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CASE REPORT
Reconstructive

Mucormycosis of the Forehead and Sinuses in a Trauma Patient

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Summary: Mucormycosis is a rare fungal infection in immunocompetent patients. It is not commonly seen in trauma patients who sustain multisystem injuries and are often exposed to numerous infectious sources. A multidisciplinary approach between medical and surgical specialties is crucial to ensuring timely diagnosis and treatment as morbidity and mortality can be high once acquired. In addition to antifungal therapy, radical debridement and reconstruction by plastic surgery is often necessary. Review of the literature shows that there is no definitive reconstructive technique for mucormycosis of the forehead and sinuses because the amount of tissue destruction may be varied in location and depth, therefore requiring varying extents of debridement. However, other reconstructive techniques commonly used for oncologic and trauma reconstructions can be used to achieve functionality and a satisfactory cosmetic result. Few facial reconstructions after infection with mucormycosis have been documented in the literature. *(Plast Reconstr Surg Glob Open 2016;4:e818; doi: 10.1097/GOX.0000000000000793; Published online 22 July 2016.)*

Mucormycosis is an angioinvasive fungal infection, which is commonly found in decaying organic matter. It is typically seen in immunocompromised patients with diabetes mellitus and those with hematologic malignancies.[1] There are several types or manifestations of mucormycosis including pulmonary, rhino–orbital–cerebral, cutaneous, gastrointestinal, and disseminated.[2] Immunocompetent hosts, such as trauma patients, do not usually acquire mucormycosis infection; but when they do, it is usually through a break in tissue barriers leading to cutaneous mucormycosis through direct inoculation. This is most commonly seen with blunt trauma such as motor vehicle accidents.[3] Cutaneous mucormycosis is the third most common type of mucormycosis infection occurring 19% of the time. The most common type is invasion of the sinuses leading to rhino–orbital–cerebral mucormycosis, which occurs when spores are inhaled through the sinuses leading to sinusitis, periorbital edema, blindness, proptosis, and cranial invasion.[2] Regardless of the type of mucormycosis, tissue necrosis occurs because of angioinvasion and thrombosis, which prevents migration of leukocytes and antifungal therapies to the site of infection.[1] All types of mucormycosis require treatment with amphotericin B; however, the cases of cutaneous and rhino–orbital–cerebral mucormycosis may also require early surgical debridement with excision of all necrotic tissues followed by extensive reconstruction.

CASE REPORT

A 30-year-old woman sustained a motor vehicle collision with ejection into a cattle field. The patient sustained multiple injuries, including soft-tissue edema of the head and face with no underlying fractures seen on computed tomography (CT) scan of the head. She was started on low-dose dexamethasone per neurosurgical recommendations for spinal cord edema. She became febrile within 1 week of her hospital stay and underwent blood and urine cultures, as well as bronchoscopy with broncheoalveolar lavage. Broad-spectrum antibiotics and micafungin were started empirically, but cultures remained negative. She then began to develop periorbital edema, a small eschar on her forehead, and copious nasal drainage. Missed facial fractures and/or sinusitis were suspected. CT maxillofacial scan was performed and showed no facial fractures and no opacification of the paranasal sinuses or mastoid air cells, ruling out sinusitis. However, bilateral proptosis was noted (Fig. 1). In the following days, she developed worsening facial edema, an expanding eschar that involved the forehead, orbital, and nasal areas, as well as sloughing of skin. A duplex ultrasound was performed,

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which showed no evidence of superior vena cava obstruction as a potential cause of the significant facial edema that was thought to be contributing to skin necrosis. Repeated CT scan showed increasing facial edema with development of opacification of the paranasal sinuses, bilateral orbital nerve tension, proptosis, and left globe hemorrhage (Fig. 2). Ophthalmology performed an emergent bedside canthotomy/cantholysis for bilateral orbital compartment syndrome. Dermatology performed biopsies of the facial eschar. Immediate frozen sections were performed and were consistent with an angioinvasive fungal infection. Because of concern for mucormycosis, amphotericin B was started before final histological analysis (Fig. 3). Radical surgical debridement would be required to gain control, because the aggressive infection had rapidly spread to the patient's lips and maxilla (Fig. 4). This surgical option was discussed with the family, but with the patient's overall poor prognosis, including disfigurement from extensive debridement, paralysis from spinal cord injury, likely blindness from optic nerve compression, and sepsis with multiple organ failure requiring dialysis and pressor support, the family elected to pursue palliative care.

