Case Report

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Pathology Section

Gastric Black Fungus: A Rare Case Report

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ABSTRACT

Mucormycosis is an opportunistic fungal infection that typically affects patients with diabetes mellitus or immunosuppression. The fungus invades nearby blood vessels, leading to thrombosis and organ necrosis. While Mucorales can infiltrate any organ in the body, the gastrointestinal system is an uncommon site for infection. Gastric mucormycosis is a rare but potentially lethal fungal infection resulting from the invasion of Mucorales into the gastric mucosa, exhibiting angioinvasive characteristics. It can lead to high mortality rates due to the increased risk of complications in immunocompromised patients. Common predisposing factors include diabetes mellitus, neutropenia, iron overload states, malnourishment, and other immunocompromised conditions. Mucormycosis is a fatal infection, necessitating prompt intervention to ensure survival. In this case report, authors present a 42-year-old man with a history of chronic alcoholism and chronic kidney disease who presented with complaints of abdominal pain and vomiting for six months, significant weight loss, and loss of appetite for one month. Initially suspected clinically and radiologically as a malignant gastric ulcer, an endoscopy was performed, and a gastric biopsy was sent for Histopathological Examination (HPE). Histological analysis of the gastric biopsy revealed multiple fragments of gastric mucosa with areas of ulceration, neutrophilic abscess, and numerous broad aseptate obtuse-angle fungal hyphae resembling Mucorales. The presence of the organisms was confirmed through special stains for fungus. Very few cases of invasive gastric mucormycosis associated with uncontrolled diabetes, alcoholism, and chronic kidney disease have been reported in the literature.

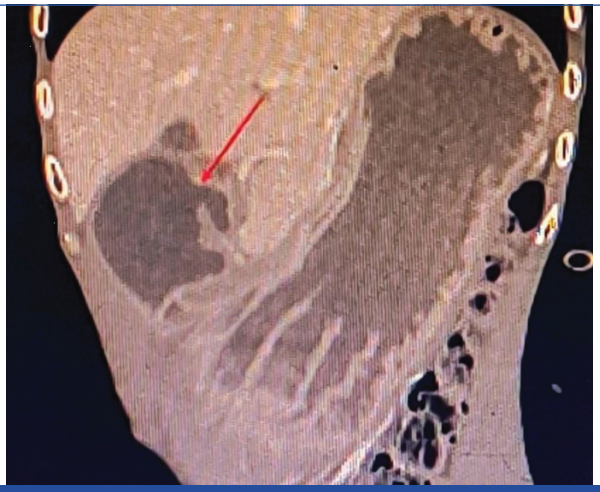
Keywords: Angioinvasion, Gastric, Mucormycosis

CASE REPORT

A 42-year-old male with a history of chronic alcoholism presented with chief complaints of vomiting for six months, significant weight loss, and loss of appetite for one month. Further evaluation revealed metabolic alkalosis, altered renal function test results, and dyselectrolytemia. Laboratory investigations showed neutrophilic leukocytosis, elevated blood urea nitrogen, increased serum creatinine levels, and altered electrolyte levels. Serologic biomarkers were non specific. The laboratory parameters are tabulated in [Table/Fig-1]. Radiologic findings on Computed Tomography (CT)-Abdomen showed abrupt tapering at the Pyloroduodenal junction and thickened gastric rugal folds [Table/Fig-2]. The endoscopic report revealed two ulcers, measuring 2×1.5 cm and 1.5×1.5 cm, with heaped up edges [Table/Fig-3], a central depression with overlying clot, and a necrotic base in the antrum.

