CLINICAL VIGNETTE

Unilateral Eye Redness and Pulsatile Tinnitus One Year after Head Trauma

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Eye redness due to injury can be anticipated in the immediate aftermath of an accident and is usually diagnosed after gross visual examination or after slit-lamp examination. Rarely, symptoms can present months or even a year after the inciting event. The report reviews a female patient who presented with unilateral eye redness one year after an accident.

A 56-year-old previously healthy woman presented one year ago after a motor vehicle accident. She was making a left turn when she was rear ended by another car. Her head was rotated to the left at the moment of impact and, when the airbags deployed, her eyeglasses shattered and injured the left side of her face, without loss of consciousness. She was initially evaluated in the emergency room, with a normal CT scan of her brain and facial bones, and was released home. The patient followed up with her primary care physician a few days later, complaining of persistent headaches, neck, and leg pain and isolated photophobia in her left eye. She has a remote history of migraine that resolved after menopause but was otherwise well without chronic problems.

Her exam was unremarkable except for left eyelid ecchymosis and trigger point tenderness consistent with whiplash injury. Her extra-ocular movements and pupillary reflexes were normal. After counseling on routine precautions for head injury and post-concussion headaches, she was referred to ophthalmology for the isolated photophobia in her left eye. In the setting of airbag deployment and subsequent chemical exposure, it was felt that her symptoms were due to trauma to the cornea or iris. Her ophthalmologist diagnosed traumatic iritis of the left eye and instructed to monitor her symptoms for signs of worsening.

The patient improved and was well until a month after the MVA, when she returned to the primary care office complaining of persistent left eye, face and jaw pain, as well as insomnia. Her eye exam was normal and photophobia had resolved. There was no jaw clicking and range of motion involving neck, jaw, and eyes were all normal. Cranial nerve exam was normal. Tender points along the temples, sternocleidomastoid and trapezius were noted bilaterally. A brain MRI was normal.

Because her headaches and jaw pain on the left side persisted, she was referred to an oral-maxillofacial surgeon who diagnosed temporal mandibular joint (TMJ) dysfunction and post-concussive migraines triggered by the MVA. She was prescribed meloxicam for myofascial pain and doxepin for insomnia, TMJ, and headache. A follow-up visit to her neurologist supported the diagnosis of TMJ and post-concussive migraines.

Her headaches and jaw pain persisted five months after the accident prompting referral to Head and Neck surgery for additional evaluation, as well as a second opinion regarding TMJ management. A diagnosis of chronic sinusitis was considered and the patient was prescribed nasal steroids, nasal rinses, and allergy medication. An MRI brain with MR angiogram was ordered but not performed due to denial of authorization by her insurance company. Her symptoms did not improve.

Two months later the patient noted new right ear pain and pulsatile tinnitus along with her left-sided headaches. She denied hearing loss and vertigo. The tinnitus was confined to the right side only and described as “whooshing” but at times would worsen to the point that she could hear “screeching” noises that would wake her up at night. There were no positional changes. She saw her Head and Neck physician in January and imaging was reordered. MRI and MRA of her brain were normal. Subsequently, she was instructed on masking measures and cognitive behavioral techniques for her tinnitus.

By one year after her accident, her symptoms evolved further to include redness, pain and swelling of her right eye. The pulsatile tinnitus was rare and intermittent. She saw her ophthalmologist who reported a normal eye exam, including normal intraocular pressure. Her primary medical doctor referred her to a neuro-ophthalmologist who ordered a CT Brain with angiogram. The CT angiogram revealed right greater than left proptosis with the presence of a carotid cavernous fistula on the right and possibly on the left. Though the initial plan was monitoring symptoms and consultation with neurosurgeon and interventional radiology, the patient was admitted emergently to the hospital four days later after she developed visual blurring, worsening proptosis, and inability to open her right eye.

The patient underwent successful transvenous embolization of a right indirect carotid cavernous fistula, involving the internal and external carotid artery (called a Type D cavernous fistula). The patient was discharged but returned 2 days later with a relapse of symptoms that required re-embolization. At last report, the patient had complete resolution of her pulsatile tinnitus and headache, partial relief of her proptosis, and residual blurriness of her right eye. The left carotid cavernous

fistula is being monitored and may undergo embolization in the future. The patient is currently undergoing visual rehabilitation. According to the WHO Programme for the Prevention of Blindness, 55 million eye injuries occur annually that are severe enough to impair activity for one or more days.[1] Of these, there are 1.6 million who will be blinded by injuries; 2.3 million will suffer bilateral low vision; and 19 million unilateral permanent deficits. In the USA, 2.5 million eye injuries occur annually, with the majority occurring at the home (43%), followed by industrial accidents (20%), and recreational sports (13%).[2] As in this patient's case, about 15 % of eye injuries occur on the streets and highways and 10% are the result of a motor vehicle crash.[2] While auto related injuries were the most severe, the incidence has decreased since protective legislation was enacted, including mandatory seat belt use, standardized use of tempered (laminated) windshield glass, and the widespread use of airbags.[3] Compared to the past, when impact was direct to the windshield and the steering column, airbags have reduced the incidence of more severe eye injuries. Currently, the eye trauma rate is 2.5 times higher in cars without airbags.[4]

