CASE REPORT

Compressive Optic Neuropathy from Allergic Fungal Sinusitis

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ABSTRACT

Ophthalmic manifestations of allergic fungal sinusitis (AFS) are rare, but can occur in advanced disease. A 32-year-old man with advanced AFS presented with severe bilateral vision loss and restricted ocular motility. Magnetic resonance imaging and histological analysis confirmed active chronic AFS. Functional endoscopic sinus surgery was performed, with adjunctive steroid therapy. Although AFS is a reasonably well-recognised entity, severe disease causing bilateral visual deficits is rarely encountered. This can confound the diagnosis and appropriate treatment. Ophthalmologists should thus be aware of compressive optic neuropathy as a complication of advanced AFS to prompt early treatment and mitigate visual loss.

Keywords: Allergic fungal sinusitis, compressive optic neuropathy, magnetic resonance imaging

INTRODUCTION

Allergic fungal sinusitis (AFS) is a highly recurrent, non-invasive infection constituting 5–10% of chronic fungal rhinosinusitis.^{1,2} Optic neuropathy causing visual loss is rare, but can occur in advanced disease. Early clinical recognition, neuroimaging for optic nerve involvement, and prompt ENT (ear, nose, and throat) intervention are of the utmost importance to mitigate visual loss.

MATERIALS AND METHODS

Retrospective case report and literature review.

RESULTS

A 32-year-old man of Pacific Islander background was referred to the outpatient ENT and ophthalmology clinics. He had an 18-month history of progressive

nasal obstruction refractory to nasal steroids and decongestants. He also had several months of diminished visual acuity (VA), without diplopia or pain. He had pre-existing right central acuity loss from a toy laser beam injury. His past medical history was significant for obesity, obstructive sleep apnoea, and asthma. There was no history of diabetes mellitus. His regular medications were fluticasone and salbutamol. He had smoked 4 pack-years.

On examination, VA was count fingers in the right eye (RE) and 6/9 in the left eye (LE). Colour vision was not assessable in the RE. Hertel exophthalmometry showed proptosis of 27 mm RE and 25 mm LE. Eye movements were restricted bilaterally, and more marked in adduction. Applanation tonometry was normal, though intraocular pressure increased on vertical movement by 6 mm Hg RE and 7 mm Hg LE. Fundoscopy was unremarkable. Humphrey visual field analysis revealed globally depressed fields in the right eye (Figure 1A), and a temporal hemianopia with paracentral nasal scotomas in the left eye (Figure 1B). Retinal nerve fibre layer thinning

Received 13 April 2015; revised 25 May 2015; accepted 26 May 2015; published online 19 August 2015

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FIGURE 1 Pre-operative and post-operative Humphrey visual fields of each eye (central 24-2 test). Improvements were seen bilaterally by day 20. In the right eye (A), there was recovery of the inferonasal quadrant. In the left eye (B), the supero- and infero-nasal scotomas resolved, leaving a residual temporal hemianopia.

FIGURE 2 Axial (A) and coronal (B) MRI T1-weighted images without gadolinium. The paranasal sinuses, particularly the ethmoidal air cells, are congested with thickened mucoid contents. Expansion of the sinuses has caused compression against the right and left medial recti, which directly abut their respective optic nerve (A). Extension of a mucocoele into the frontal sinus appears above the left orbit (B). This appearance is consistent with a chronic fungal pansinusitis.

of the inferotemporal quadrants was also apparent bilaterally, and more severe in the left eye.

Paranasal sinus computed tomography (CT) revealed widespread demineralisation of the bony walls, and extension of sinus contents into the orbits bilaterally. A magnetic resonance imaging (MRI) of the brain and orbits revealed gross expansion and opacification of the frontal and ethmoidal sinuses (Figure 2A and B). There was margined extension into both orbits, with the medial recti flattened and abutted against the optic nerve. The radiological appearance was that of advanced AFS with nasal polyposis.