Laboratory parameters	Patients value	Reference range
Random blood sugar (mg/dL)	106	65-110
Urea (mg/dL)	62	17-45
Creatinine (mg/dL)	3.3	0.8-1.3
Sodium (mmol/L)	118	135-145
Potassium (mmol/L)	2.8	3.5-5
Total bilirubin (mg/dL)	0.47	0.1-1.2
Direct bilirubin (mg/dL)	0.11	0-0.4
Alanine transaminase (Units/L)	16	5-30
Aspartate Transaminase (Units/L)	15	5-30
Alkaline phosphatase (IU/L)	83	50-100
Albumin (g/dL)	2.9	3.5-5
WBC count (×10^9/L)	10.4 (Neutrophils-89%, Lymphocytes-8%, Monocytes-3%)	4-10
RBC count (×10^{12}/L)	3.64	4.2-5.4
Platelet count (×10^9/L)	209	150-400

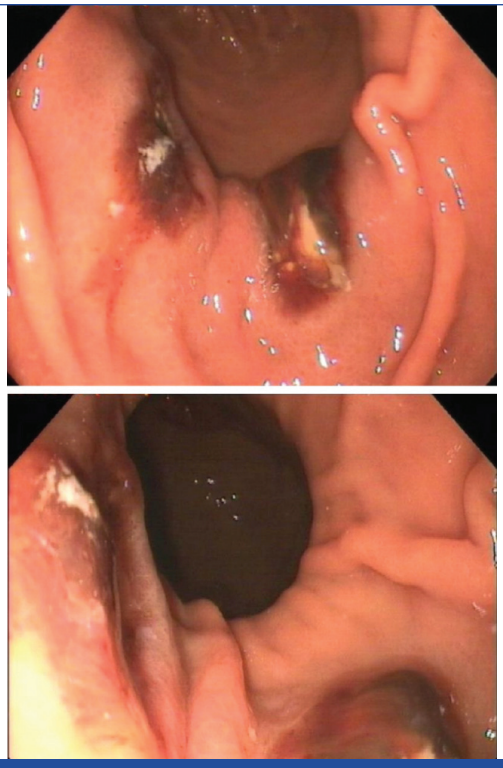
[Table/Fig-1]: Laboratory parameters.



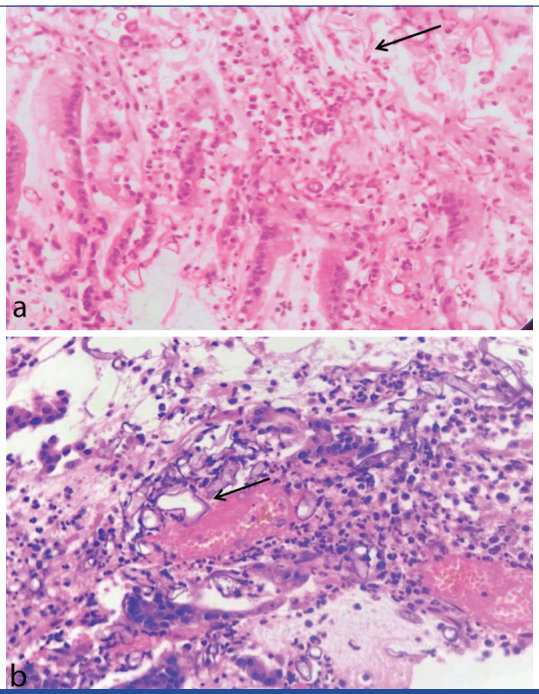
[Table/Fig-2]: CECT abdomen -Coronal view showing multiple gastric ulcers and irregularity of the gastric wall causing gastric outlet obstruction.

Clinically and radiologically suspected to be a malignant gastric ulcer, an endoscopic biopsy from the ulcer was sent for histopathology.

