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Mucormycosis of facial region: a fatal outcome of uncontrolled diabetes mellitus (Case Report)

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ABSTRACT

Mucormycosis is a rare but severe fungal infection caused by fungi in the order Mucorales, typically affecting immunocompromised individuals. This opportunistic infection often presents in patients with uncontrolled diabetes, hematologic malignancies, or those on immunosuppressive therapy. The most common form of mucormycosis is rhino-orbital-cerebral, which can lead to facial gangrene, a life-threatening condition characterized by tissue necrosis due to impaired blood flow. The pathogenesis of mucormycosis involves the inhalation of fungal spores that invade blood vessels, leading to ischemia, thrombosis, and necrosis. Early diagnosis and prompt intervention, including antifungal treatment and surgical debridement, are crucial in improving survival rates. However, the high mortality associated with facial gangrene due to mucormycosis underscores the need for timely management and a multidisciplinary approach. This review explores the clinical features, diagnostic methods, therapeutic strategies, and outcomes of mucormycosis-associated facial gangrene, highlighting the importance of early recognition and aggressive treatment in preventing catastrophic consequences.

Keywords: Diabetes Mellitus, Diabetic ketoacidosis, Mucormycosis, Oro-Facial Gangrene

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el of 341.95, and her blood glucose was 422mg/dl. The urine examination showed the presence of ketone bodies, which serves as a criterion for the diagnosis of ketoacidosis.
A CT scan was performed, revealing the following findings: a large ill-defined hypodensity in the left convexity of the frontoparietal region, diffuse left periorbital oedema with no intra-orbital mass, and a large acute ischemic infarction in the left frontoparietal region, within the territory of the middle cerebral artery.
Two days later, the area of cyanotic discolouration became more diffuse to involve the skin of the wound margins, ear lobule, and part of the nose with nearly black colour (Figure 3). A team approach was again asked to manage the case, including a maxillofacial surgeon, ENT, plastic surgeon, cardiovascular specialist, internist, and general surgeon.

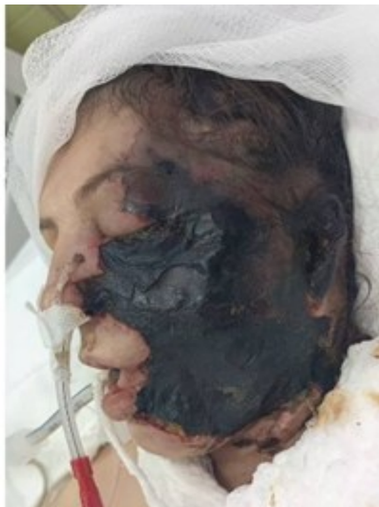

Figure 3. Diffusion of necrosis

A few days later, the condition deteriorated, and the whole left side of the face became swollen. The discolouration enlarged to involve the face, eye, and neck. At this point, the clinical presentation raised suspicion for facial mucormycosis.
Over the course of two weeks in the Respiratory Care Unit (RCU), the patient received various medications, including potent antibiotics such as meropenem and clindamycin, antifungal agents such as voriconazole, and paracetamol for pain management. Additionally, she was administered calcium gluconate and potassium chloride. During her stay at the RCU, the patient required frequent insulin administration. Despite continued treatment and maintenance under general anaesthesia with persistent unconsciousness, the patient unfortunately passed away.

DISCUSSION

The case of facial necrosis reported here focused on the association of facial necrosis with DKA; the issue of diagnosis, the timing of intervention and the multidisciplinary approach.
The DKA is one of the most serious complications of DM. Usually, it happens in uncontrolled cases. When it happens, it will seriously alter the physiology of the body's organs, and the circulating blood will be the first affected. The high viscosity of blood increases the risk of thrombosis, which can subsequently lead to tissue infection and necrosis. Mucormycosis is a rare but severe fungal infection, which can be particularly concerning in patients with diabetes mellitus. Cutaneous and soft-tissue mucormycosis are the most prevalent forms of mucormycosis observed in immunocompetent individuals.[5] Uncontrolled DM may be one of the principal factors in the development of such a disease. The loss of control over DM may arise from several factors: not taking treatment and relying on enteroception, estimating or guessing blood glucose levels based on physiological sensations, underdosing, ineffective treatments, etc..[8] In such cases, ketoacidosis is an expected complication. Ketoacidosis is a metabolic condition characterized by abnormally elevated concentrations of ketone bodies (specifically acetone, acetoacetate, and beta-hydroxybutyrate) in both serum and urine.[9] In the current case, many features of uncontrolled DM were present, increasing the risk of infection in the head and neck region. When infection happens, especially when it reaches the neck spaces it is considered serious. Such a serious infection may serve as a strong factor for developing ketoacidosis.
Both fascial space infection and ketoacidosis need aggressive management in advanced medical settings. What happened in this case was possibly an underestimation of the condition's seriousness and a subsequent delay in proper, aggressive management. The last one led to complications, including necrosis and/or mucormycosis. For the last one, early diagnosis is critical for initiating prompt and effective treatment, thereby enhancing patient outcomes.[10]
In the majority of cases, management of mucormycosis focuses on aggressive debridement

