphologically consistent with mucormycosis. (B) H&E stain of gastric ulcer biopsy at medium magnification showing fungal aseptate hyphae, consistent with invasive mucormycosis.



**Figure 3.** Necrotic lesion at the open left flank ballistic wound.

Although there is no clear consensus regarding optimal antifungal therapy, amphotericin B is the advised first-line treatment. Liposomal amphotericin B can be used at higher doses and has a lower risk for nephrotoxicity. The recommended course of treatment duration is usually 4-6 weeks.<sup>12</sup> Posaconazole is also an effective agent and can also be used for treatment in cases of polyene intolerance.<sup>13</sup> Antifungal therapy alone is typically inadequate. Surgical debridement of necrotic tissue is often required for comprehensive treatment of invasive mucormycosis.<sup>14</sup>

## DISCLOSURES

**Author contributions:** G. Sehmbey and R. Malik acquired and analyzed the data and wrote the manuscript. D. Kosa, I. Srinivasan, K-Y Chuang, and S. Bellapravalu analyzed the data and wrote the manuscript. K-Y Chuang is the article guarantor.

**Financial disclosure:** None to report.

**Previous Presentation:** This case report was presented as a poster at the 2018 ACG Scientific Meeting; October 5–10, 2018; Philadelphia, Pennsylvania.

**Informed consent** was obtained for this case report.

Received January 31, 2019; Accepted May 31, 2019

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