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Case report

Progression of chronic rhinosinusitis to invasive cerebro-orbital aspergillosis following steroid treatment: A case of induced immunosuppression

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ABSTRACT

Invasive aspergillosis is a classic fungal infection of immunocompromised hosts which rarely manifests in immunocompetent patients. In this report, we present a case of invasive aspergillosis which resulted from induced immunosuppression through corticosteroid treatment of chronic rhinosinusitis. Further investigation is necessary into the epidemiology of mixed fungal rhinosinusitis and providers should be wary of invasive disease in those receiving chronic steroids.

Introduction

Nasal polyps are growths of inflamed mucosal tissue in the paranasal sinuses associated with multiple etiologies. While the most common cause in Western countries is eosinophilic chronic rhinosinusitis (CRSwNP), other causes include cystic fibrosis, aspirin sensitivity, and fungal infection [1,2]. Allergic fungal rhinosinusitis is typically noninvasive. However, it may sometimes develop into invasive infection, commonly in immunocompromised individuals [3,4]. Recently, there has been a substantial increase in the number of reported acute invasive fungal infections in immunocompetent individuals [3,5–11]. We present a case of an immunocompetent young adult initially presenting with CRSwNP who then developed invasive aspergillosis with cerebral and orbital involvement.

Case

The patient is a 26-year-old man with a 19-month history of chronic allergic rhinosinusitis with nasal polyps (CRSwNP) refractory to treatment with multiple courses of inhaled fluticasone, amoxicillin/clavulanate, and prednisone who initially presented to the emergency department (ED) with blurry vision and headache. The patient endorsed severe frontal headache and blurry vision in the left eye that had progressed over the past week after completing a repeat 25 day tapering prednisone course that began with 50 mg daily. The patient was afebrile, lab results showed no leukocytosis, and he was empirically started on ampicillin/sulbactam. Magnetic Resonance Imaging (MRI) described pansinusitis with right sphenoid mucocele, evidence of chronic obstruction of the frontal sinuses, bilateral enhancement of the dura over the periorbita and frontal lobes, evidence of abscess in the right orbital region (Fig. 1), and right frontal lobe cerebritis. Subsequently, otolaryngology (ENT) performed a sinonasal endoscopic frontal sinusotomy with bilateral maxillary antrostomy, frontoethmoidectomy, and sphenoidotomy. Expansive fungal mucin was found along with erosive changes and extensive polypoid disease; intraoperative cultures were not sent. Per ENT records, there was low suspicion for invasive disease given surgical findings and clinical improvement after debridement. A diagnosis of chronic allergic fungal sinusitis without invasive disease was made and the patient was discharged on another short course of amoxicillin/clavulanate and prednisone without Infectious Diseases consultation.

The patient returned nine days later with recurrent pain, headache, and blurry vision. He was hemodynamically stable and repeat MRI showed similar findings along with pachymeningitis overlying the bilateral frontal lobes and compression of the left optic nerve. Finalized pathology from the prior procedure then returned showing extensive necrotizing granulomas with abundant fungal hyphae. Infectious diseases consultation was sought and due to the concern for invasive fungal

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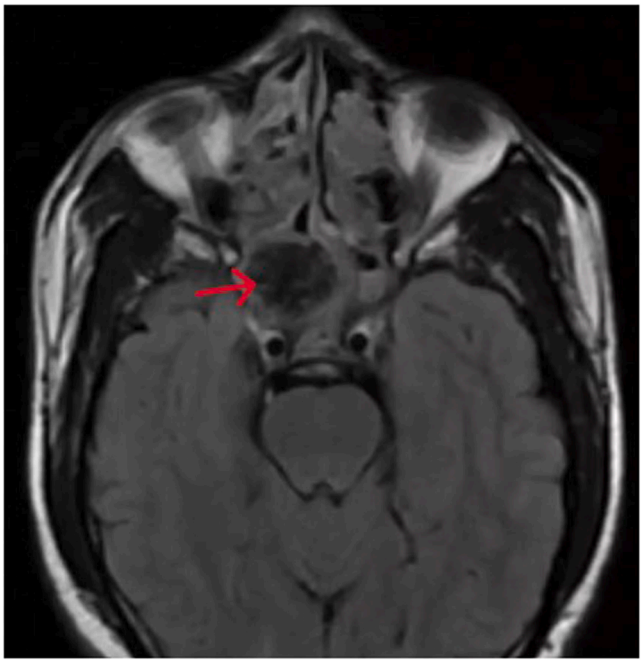

Fig. 1. : MRI brain demonstrating invasive sinusitis with abscess formation (arrow).

infection, the patient was started on liposomal amphotericin B, as well as empiric cefepime, linezolid, and metronidazole. The patient then underwent repeat surgical debridement.

Initial pathology from debridement reported sinonasal mucosa with extensive necrotizing granulomas and abundant fungal hyphae. There was also evidence of possible osteomyelitis with bone turnover. Multiple operative cultures later grew a mold as well as methicillin-sensitive *Staphylococcus aureus,* methicillin-resistant *Staphylococcus lugdunensis,* and *Klebsiella oxytoca*. While awaiting laboratory confirmation of the mold species, the patient was switched from liposomal amphotericin B to oral isavuconazonium sulfate to avoid possible toxicity given successful surgical intervention and control of symptoms. The mold identification later returned as *Aspergillus flavus*. After a second surgical debridement and left optic nerve decompression for continued blurred vision was completed, the patient was discharged with a six-week course of isavuconazonium sulfate, linezolid, and levofloxacin for invasive fungal sinusitis with assumed cranial osteomyelitis. These agents were chosen for their high oral bioavailability in the setting of treating an invasive infection without prolonged intravenous therapy per patient request. Follow up MRI showed persistent bilateral enhancement in the superior orbits, decreased pachymeningeal enhancement, and resolution of abscess. A six-month minimum treatment course with isavuconazonium sulfate alone for chronic invasive aspergillosis was planned. After 3 months, the patient reported significantly improved but persistent blurry vision and intermittent headache. Continued treatment with isavuconazonium sulfate and repeat imaging was ordered however the patient was subsequently lost to follow up.