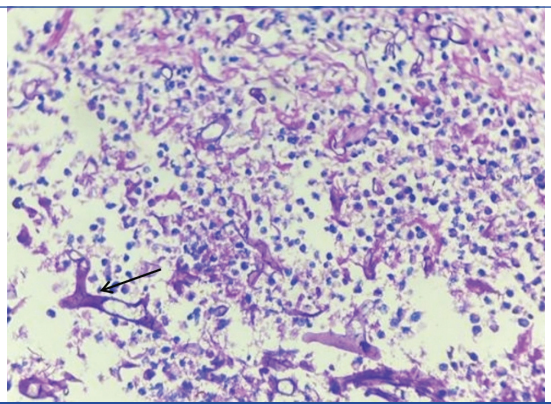
Histological examination of the gastric biopsy revealed multiple fragments of gastric mucosa with areas of ulceration, neutrophilic abscess, and numerous broad aseptate obtuse-angle branching fungal hyphae resembling Mucorales [Table/Fig-4a,b]. Granulation tissue areas, proliferating blood vessels, and fungal hyphae infiltrating the gastric pits and blood vessels were observed. Special stains (Periodic Acid Schiff (PAS) [Table/Fig-5] and Gomori Methanamine Silver (GMS) [Table/Fig-6]) were performed to highlight the fungal hyphae in magenta pink colour with PAS stain and in black colour with GMS stain. Based on the histology and fungal stains, a diagnosis of invasive gastric mucormycosis was made. However, microbiological culture and species subtyping were not performed. Following the histopathological examination diagnosis, the patient was started on antifungal therapy with Amphotericin-B and advised regular follow-up for a period of one year.



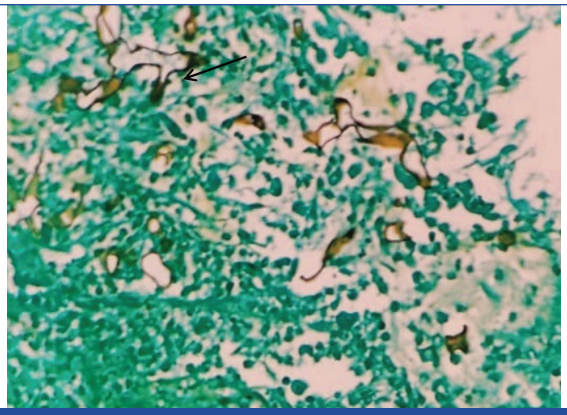
[Table/Fig-3]: Endoscopic image showing multiple gastric ulcers with a necrotic base and adjacent erythematous mucosa.



[Table/Fig-4a,b]: Histology showing gastric mucosa with dense inflammatory infiltrate, necrosis and hyphae of Mucormycosis (H&E x 400x).



[Table/Fig-5]: Periodic Acid Schiff (PAS) special stain highlighting the fungal organisms (10x).



[Table/Fig-6]: Gomori Methanamine Silver (GMS) special stain highlighting the fungal organisms (10x).

DISCUSSION

Mucormycosis is an opportunistic fungal infection that is angioinvasive in nature and results from the inhalation or direct inoculation of sporangiospores onto disrupted skin or mucosa in immunocompromised individuals [1]. Rhinocerebral and pulmonary locations are the most common presentations, while primary gastrointestinal mucormycosis is very rare [2,3]. In a systematic review and meta-analysis of 851 cases of mucormycosis, Rhino-Orbital-Cerebral Mucormycosis (ROCM) involvement was most commonly observed (34%), followed by skin (22%) and lung (20%). Gastrointestinal mucormycosis was reported in only 8% of the cases [4]. Mucormycosis usually reaches the gastrointestinal tract through the ingestion of contaminated moldy food. Subsequently, due to the angioinvasive nature of the Mucorales, they invade nearby blood vessels, resulting in vessel thrombosis and tissue necrosis [5]. The vast majority of patients with mucormycosis have predisposing risk factors, including uncontrolled diabetes mellitus, chronic kidney disease, solid organ/stem cell transplantation, underlying haematologic malignancy, Acquired Immunodeficiency Syndrome (AIDS), disseminated chronic infections, major trauma, severe neutropenia, and prolonged steroid use [4]. Although literature reviews mention a relationship between hyperferritinemia and mucormycosis [6], it is not established whether hyperferritinemia is a risk factor for mucormycosis or just an inflammatory marker. Most reported cases were treated with deferoxamine, an iron chelator that plays an essential role in the pathogenicity of Mucorales [7]. An increased number of cases of black fungus also emerged during the Coronavirus Disease-2019 (COVID-19) pandemic, which may be associated with the widespread use of steroids for treatment. A review of 31 cases of gastric mucormycosis showed that it most commonly presented in middle-aged male patients, with abdominal pain, vomiting, and GI bleeding being the most frequently encountered symptoms [8], which was consistent with the present case. Rarely, it may even lead to gastrointestinal perforation [9]. Diagnosis is obtained through detailed microscopic and histopathological examination of a tissue biopsy, which shows aseptate, obtuse-angle fungal hyphae mixed with areas of neutrophilic abscess, necrosis, and granulation tissue [10]. Special stains like PAS and GMS may be used to confirm the presence of the organisms. Unfortunately, there are no Polymerase Chain Reaction (PCR)-based or serological tests available for the early detection and diagnosis of mucormycosis [11].