Airbags however introduce several new methods of injury to the eye—whether due to deployment and inflation at speeds of up to 200mph or the venting of chemical and particulate matter (e.g. talc, aerosolized mist of sodium hydroxide, sodium bicarbonate, metallic oxides).[5] Especially after a mild accident, patients may seek care in the office of their primary care physician rather than emergency care. Obtaining specific history from the patient regarding airbag deployment is important, as airbags can deploy even after low impact accidents at speeds of 10-30 mph.[5] Anticipating, identifying and treating eye injuries after a motor vehicle accident is aided by having familiarity with airbag-related complications to the eye. A literature review demonstrated that the airbag-eye injury included corneal abrasion (18%), hyphema (17%), vitreous and retinal hemorrhage (9%) eyelid laceration (8%), retinal detachment (5.7%), traumatic iritis, cataract and iris tear (4.9%), and traumatic angle-recession glaucoma.[4]

In this particular patient, a detailed history revealed the cause of injury was blunt force trauma. The fact that her eyeglasses were damaged in the accident added additional, critical information regarding the severity of the impact. Eyewear, like contacts, can also play a role in the injury itself.[6,7] Management of eye trauma is focused primarily on knowing when to refer to an ophthalmologist. The patient did not have red eye at her first presentation but did complain of eye pain, in particular photophobia. Initial assessment of the painful eye by the primary care physician involves check of visual acuity, pupils (size, reactivity, relative afferent pupillary response), external skin exam (including visual and palpated), visual field testing, and presence or absence of photophobia.[8] The presence of a normal eye exam and acute eye pain might suggest a neurologic headache syndrome or trigeminal neuralgia, especially in the setting of a traumatic brain injury.[9,10] In this case, the patient had unilateral photophobia of the affected left eye. The differential included traumatic uveitis, traumatic iritis, and corneal abrasion. Traumatic iritis confirmed by the ophthalmologist can be treated with topical anti-inflammatories and prophylactic antibiotics. Resolution for this patient was within the typical 1-2 weeks expected for this type of injury.[8,10]

When this patient presented with red eye, only her history of continuous headaches with unilateral otalgia and pulsatile tinnitus linked the current presentation with the motor vehicle accident one year prior. Without that information, the standard work-up for red eye would have been pursued including, dry eye, acute glaucoma, conjunctivitis, foreign body, corneal abrasion or ulcer, chemical burn, uveitis, and blepharitis. Because the patient had only a distant history of trauma, did not wear contacts, and had no discharge or foreign body sensation, she was referred to another ophthalmologist for second opinion. The additional history obtained, in particular that of pulsatile tinnitus, led the consultant to search for a vascular cause. Her distant history of an MVA was now relevant to the medical work-up. As a result, she underwent a CT angiogram of the brain and orbits, which revealed a vascular defect suggestive of a fistula between the ICA and ECA and the carotid.

Carotid cavernous fistulas have two main types, direct and indirect. Direct fistulas are most common and are often the result of head trauma and are usually unilateral. Less often these fistulas occur spontaneously as the result of an aneurysm, iatrogenic complication, or due to an underlying collagen disorder such as Ehlers-Danlos. Because these are high flow lesions, they rarely heal spontaneously. Indirect fistulas are less common, but are low flow and therefore more likely to heal spontaneously. As in this patient's case, indirect fistulas present slowly and often present with fluctuating severity of symptoms that are easy to overlook. Presenting complications of both fistulas include conjunctival injection, proptosis, and chemosis. In the case of direct fistulas, the onset is abrupt, while indirect fistulas will present with chronic eye redness, glaucoma, and gradual proptosis. In either type, however, complications eventually can be severe and disabling, resulting in ophthalmoplegia, vision loss, and intracranial hemorrhage.[11,12]

In conclusion what sets apart this patient's presentation from the typical red eye was the persistent and worsening nature of her associated symptoms and the development of new symptoms over a year's time. It is not unusual for a patient in an MVA to present with headaches or even red eye. However, the progression of her symptoms over 7-12 months (left-sided ear pain, pulsatile tinnitus, acute eye redness and pain with proptosis) eventually required an emergent neurosurgical procedure is unique.

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Submitted September 20, 2017