Meningococcal B vaccine-associated papillophlebitis and cilioretinal artery occlusion

Vaccine-induced optic neuritis is a known subtype of optic neuritis that has been reported following the administration of various types of vaccines, both viral and bacterial. Ocular symptoms vary significantly and can result in permanent vision loss. There has been only one case of optic neuritis following meningococcal B vaccine (Bexsero; GlaxoSmithKline, London, UK) administration that was reported on the Vaccine Adverse Event Reporting System (2016, VAERS ID 686394), but the details of the event are not thoroughly explained. To our knowledge, this is the first case of retinal venous dilation, retinal hemorrhages, optic disc edema, and cilioretinal artery occlusion to occur after presumed meningococcal B vaccination to be described in the English-language ophthalmic literature.

A 15-year-old previously healthy male presented with acute vision loss OS 2 weeks following administration of the meningococcal B vaccine. He stated that he saw a horizontal "dark red line" across his vision in the left eye on awakening that had changed to "gray" by the time of presentation. He denied any flashes of light, eye pain, headache, nausea, vomiting, or fever. Medical, surgical, social, and family histories were unremarkable. He was taking no medications.

His best-corrected vision was 20/25 OD and counting fingers at 5 feet OS. No relative afferent pupillary defect was noted OU. No abnormalities were found on slit-lamp examination. Intraocular pressure measured 14 mm Hg OU. Funduscopic examination OD was within normal limits. There was 1+ optic disk swelling, rare blot hemorrhages, and superior macular retinal edema with arterial narrowing consistent with a cilioretinal artery occlusion OS (Fig. 1). Automated perimetry (24-2 Humphrey visual field) showed no abnormalities OD and cecocentral scotoma OS with a mean deviation of −12 dB (Fig. 2). Optical coherence tomography of the macula revealed intraretinal thickening consistent with macular edema OS.

The patient was diagnosed with neuroretinitis and was treated with a 5-day course of intravenous methylprednisolone 1000 mg daily followed by an oral prednisone taper that consisted of 40 mg daily for 5 days and 20 mg daily for 5 days. Follow-up examination 11 days later revealed mild improvement in visual acuity (20/400 OS), but a mild relative afferent pupillary defect was noted OS. Four weeks after the onset of symptoms, the patient experienced improvement of vision to 20/30 OS. Funduscopic examination OS revealed resolving optic disc edema and mild tortuosity and dilatation of veins, but the retinal hemorrhage and cilioretinal artery distribution macular edema resolved. The 24-2 Humphrey visual field mean deviation was −8 dB. Extensive laboratory tests including C-reactive protein, rapid plasma reagin, rheumatoid factor, anti-neutrophil cytoplasmic antibody, anti-nuclear antibody, *Bartonella henslae* titer (IgM and IgG), and West Nile virus were negative. Chest x-ray was normal. Magnetic resonance imaging of the brain and orbit with and without contrast material was unremarkable. Follow-up at 1 year demonstrated 20/30 vision OS.

The pathogenesis of vaccine-induced optic neuritis is unknown, primarily because an association between optic neuritis and vaccines has not been officially established.[1] It is theorized that there is an autoimmune reaction to either

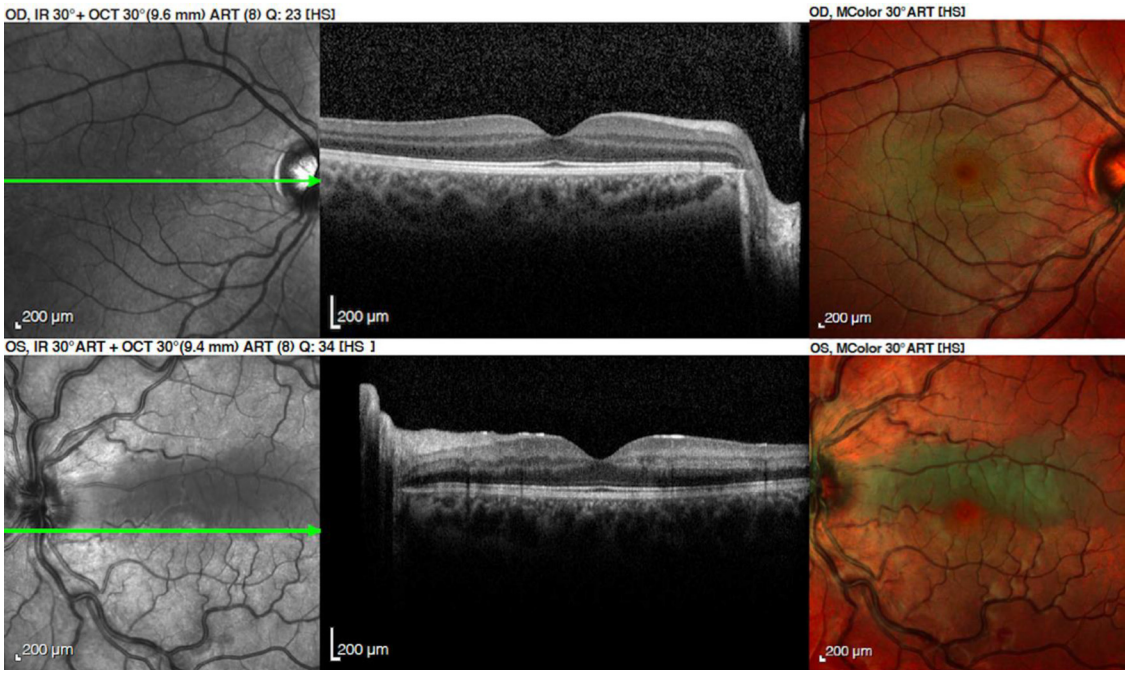

Fig. 1—Optical coherence tomography images as well as colour images of the fundus.

