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Letter to the Editor: New Observation

Severe Anterior Ischemic Optic Neuropathy Due to COVID-19-Related Epistaxis

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Non-arteritic ischemic anterior optic neuropathy (NAION) is the most common cause of optic neuropathy in older patients. It is frequently associated with a "disc at risk" appearance and vascular risk factors. Rarely, NAION occurs following non-surgical blood loss, most typically in context of gastrointestinal and uterine bleeding.[1] A far less common cause of NAION is epistaxis. We present a 60-year-old woman who developed bilateral visual deficits following an episode of severe epistaxis related to COVID-19 lasting for over 5 days. This case highlights a potential risk of COVID-19 infection – severe vision loss through a unique mechanism of epistaxis.

A 60-year-old woman with a past medical history of type 2 diabetes, hypertension, and takotsubo cardiomyopathy presented with sudden upper visual field loss in the right eye (RE) and complete vision loss in the left eye (LE). A month prior to her presentation, she tested positive for COVID-19 (polymerase chain reaction test from nasopharyngeal swab). She was asymptomatic from this except for nasal congestion. Two weeks after testing positive for SARS-CoV2, she developed severe epistaxis lasting over 5 days which required balloon angioplasty on the second day to control. On fifth day, she woke up with partial visual loss in the RE and complete visual loss in the LE. She subsequently presented to the emergency department where she was found to have a hemoglobin of 55 g/L and mean corpuscular volume of 86 fL and subsequently transfused with two units of packed red blood cells. Her complete blood count 4 months prior was normal with a hemoglobin of 138 g/L. She denied any constitutional symptoms or symptoms of giant cell arteritis.

Initial ophthalmological exam revealed a visual acuity of 20/20 RE and counting fingers LE, with a left afferent pupillary defect. Fundus examination demonstrated bilateral optic disc edema. The macula and retina were unremarkable. Humphrey 24-2 SITA-Fast visual fields demonstrated superior hemifield defect in RE and dense complete visual field defect LE (Figure 1). Magnetic resonance imaging showed no enhancement or signal change in the optic nerves and CRP was 3.2 mg/L (normal <5 mg/L). She was diagnosed with NAION, and optimization of her hematological parameters to prevent further episodes of anemia and appropriate control of blood pressure and blood sugars were recommended. The optic disc edema resolved after 2 months and 1 year after onset her visual function remained stable.

We here present a unique case of NAION following epistaxis related to COVID-19. NAION in temporal relation to COVID-19 may occur after several mechanisms, and this case adds epistaxis to this list. The proposed mechanisms for NAION from COVID-19 include microangiopathic/thrombotic phenomenon,[2,3] hypoxia,[2,4] and endothelial dysfunction resulting in decreased optic nerve head vascular compliance.[5,6] NAION can develop in early stages to 4 weeks after COVID-19 infection, primarily in patients with underlying vascular risk factors.[6] Our patient did not have any signs/symptoms suggestive of other mechanisms resulting in post-COVID-19 NAION. The temporal association with severe epistaxis and anemia implies hemorrhagic-induced NAION as the most likely mechanism.

A literature search revealed six case reports of NAION after epistaxis.[7–12] The cause of epistaxis was spontaneous, and all but one patient were older with underlying vascular risk factors.[10] In a study of 198 patients by Singer et al., the most common source of hemorrhage was gastrointestinal bleeding (40.2%), followed by uterine bleeding (32.8%), phlebotomy (14.3%), epistaxis (7.4%), wounds (3.2%), hemoptysis (1.05%), and urethral bleeding (1.05%).[1]

Our case highlights multiple features characteristically associated with hemorrhage-induced ischemic optic neuropathy. It is frequently bilateral – in the review by Hollenhorst et al., 87.4% of cases were bilateral. It rarely occurs immediately at the time of hemorrhage. In the review by Hollenhorst et al., 8.3% cases occurred at the time of hemorrhage, 11.6% immediately following hemorrhage, 14.2% within 12 hours, 19.2% within 12–48 hours, 39.2% within 3–10 days, and 7.5% occurred after 14 days.[1] Interestingly, a single episode of hemorrhage rarely results in ischemic optic neuropathy; rather, the main culprit is multiple episodes of recurrent bleeding.[1] Post-hemorrhagic NAION often occurs in

