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An Unwonted Case of Cutaneous Mucormycosis in a De Novo Diabetic Patient

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Abstract:

Background: Cutaneous mucormycosis is a rare but aggressive fungal infection typically associated with immunocompromised states, particularly uncontrolled diabetes mellitus. The disease can rapidly progress to systemic involvement, requiring prompt diagnosis and intervention.

Case Presentation: A 33-year-old male with no prior medical history presented with right lower limb swelling, ulcerations, and blistering. He was found to have newly diagnosed diabetes mellitus. Despite fasciotomy and broad-spectrum antibiotic therapy, the condition progressed to necrotizing fasciitis requiring a guillotine amputation. Histopathology revealed broad, aseptate, right-angled branching fungal hyphae consistent with mucormycosis. Bacterial cultures grew Proteus mirabilis and Escherichia coli. The patient deteriorated due to septic shock and multi-organ dysfunction and succumbed despite intensive care.

Investigations: Elevated renal parameters and electrolyte imbalances were noted. Histopathology confirmed cutaneous mucormycosis. Culture reports showed a polymicrobial bacterial infection.

Intervention: Right above-knee guillotine amputation, supportive care, antifungal and antibiotic therapy.

Outcome: Despite surgical and medical management, the patient died due to complications of septic shock and multi-organ failure.

Conclusion: Cutaneous mucormycosis, although rare, should be considered in patients with rapidly progressive necrotizing soft tissue infections—even in the absence of classical signs such as black eschar. This case highlights the importance of early recognition, timely histopathological examination, and prompt surgical and antifungal management to improve outcomes.

Keywords:

Cutaneous mucormycosis, necrotizing fasciitis, de novo diabetes, fungal infection, histopathology, Mucorales, case report

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Introduction

Mucormycosis is a rare but highly invasive fungal infection caused by fungi belonging to the order Mucorales. It ranks as the third most common invasive fungal disease after candidiasis and aspergillosis [1]. Despite its low incidence, mucormycosis has gained increasing clinical significance due to its rapid progression and high mortality, particularly in immunocompromised individuals [2]. Cutaneous mucormycosis is a distinct clinical form that often arises following direct inoculation of fungal spores into the skin, especially at sites of trauma, surgical wounds, burns, or injection sites. It is characterized by extensive tissue necrosis, vascular thrombosis, and angioinvasion. The infection may remain localized or progress to involve deeper structures, leading to systemic dissemination [3]. India has seen a disproportionate rise in mucormycosis cases, with a prevalence estimated to be 70 times higher than the global average [4]. This surge has led to the disease being declared notifiable in many regions. While diabetes mellitus—particularly when poorly controlled—is the most common predisposing factor, mucormycosis can also develop in patients with no prior comorbidities [5, 6]. This case report presents a rare and fulminant presentation of cutaneous mucormycosis in a 33-year-old male with newly diagnosed (de novo) diabetes mellitus. The patient's clinical deterioration despite early surgical intervention highlights the importance of considering fungal etiologies in rapidly progressive soft tissue infections. We aim to underscore the diagnostic challenges, the aggressive nature of the disease, and the critical role of early histopathological evaluation in managing such infections.

Epidemiology

India has become a hotspot for mucormycosis, especially in the context of rising diabetes prevalence [4]. Most human infections are caused by species within the Mucorales order, primarily Rhizopus, followed by Mucor and Rhizomucor [1]. Primary cutaneous mucormycosis often results from direct inoculation into the skin via trauma, contaminated dressings, or surgical instruments. Less commonly, it can occur at injection sites or in burn patients [2].

Case Report

A 33-year-old male presented to the Emergency Medicine Department with a 10-day history of right lower limb swelling, ulceration, and blistering. He also reported shortness of breath, decreased urine output, and loose stools. He had no prior history of diabetes, fever, or trauma. He was previously treated at an external hospital, where a fasciotomy was performed for suspected cellulitis. Upon admission, the patient was hemodynamically unstable and required immediate stabilization. Initial investigations revealed (Table 1):

Table 1.Laboratory Investigations at The Time of Admission

Parameter	Value
Blood Urea Nitrogen	**63.88 mg/dL**
Blood Urea	**136.7 mg/dL**
Serum Creatinine	**3.7 mg/dL**
Serum Uric Acid	**10.0 mg/dL**
Serum Sodium	**131.3 mEq/L**
Serum Potassium	**3.7 mEq/L**