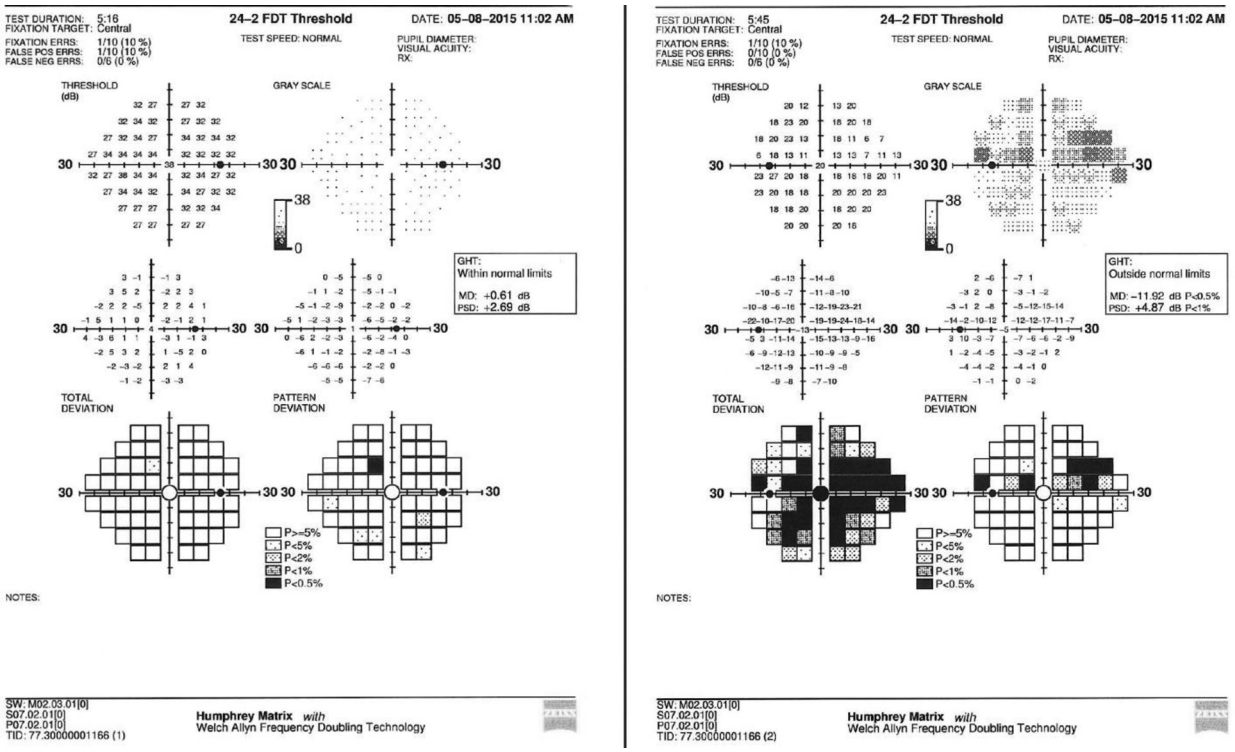

Fig. 2—Results of Humphrey visual field at the patient's first visit.

the pathogen itself or to a vaccine adjuvant used to induce immune response.[1,2] Specifically, it has been proposed that this reaction results in immune complex formation that attacks the retinal vasculature, leading to hyperpermeability and inflammation.[2]

In this case, macular edema and retinal hemorrhages without exudate supported a diagnosis of inflammatory disease of the retina and optic nerve (neuroretinitis).[3] In the literature, neuroretinitis is often characterized by a triad of decreased visual acuity, optic disc edema, and macular star formation (which typically appears within 2–6 weeks).[4] Several causation criteria have been proposed to try to establish a cause-and-effect relationship between triggering events and visual loss. These include a biologically plausible mechanism; a close temporal relationship between cause and effect coherent with the pharmacokinetics or pathogenesis of the purported cause; analogy from prior animal model or human cases; specificity of effect; exclusion of alternative etiologies including chance alone; dose–response gradient; and dechallenge/rechallenge. In our case, the presumed biologically plausible mechanism is believed to be autoimmune inflammatory disease triggered by the vaccine. The onset of symptoms and signs within 2 weeks is consistent with an immunologic mechanism that requires mobilization and activation of inflammatory lymphocytes. There is analogy for optic neuritis after vaccination with other vaccines. No other etiology for the optic neuritis and retinal findings was found despite a complete laboratory evaluation and neuroimaging. The most common alternative etiologies were not present, including multiple sclerosis or other antibody-mediated causes of optic neuritis. Although there was no rechallenge, a dechallenge led to improvement of symptoms and signs without recurrence. The presence of the optic disc edema in conjunction with the retinal findings is an atypical finding for idiopathic or demyelinating optic neuritis, retinal vein occlusion, or retinal artery occlusion. The presence of optic disc edema, retinal venous dilatation, retinal hemorrhages, and a concomitant cilioretinal artery occlusion suggests a partial retinal vein occlusion as the unifying mechanism in our case. The lower perfusion pressure of the cilioretinal artery in the setting of central retinal venous backpressure is the presumed mechanism for the ophthalmoscopic appearance in our case.[5] Further study is necessary to determine whether our observation is confirmed by other cases in the future.