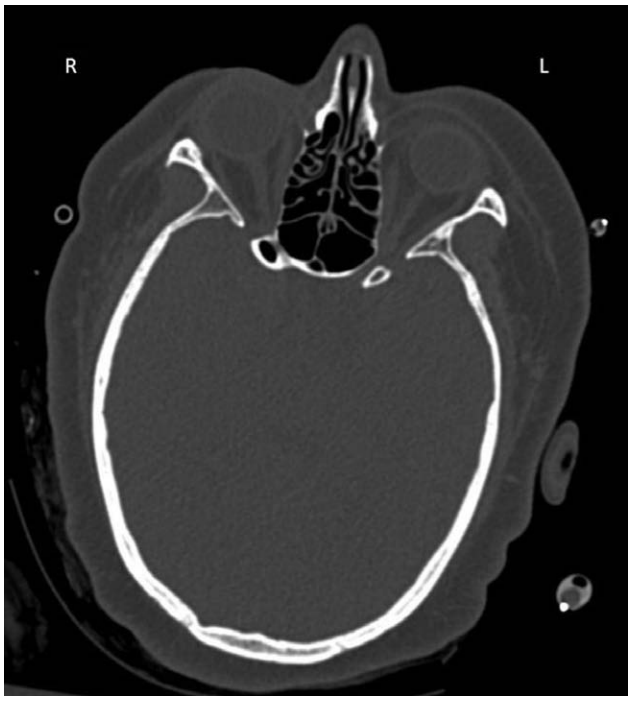

Fig. 1. Initial CT scan with no facial fractures or opacification of paranasal sinuses or mastoid air cells, but extensive facial edema and bilateral proptosis are noted.

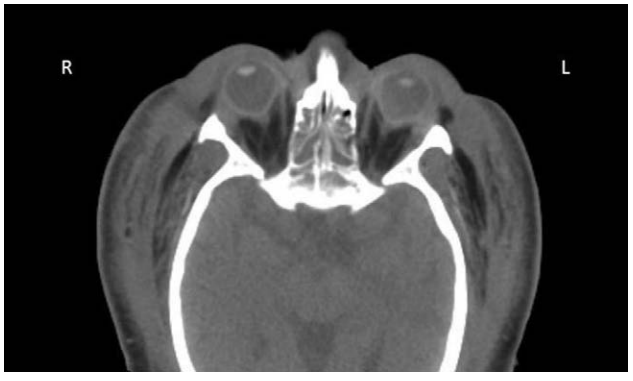

Fig. 2. Follow-up CT scan with increasing facial edema, sinusitis, bilateral optic nerve tension with tenting of the posterior globes, and left globe hemorrhage.

DISCUSSION

Although mucormycosis is commonly seen in immunocompromised patients, it can occur in immunocompetent patients. Although this patient was immunocompetent before her trauma, mucormycosis spores were most likely introduced into the patient through facial abrasions and inhaled through the sinuses, when she was ejected into a cattle field during the motor vehicle collision. She then became immunocompromised because of trauma and critical illness, a spinal cord injury, low-dose steroid treatment, acute kidney failure requiring hemodialysis, and development of sepsis requiring hemodynamic support. This transition from an immunocompetent state to an immunocompromised one allowed mucormycosis spores to disseminate through the sinuses causing sinusitis, as well as into the orbits causing proptosis, optic nerve tension, and orbital edema/hemorrhage leading to mucormycosis of the forehead and sinuses. Rapid diagnosis, as in this case, should be obtained by immediate frozen sections of biopsies. Although amphotericin B was initiated, aggressive surgical debridement was indicated once the diagnosis was established. This would have required debridement of the majority of the soft tissue and some bony structures of the patient's face, resulting in significant facial deformity. Although tissue-sparing techniques have been described to assist with the reconstruction process using Mohs surgery, this technique is usually not appropriate for treatment of mucormycosis of the forehead and sinuses.[4] Inadequately treated infections can hinder the reconstruction process significantly; the aggressive nature of a mucormycosis infection typically requires a radical surgical debridement of skin, soft tissue, muscle, and/or bone as the initial approach to get rapid control of the infection and to minimize further tissue damage. Review of the literature shows that there is no definitive reconstructive technique for mucormycosis of the forehead and sinuses because the amount of tissue destruction may be varied in location and depth, requiring varying extents of debridement. Therefore, reconstruction options are extremely variable. Other facial reconstructive techniques commonly used by plastics surgeons for oncologic and trauma reconstructions including the use of tissue expanders with local flap advancement,[4] free flaps including soft tissue and bone, skin grafting, and the use of titanium implants[5] may be considered. Balancing functionality with cosmesis is often difficult because of the extent of tissue damage.