The patient was newly diagnosed with diabetes mellitus and had no history of fever. He had previously undergone fasciotomy at an external hospital due to underlying cellulitis. A diagnosis of necrotizing soft tissue infection was established. Upon arrival at the emergency department, the patient was hemodynamically unstable and required immediate stabilization. Routine investigations revealed elevated renal parameters, indicating kidney dysfunction. A

chest X-ray showed increased broncho-vascular markings but no other significant abnormalities (Figure 1). Physical examination revealed necrotizing fasciitis of the right lower limb, with fasciotomy incisions on the medial side of the thigh and the lateral side of the leg, along with extensive blistering. Peripheral pulses (anterior tibial artery, posterior tibial artery, dorsalis pedis artery) were palpable. Given the severity of the infection, the patient was scheduled for a right guillotine amputation.

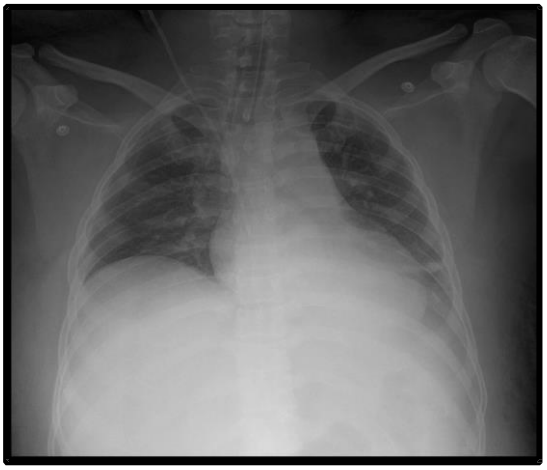

Fig. 1. Chest X-Ray (Pa View)- Increased Broncho-Vascular Markings

Intra op details

During the surgery, the muscles appeared healthy, showing active retraction with the presence of muscle ooze. The tissue was notably oedematous. Additionally, pus was detected in both the posterior and medial muscle groups, and a sample was collected for culture and sensitivity testing which showed growth of Proteus mirabilis and Escherichia coli.

Grossly, a received above-knee amputation specimen measured 48 x 21 x 9.8 cm. An ulcer, measuring 20 x 11 cm with an undermined edge, was noted. It was located 14.4 cm from the resected end. Exposed muscle bundles were observed, but no necrosis was seen (Figure 2)

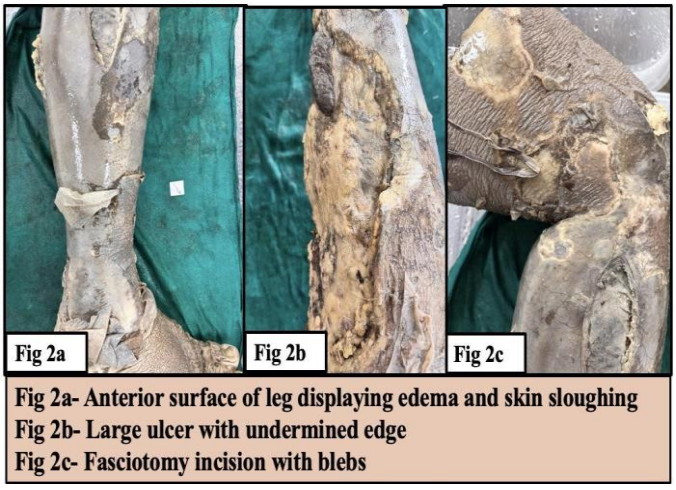

Fig 2a- Anterior surface of leg displaying edema and skin sloughing
Fig 2b- Large ulcer with undermined edge
Fig 2c- Fasciotomy incision with blebs

Fig. 2. Gross Appearance of Above-Knee Amputation Specimen Showing Ulceration with Exposed Muscle Bundles

Microscopic examination revealed a viable skin margin lined by keratinized stratified squamous epithelium with mild chronic inflammation. The muscle margin contained viable skeletal muscle bundles. The neurovascular margin showed thickened blood vessels with dystrophic calcification and unremarkable nerve bundles. The ulcer bed exhibited complete loss of epithelium, moderate chronic inflammatory infiltrate, and the presence of bacterial colonies. Notably, broad, aseptate, ribbon-shaped fungal hyphae with right-angled branching were identified, consistent with Mucorales species. The underlying muscle and subcutaneous tissue showed evidence of myonecrosis, septal panniculitis, and a mixed inflammatory infiltrate composed predominantly of neutrophils, along with scattered lymphocytes (Figure 3 and 4). Meanwhile, the patient was in septic shock with multi-organ dysfunction and on ionotropic support under antibiotic cover. The patient's condition deteriorated and was declared dead in spite of resuscitative efforts