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The authors have no proprietary or commercial interest in any materials discussed in this article.

Intraocular pressure fluctuations in a professional woodwind musician with advanced glaucoma

Ocular hypertension and fluctuations in intraocular pressure (IOP) are critical modifiable risk factors for the development and progression of glaucoma. Transient IOP elevations while playing wind instruments have been observed in musicians with[1] and without[2,3] glaucoma. However, the comparative effect of trabeculectomy surgery on IOP fluctuations during wind instrument performance has not been previously described.

We report a 62-year-old oboist with advanced pseudoexfoliation glaucoma in the right eye and moderate primary open-angle glaucoma in the left eye. Her glaucoma was initially controlled with topical medications and selective laser trabeculoplasty in both eyes.

Three years following presentation, glaucoma in the right eye progressed. No evidence of progression was noted in the left eye. Trabeculectomy with mitomycin-C was performed in the right eye. At 6-month follow-up, visual acuity was 20/25 OD and 20/20-2 OS. IOP via Goldmann applanation tonometry (GAT) was 8 mm Hg OD and 15 mm Hg OS. Topical therapy in the left eye consisted of latanoprostene bunod 0.024% daily and brinzolamide 1%−timolol 0.5% twice daily.

The patient was concerned about the effect of playing the oboe on the IOP in both eyes. To determine her risk of IOP elevation, we measured her IOP while she performed classical pieces and musical exercises on the oboe. Measurements were obtained with GAT at baseline and repeated at periodic rest intervals. A handheld tonometer (Tono-Pen XL; Reichart Inc, Depew, NY) was used at corresponding time points to measure IOP while the patient played the oboe.

To assess the IOP during a typical classical music performance, we measured IOP every 20 seconds in each eye while our patient played the oboe for ≥3 minutes. Pieces by composers Telemann and Mozart were played using low- and high-resistance reeds, respectively. A rest period of 5 minutes was given between each piece. Next, we recorded the IOP every 20 seconds during playing of sustained notes of low (B flat, below treble clef), middle (B flat, middle of treble clef), and high frequency (D, above treble clef), each held for up to 1 minute and separated by 30-second rests.

The baseline IOP was 8 and 15 mm Hg measured with GAT and 9 and 15 mm Hg measured with the handheld tonometer in the right and left eyes, respectively. During performance with a low-resistance reed, the IOP in the right eye did not elevate higher than 9 mm Hg (Fig. 1). In the left eye, the IOP increased up to 18 mm Hg and remained steady over 3 minutes. The IOP in both eyes returned to baseline within 5 minutes. During performance with a high-resistance reed, the IOP elevated to 10 mm Hg OD and 26 mm Hg OS. During playing of sustained notes, the IOP increased bilaterally with all 3 notes. The peak IOP OD was 13 mm Hg during playing of a high-frequency note. In the left eye, IOP rose sharply with all sustained notes, peaking at 29 mm Hg during playing of a low-frequency note. Following a final rest of 5 minutes, the IOP measured 7 mm Hg OD and 16 mm Hg OS with GAT.

The oboe is a high-resistance double-reed woodwind instrument originating in 17th century France. Previous studies have described IOP elevations in oboists and other musicians playing both high-resistance (e.g., trumpet, French horn) and low-resistance (e.g., saxophone, tuba) wind instruments.[2,3] IOP elevations have been associated with playing higher-frequency notes and louder volumes,[2] but the magnitude of IOP rise during and following performance can vary widely between subjects. Differences in IOP response between subjects with or without glaucoma have not been observed.[1]

The proposed mechanism for IOP elevation during wind instrument performance is akin to that of a Valsalva maneuver, which leads to elevated IOP via a rise in intrathoracic venous pressure.[4] This venous pressure increase is transmitted upward, ultimately to vortex veins and the choroid, bringing about vascular engorgement and a rise in IOP.[4] In light of the suggested pathophysiology, the presence of a trabeculectomy in our patient's right eye could explain why the IOP did not rise to the same degree as in the medically treated left eye during playing of sustained notes. In the literature, 1 other patient with bilateral trabeculectomies was described to have minimal rises in IOP in both eyes while playing the trombone,[1] but no prior reports have compared the IOP in an eye following trabeculectomy with the medically treated fellow eye of the same patient.

The risk of glaucomatous optic neuropathy in wind instrument musicians is not well known. Life hours of high-