Discussion

Invasive fungal rhinosinusitis in an immunocompetent patient is often related to certain predisposing risk factors. These can range from malaria [12] or diabetes [13], to intranasal drug use [7]. Given that this patient did not have such history, this case may represent a rare but previously observed complication of chronic steroid treatment [13]. The patient received multiple treatments of prednisone while being treated for allergic fungal rhinosinusitis. We hypothesize that this precipitated a temporary immunosuppressed state which allowed progression to invasive fungal rhinosinusitis. Given that the patient's symptoms were controlled with dexamethasone treatment, it is likely that he had mixed fungal rhinosinusitis with both invasive and non-invasive etiologies [14]. Cases of mixed fungal sinusitis are poorly described, likely due to their rarity [14]. Those reported included orbital involvement and like our patient, were usually receiving treatment for chronic rhinosinusitis. Chronic steroid therapy may require closer monitoring for potential invasive disease even in immunocompetent patients.

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References

[1] Chaaban MR, Walsh EM, Woodworth BA. Epidemiology and differential diagnosis of nasal polyps. Am J Rhinol Allergy 2013;27(6):473–8. https://doi.org/10.2500/ajra.2013.27.3981.
[2] London Jr NR, Reh DD. Differential diagnosis of chronic rhinosinusitis with nasal polyps. Adv Oto-Rhino-Laryngol 2016;79:1–12. https://doi.org/10.1159/000444957.
[3] Chaaban MR, Bell W, Woodworth BA. Invasive mucormycosis in an immunocompetent patient with allergic fungal rhinosinusitis. Otolaryngol Head Neck Surg 2013;148(1):174–5. https://doi.org/10.1177/0194599812460988.
[4] Meltzer EO, Hamilos DL, Hadley JA, et al. Rhinosinusitis: establishing definitions for clinical research and patient care. J Allergy Clin Immunol 2004;114(6 Suppl):155–212. https://doi.org/10.1016/j.jaci.2004.09.029.
[5] Akhaddar A, Gazzaz M, Albouzidi A, Lmimouni B, Elmostarchid B, Boucetta M. Invasive Aspergillus terreus sinusitis with orbitocranial extension: case report. discussion 495 Surg Neurol 2008;69(5):490–5. https://doi.org/10.1016/j.surneu.2007.02.059.
[6] Ganesh P, Nagarjuna M, Shetty S, Kumar P, Bhat V, Salins PC. Invasive aspergillosis presenting as swelling of the buccal mucosa in an immunocompetent individual. Oral Surg Oral Med Oral Pathol Oral Radio 2015;119(2):e60–4. https://doi.org/10.1016/j.oooo.2014.09.033.
[7] Bougioukas L, Campbell B, Crooker K, et al. Invasive Aspergillus flavus sinusitis in an immunocompetent patient using intranasal cocaine. IDCases 2021;26:e01327. https://doi.org/10.1016/j.idcr.2021.e01327.
[8] AlHaj Houssen A, Algreeshah F. Aspergillus sinusitis complicated with meningitis and multiple cerebral infarctions in immunocompetent patient. Neurosciences 2018;23(2):148–51. https://doi.org/10.17712/nsj.2018.2.20170368.
[9] Chae SY, Park HM, Oh TH, et al. Fusarium species causing invasive fungal pneumonia in an immunocompetent patient: a case report. 300060520976475 J Int Med Res 2020;48(12). https://doi.org/10.1177/0300060520976475.
[10] Cullen GD, Davidson TM, Yetmar ZA, Pritt BS, DeSimone DC. Orbital apex syndrome due to invasive aspergillosis in an immunocompetent patient. IDCases 2021;25:e01232. https://doi.org/10.1016/j.idcr.2021.e01232.
[11] Kim BJH, Garcia Redmond J, Donaldson AD, Aspoas AR. Aspergillus fumigatus cerebral abscess and sphenoid sinus osteomyelitis in an immunocompetent patient following previous nasopharyngeal carcinoma and radiotherapy. J Surg Case Rep 2021;2021(9):rjab402. https://doi.org/10.1093/jscr/rjab402.
[12] Eckerle I, Ebinger D, Gotthardt D, et al. Invasive aspergillus fumigatus infection after plasmodium falciparum malaria in an immuno-competent host: case report and review of literature. Malar J 2009;8:167. https://doi.org/10.1186/1475-2875-8-167.
[13] Fadda GL, Martino F, Andreani G, et al. Definition and management of invasive fungal rhinosinusitis: a single-centre retrospective study. Acta Otorhinolaryngol Ital 2021;41(1):43–50. https://doi.org/10.14639/0392-100X-N0848.
[14] Rupa V, Thomas M. Different types of fungal sinusitis occurring concurrently: implications for therapy. Eur Arch Otorhinolaryngol 2013;270(2):603–8. https://doi.org/10.1007/s00405-012-2096-2.