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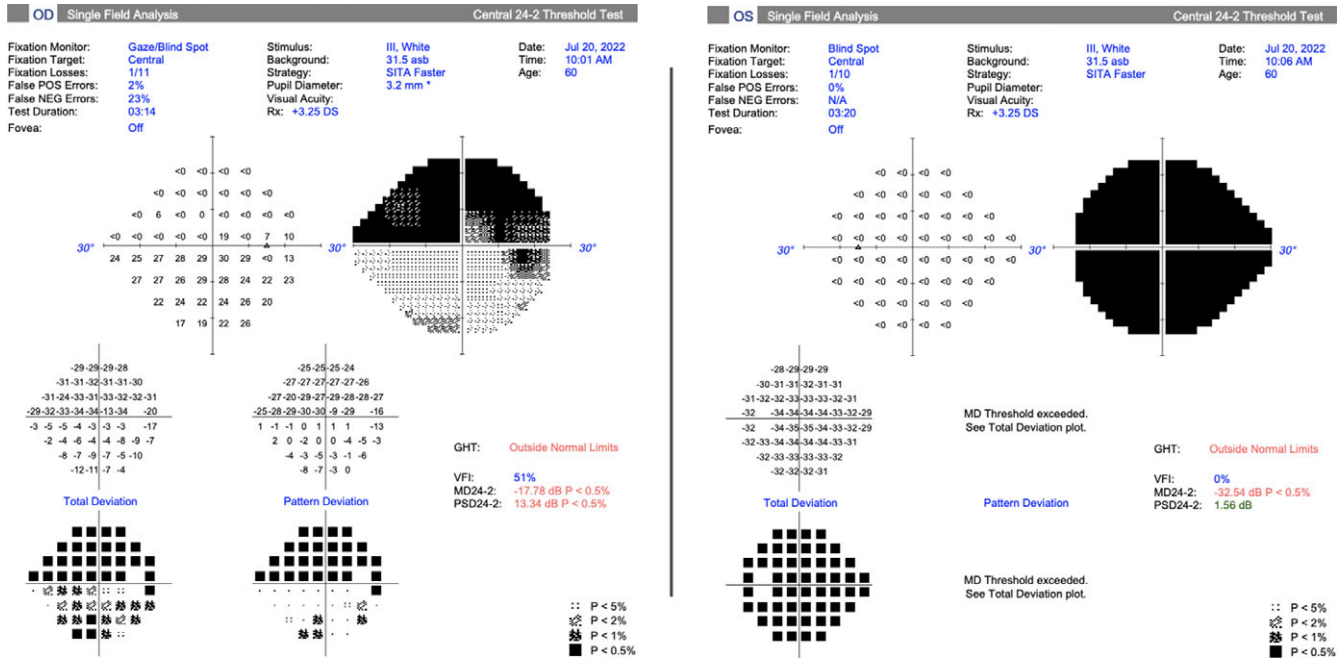

Figure 1: Humphrey visual fields demonstrating superior hemifield defect in the right eye and complete defect in the left eye.

patients with underlying vascular risk factors.[1] The majority of patients will not recover vision; however, numerous cases have demonstrated visual improvement following immediate correction of anemia.[1] Therefore, immediate transfusions must be provided to prevent further visual deficits as well as provide a chance for visual recovery.

The etiology of NAION is not known. The main theory focuses on an acute event leading to hypoperfusion to posterior ciliary arteries – which are susceptible due do their small size – resulting in ischemia and subsequent inflammation. This is followed by the development of compartment syndrome in patients with a small cup to disc ratio or "disc at risk appearance." Hemorrhagic NAION may result in hypoperfusion through either anemia or hypotension. Many authors consider anemia to be the main risk factor, as the visual symptoms often develop hours to days following a hemorrhagic event. The timing would be in keeping with anemia as the main culprit, as the recovery of hemoglobin levels is gradual, while blood volume rapidly returns to normal following hemorrhage.[1]

In summary, post-hemorrhagic NAION may rarely develop after epistaxis. It often results in bilateral visual deficits, compared to NAION not preceded by hemorrhage, which is frequently unilateral. Patients with underlying vascular risk factors and multiple episodes of recurrent bleeding are at risk. The rapid correction of anemia and hypotension is important to prevent further visual deficits and may also result in visual recovery.

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