Three weeks before surgery, the patient was commenced on a tapering schedule of prednisolone from 50 mg. He subsequently underwent septoplasty and functional endoscopic sinus surgery (FESS), with bilateral maxillary antrostomy, ethmoidectomy, and sphenoidectomy. Intraoperatively, a large intracranial extension of waxy, mucoid material was visualised and débrided. Histological examination of the sinus mucosal biopsy revealed collections of allergic mucin with eosinophil aggregates and Charcot-Leyden crystals. On methenamine silver stain of allergic mucin, dichotomous branching septate hyphae confirmed the presence of fungal elements (Figure 3). There

FIGURE 3 Methenamine silver stain of allergic mucin (40×). Dichotomous branching hyphae (black arrow) and Charcot-Leyden crystals (white arrow) are seen near the periphery.

was no evidence of fungal invasion into the sinus mucosa, thus excluding invasive fungal sinusitis. Serologic testing showed elevated total levels of immunoglobulin E (IgE) to house dust, grass, and moulds, including *Aspergillus fumigatus*. Active chronic allergic sinusitis was confirmed.

On postoperative day 1 (D1), RE VA was 6/60 in eccentric viewing. This improved to 6/36 on D20. LE VA remained unchanged. Ocular motility was full with no restrictions. Humphrey visual field tests improved bilaterally, with increased sensitivity in the inferonasal quadrant of the right eye (Figure 1A), and recovery of the left nasal field (Figure 1B).

DISCUSSION

AFS is an allergic hypersensitivity reaction to inhaled fungal elements, resulting in chronic inflammation. It typically affects young immunocompetent patients living in warm humid climates, with a past history of atopy, nasal congestion, and chronic sinusitis.^{1–4} Its natural history is that of a slowly progressive, non-infiltrative mass.

AFS often presents a diagnostic dilemma, as it can mimic other forms of fungal rhinosinusitis. One widespread set of diagnostic criteria was developed by Bent and Kuhn¹ (Table 1). Magnetic resonance imaging can assist in the diagnosis, as fungal elements are identified by their reduced signal intensity. AFS is distinguished from a paranasal sinus tumour by hypointensity in the centre or bulk of the allergic mucin.³ Our patient met all the diagnostic criteria for AFS.

Ophthalmic manifestations in AFS have been reported at rates of 18%,⁵ but such severe, bilateral disease in an immunocompetent patient is rarely encountered. This risk increases with advanced,

TABLE 1. Diagnostic criteria for allergic fungal sinusitis¹.

• Serological evidence of type 1 hypersensitivity   • Nasal polyposis   • Characteristic CT appearance of hyperattenuated sinus contents ± bone erosion   • Eosinophilic mucin without fungal tissue invasion   • Positive fungal stain

untreated disease. In previous studies of complications in AFS, the commonest ophthalmic symptoms were proptosis, diplopia, orbital infection, ophthalmoplegia, and reduced or blurred vision.^{6–8} One patient had bilateral blindness, but this was induced by mucormycosis-related invasive fungal sinusitis.⁶ Advanced AFS has also been associated with unusual presentations, such as asthenopia, secondary to bilateral medial rectus displacement limiting convergence.⁹ The insidious and destructive nature of advanced AFS was demonstrated in a case series of AFS-induced ophthalmic pathology within 10 months after a hurricane, in which two patients had intracranial expansion of contents into the cavernous sinus.¹⁰ Perhaps due to the relatively early disease course, there was only unilateral involvement in all three cases.

The diagnosis of AFS had previously been missed in our patient, which contributed to his delayed presentation. Thus, in contrast to previous case reports, our patient had a severe constellation of neuro-ophthalmic manifestations that are rarely encountered in AFS. At the time of presentation, he had restricted ocular motility, and dense bilateral visual field deficits corresponding with retinal nerve fibre layer thinning.

Although AFS patients are normally managed within the realm of ENT, ophthalmologists become involved in advanced disease to prevent or reverse impending vision loss. Early clinical recognition and use of magnetic resonance imaging to detect visual compromise are important for determining appropriate management and preventing visual morbidity. In advanced disease, mechanical or ischaemic optic neuropathy can occur from bone erosion. This is a late complication that permits intraorbital expansion of sinus contents. Consequences include direct nerve fibre compression, congestion of vascular supply to the optic nerve, or secondary optic neuritis from perineural inflammation.^{5,11}

As the first step in management, FESS aims to reduce fungal load, and decompress intraorbital and/or intracranial pressure on the optic nerve. Restoration of sinus drainage will allow for topical delivery of indicated medical therapy.^{1–3,5}