A high index of suspicion is needed due to the rarity of the disease and the varied clinical presentation for early diagnosis. The treatment approach should focus on managing the underlying co-morbidities and reversing the risk factors, in addition to antifungal therapy. Rapid initiation of antifungal therapy has been shown to improve patients' prognosis, while delayed treatment has been associated with a two-fold increase in mortality rates [12]. Although no consensus has been reached on the optimal antifungal treatment, Liposomal Amphotericin B (LAB) is recommended as first-line therapy. The

Studies	Age (years)/Sex	Associated risk factors	Presenting symptoms	Treatment	Outcome
Khsiba A et al., [13] 2022, Tunisia	61/F	Hypertension, diabetes mellitus, dyslipidaemia, steroid inhalers for cough	Vomiting for seven days	Antifungal therapy followed by gastrectomy	Patient succumbed 10 days after surgery
Khsiba A et al., [13] 2022, Tunisia	59/M	Septic shock	Gastric pain, vomiting	Broad spectrum antibiotherapy and vascular filling with vasoactive drugs	Patient succumbed eight days after admission
Kulkarni RV and Thakur SS [14] 2015, India	50/M	Chronic alcoholic, diabetes mellitus	Fever, vomiting, anorexia, abdominal pain for six days	Antifungal therapy followed by wedge resection of the gastric ulcer	Patient succumbed two days postsurgery due to multiorgan failure
Kgomo MK et al., [15] 2018, South Africa	38/F	Anaemia, Retropositive (with absolute CD4 count of 63 cells/μL and HIV viral load 405139 copies/mL)	Productive cough, dyspnoea, lethargy for two weeks	Antifungal therapy	On medications for Human Immunodeficiency Virus (HIV), Tuberculosis and antifungal therapy
Present case, 2024	42/M	Diabetes mellitus, chronic kidney disease, chronic alcoholism	Abdominal pain, vomiting six months	Antifungal therapy	On medications and follow-up.

[Table/Fig-7]: Review of similar case reports in literature [13-15].

liposomal formulation of Amphotericin B is preferred due to its lower renal toxicity even at higher doses. Surgical intervention, in addition to antifungal therapy, is also recommended as the penetration of the drug may be limited in the necrotic and ulcerative focus of mucormycosis. However, in present case, the patient recovered well with oral antifungal medication, and surgical intervention was not performed. A literature search of similar case reports is tabulated in [Table/Fig-7] [13-15].

CONCLUSION(S)

This case of gastric mucormycosis is presented due to its rare presentation in the gastric location and its resemblance to a malignant ulcer in radiology and endoscopy. Mucormycosis, a fatal life-threatening opportunistic fungal disease, not only affects patients in an immunocompromised state but also rarely affects immunocompetent individuals. Given the diverse clinical manifestations, a high degree of suspicion and early confirmation of the disease through histopathology and culture confirmation are warranted for a good prognosis. Although mortality is high due to the invasive nature of the organism, a combined modality of treatment using surgical debridement and antifungal medication in its early stages may lead to complete recovery.

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