SUMMARY

Despite aggressive antifungal therapy and surgical intervention, the mortality of mucormycosis is greater than 50%,[1] and this case highlights the importance of identify-

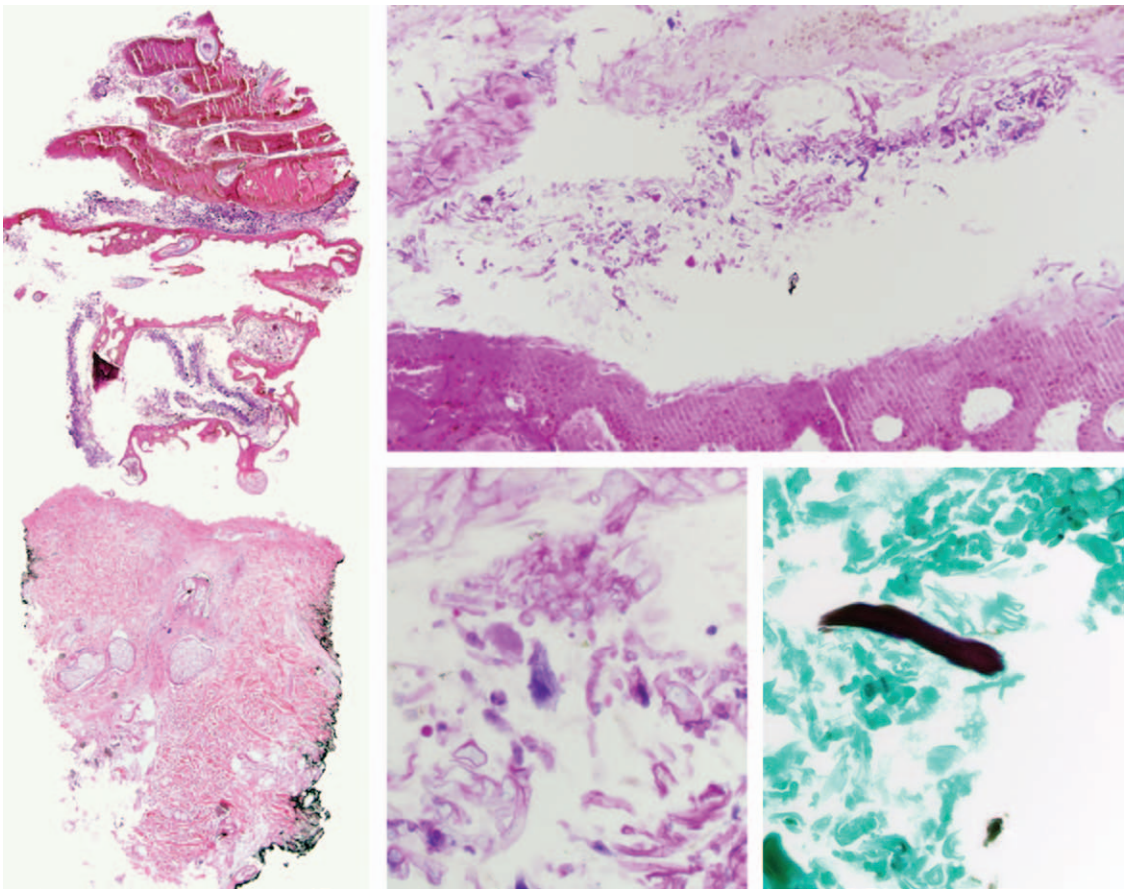

Fig. 3. Scanning magnification of necrotic skin and epidermis (2×). On medium power magnification (20×), periodic acid-Schiff diastase stain demonstrated collections of hyphae, which on higher power (40×) demonstrated nonseptated, ribbon-like structures. Grocott's methenamine silver stain demonstrated subtle inverse staining.

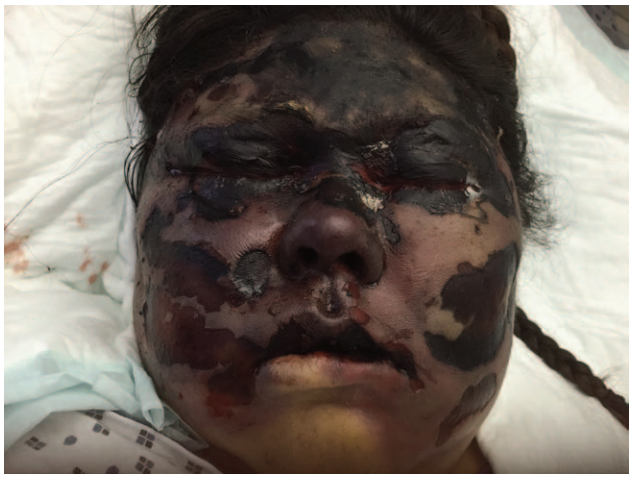

Fig. 4. Extensive eschar involving forehead, orbital, nasal, oral, and buccal areas of the face.

ing infection early to minimize morbidity and mortality. A multidisciplinary approach between dermatology, infectious disease, ophthalmology, and plastic surgery is critical to ensure timely initiation of antifungal treatment and appropriate surgical debridement and reconstruction for the most favorable outcome.

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PATIENT CONSENT

The patient provided written consent for the use of her image.

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