Post-operative adjuvant medical treatment is required to overcome the high recurrence of AFS. Careful discrimination of AFS from acute invasive

fungal sinusitis is important, as corticosteroids are absolutely contraindicated for the latter, where patients are severely immunocompromised.^{1,2} Post-operatively, our patient was commenced on budesonide nasal irrigation twice daily and a weaning dose of prednisolone upon discharge. Topical nasal steroids are the mainstay for minimising inflammation and recurrence.^{2,3,12} Recently, oral corticosteroids have also been demonstrated to be a necessary post-operative adjunct for reducing symptoms and surgical recurrence.¹³ Kuhn and Javer¹² proposed a tapering protocol of oral prednisone commencing within 48 hours after surgery, starting on 0.4 mg/kg/day for 4 days, followed by 0.3 mg/kg/day for 4 days, then reducing to 0.2 mg/kg/day before further adjustment. Systemic antifungals should be avoided in AFS, as there is inherently no fungal tissue invasion.² Fungal allergen immunotherapy has been reported to reduce corticosteroid need. Patients can also be monitored with serial total serum IgE measurements to determine the likelihood of recurrence.

Our patient was a young, immunocompetent man with chronic sinusitis, proptosis, and severe visual field deficits. AFS-induced compressive optic neuropathy must be considered in the differential diagnosis. Visual prognosis depends on early recognition, timely intervention, and ongoing post-operative medical therapy to avoid recurrent exacerbations.

ACKNOWLEDGEMENTS

We would like to thank the following contributors for their valuable assistance: Ms. Christina Peterson for supplying the Humphrey visual field, OCT, and ocular motility test results; and Dr. Georgina Clark for her contributions in the peri-operative review of the patient.

Declaration of interest: The authors report no conflicts of interest. The authors alone are responsible for the content and writing of the paper.

REFERENCES

- [1] Bent JP, Kuhn FA. Allergic fungal sinusitis/polyposis. *Allergy Asthma Proc* 1996;17:259–268.
- [2] Schubert, MS. Allergic fungal sinusitis. *Otolaryngol Clin North Am* 2004;37:301–326.
- [3] Aribandi M, McCoy VA, Bazan C. Imaging features of invasive and noninvasive fungal sinusitis: a review. *Radiographics* 2007;27:1283–1296.
- [4] Dagenais TRT, Keller NP. Pathogenesis of *Aspergillus fumigatus* in invasive aspergillosis. *Clin Microbiol Rev* 2009;22:447–465.
- [5] Marple BF, Gibbs SR, Newcomer MT, Mabry RL. Allergic fungal sinusitis-induced visual loss. *Am J Rhinol* 1999;13:191–195.
- [6] Anazy FHA, Al Dousary SH. Ophthalmic manifestations of paranasal sinus disease: a clinical grading system. *Int Forum Allergy Rhinol* 2012;2:331–335.
- [7] Bozeman S, deShazo R, Stringer S, Wright L. Complications of allergic fungal sinusitis. *Am J Med* 2011;124:359–368.
- [8] Carter KD, Graham SM, Carpenter KM. Ophthalmic manifestations of allergic fungal sinusitis. *Am J Ophthalmol* 1999;127:189–195.
- [9] Alsagoob AA, Taguri AH. Asthenopia as the presenting symptom in advance allergic fungal sinusitis. *Saudi J Ophthalmol* 2012;26:339–341.
- [10] Sridhar J, Lam BL, Pasol JP, Sternau L. Three cases of fungal disease with neuro-ophthalmic manifestations associated with post-hurricane environment. *J Neuroophthalmol* 2012;32:197–201.
- [11] Illing EA, Dunlap Q, Woodworth BA. Outcomes of pressure-induced cranial neuropathies from allergic fungal rhinosinusitis. *Otolaryngol Head Neck Surg* 2015;152:541–545.
- [12] Kuhn FA, Javer AR. Allergic fungal sinusitis: a four-year follow-up. *Am J Rhinol* 2000;14:149–156.
- [13] Schubert MS. Allergic fungal sinusitis: pathophysiology, diagnosis and management. *Med Mycol* 2009;47(Suppl 1):S324–S330.