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INTRODUCTION

Diabetes mellitus (DM) and its associated complications have become an epidemic, posing a significant challenge to the healthcare system.[1] Diabetes is characterized by elevated blood glucose levels, either in a fasting or postprandial state. The persistent hyperglycaemia associated with DM can lead to damage, dysfunction, and eventual failure of various organs and tissues, including the retina, kidneys, nerves, heart, and blood vessels.[2]

Diabetic ketoacidosis (DKA) is a severe, life-threatening emergency in individuals with diabetes, potentially leading to significant morbidity and mortality. The management of DKA involves correcting metabolic imbalances, replenishing fluids, addressing electrolyte disturbances, and treating acidosis, while simultaneously managing the underlying precipitating condition.[3] DKA is the most common complication associated with type 1 diabetes mellitus (T1DM), characterized by the presence of hyperglycaemia, acidosis, and ketosis.[4]

In other hand, mucormycosis (MCR) is a rare and challenging-to-diagnose infection with high morbidity and mortality. Diagnosis is often delayed, and the disease can progress rapidly. Prompt surgical and medical intervention is critical for survival. Multidisciplinary management strategies have the potential to improve outcomes, though approaches may vary across different healthcare settings.[5] The MCR is commonly observed in patients with severe immunosuppression, such as those with hematologic malignancies or organ transplants, those with DM and DKA, and immunocompetent patients with severe wounds.[7]

In this paper, the story of one case of uncontrolled DM and DKA associated with facial mucormycosis will be discussed

Case presentation

History

A 20-year-old female patient with type 1 DM presented with swelling of the periorbital and upper neck close to parotid regions (figure 1). She admitted to the endocrinology department at Rizgari teaching hospital for the management of her uncontrolled DM status as preparation for surgical drainage of swellings. The pulse rate was 90 bpm. The blood pressure was 77/80 mmHg. Serum electrolytes, ketone bodies and complete blood count were requested. Consultation with multiple related specialities is requested, including maxillofacial and ENT specialists.

Figure 1. Swelling before surgery

A drainage procedure was carried out according to standard protocols of abscess, with 25 cc of pus drained out (figure 2).

Figure 2. Directly after drainage of swelling in upper neck

On August 4, 2024, the condition deteriorated; she lost consciousness (Glasgow Coma Scale was 3/15), so she was transferred to the respiratory care unit (RCU) at Rozh-halat Emergency Department. The team intubated her and put her under general anaesthesia. The anaesthesiologist noticed cyanosis of the left earlobe with hypokalaemia. The SPO2 was 98%. Both KCl and NaHCO3 were given.

On August 5th, 2024, the swelling and cyanosis progressed dramatically. The team could not reach agreement on the timing of possible embolic necrosis, as suspected. Laboratory results showed an elevated white blood cell count of 15.48 x 10^9/L, a low red blood cell count of 2.59 x 10^12/L, and a markedly elevated C-reactive protein (CRP) lev-

and improved oxygenation of the site, in parallel with antibiotic and antifungal treatment. In the current case, both antibiotic and antifungal medications were prescribed for the patient, but adequate surgical debridement was not performed, as documented. Disagreement among the team's specialities, who were asked for consultation and involvement in treatment, led to the decision not to perform surgical debridement.

Why a simple infection may cause necrosis in such a vascularized area as the face will be discussed here.

The surgical team managing cases of facial necrosis should be multidisciplinary, as the condition requires a multilevel, multisystem approach. Surgical debridement may be carried out by maxillofacial, plastic, ENT, and general surgeons; however, systemic correction of inflammatory biomarkers and blood flow requires internists, immunologists, endocrinologists, and haematologists.

The maxillofacial surgical team attempted to perform the operation on the patient twice. However, during the first attempt, the patient's family did not consent to the procedure. On the second attempt, the surgery was delayed due to the absence of the required specialists from other disciplines.

CONCLUSION

Diabetic ketoacidosis (DKA) is a severe acute metabolic complication of diabetes mellitus, characterized by hyperglycaemia, ketonemia, and metabolic acidosis. It is well established that DKA initiates a cascade of pathophysiological disturbances that can significantly increase the risk of both acute and chronic diabetic complications. At elevated concentrations, ketone bodies promote oxidative stress and activate pro-inflammatory pathways, contributing to cellular dysfunction and tissue injury across multiple organ systems.

The patient, a 20-year-old female with diabetes mellitus, presented with DKA as an acute complication of inadequate metabolic control. Prompt recognition and aggressive management—including fluid resuscitation, insulin therapy, and electrolyte correction—are essential to restore metabolic homeostasis and prevent further complications. Moreover, continued specialized follow-up care is imperative after resolution of the acute episode, particularly in the context of her immunocompromised state, which predisposes her to an increased risk of infections and delayed recovery.

Conflict of Interest

The authors declare no conflicts of interest.

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