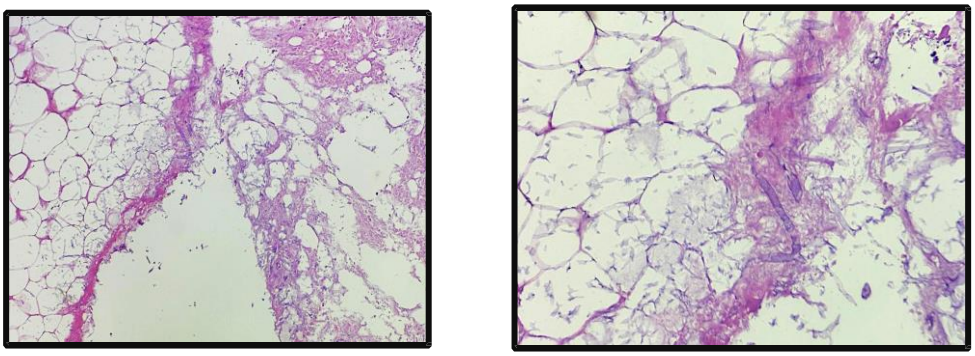

Fig. 3. Subcutaneous Tissue Displaying Broad, Aseptate, Ribbon Shaped Fungal Hyphae with Right Angled Branching (HE; X10), (HE; X40)

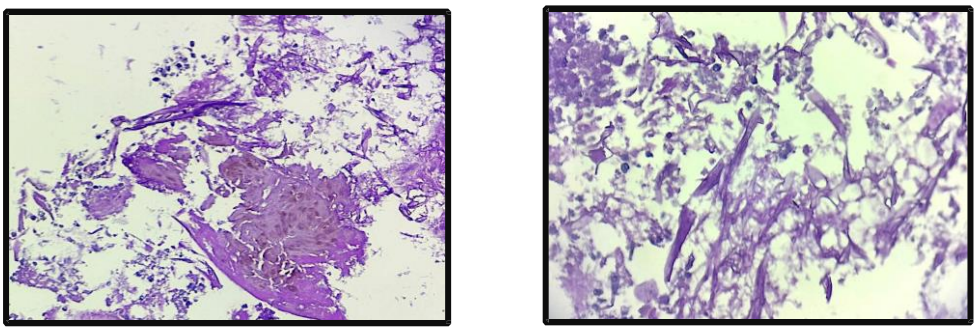

Fig. 4. Subcutaneous Tissue Displaying Broad, Aseptate, Ribbon-Shaped Fungal Hyphae with Right-Angled Branching (PAS; X10), (PAS; X40)

Discussion

Mucormycosis can affect individuals across all age groups, with a slight male predominance [3]. Cutaneous mucormycosis, though less common than other forms, can present in immunocompetent individuals following trauma. However, in most cases, including the present one, diabetes mellitus plays a crucial role in pathogenesis. Notably, our patient lacked the classical black eschar, often cited as a hallmark of mucormycosis [7]. The diagnosis was established based on histopathological examination. Bacterial culture subsequently demonstrated secondary infection with Escherichia coli and Proteus mirabilis. The gold standard for diagnosis remains histological identification of broad, aseptate hyphae with right-angle branching. Early clinical suspicion is critical, as delayed diagnosis significantly worsens prognosis [7]. Rapid diagnostic tools remain in development, and diagnosis continues to rely on tissue biopsy and culture [8]. Despite timely surgical intervention, the outcome was fatal due to the aggressive course of the disease and systemic complications. This highlights the importance of considering

mucormycosis in the differential diagnosis of rapidly progressing soft tissue infections.

Conclusion

Cutaneous mucormycosis is a rare but serious fungal infection that can lead to fatal outcomes, especially in newly diagnosed diabetic patients. This case underscores the need for high clinical suspicion, prompt histopathological diagnosis, and early aggressive treatment. Clinicians should maintain awareness of fungal infections as potential causes of necrotizing fasciitis, even in immunocompetent individuals. Timely recognition and intervention can significantly influence prognosis and survival.

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