In conclusion, a national student interest group for Canadian medical students interested in ophthalmology was able to successfully organize a nationwide networking session with excellent reported participation of recently matched Canadian ophthalmology resident physicians. Overall, attendees had a positive experience and reported an increase in their knowledge of many aspects of the residency application process. Disseminating information through virtual venues also may increase equity among applicants. It provides universal access to mentors, networking, and valuable knowledge from students who recently completed the match. The event is especially critical for students at universities without an ophthalmology residency program and without existing connections to ophthalmology and medicine. As students increasingly use online platforms to interact with and learn about residency programs, we believe that there is value in hosting these events to meet the need for information and networking.

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Footnotes and Disclosure

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Cotton-wool spots in patients with migraine

Cotton-wool spots (CWSs) refer to localized accumulations of axoplasmic debris in the retinal nerve fibre layer that result from interruption of ganglion cell axon organelle transport.[1] The histologic hallmark is the cytoid body, which represents the terminal swelling of a disrupted ganglion cell axon that has expanded and accumulated mitochondria and other organelles and subcellular material.[1] In an otherwise healthy person, even a single CWS is considered abnormal, and it is recommended that investigations for underlying systemic disease be initiated.[1,2] Migraine is

Table 1—Details regarding the 4 patients with cotton wool spots attributed to migraine

Factor	Patient 1	Patient 2	Patient 3	Patient 4
Age (years)/sex	30/F	40/M	38/M	27/F
Previous migraine diagnosis?	Yes	Yes	No	Yes
Duration of migraine	10 years	22 years	N/A	14 years
Duration of scotoma	1 day	9 days	N/A	7 days
Affected eye	Right	Right	Left	Left
Visual acuity (affected eye)	20/20	20/20	20/20	20/20
IOP (mm Hg, affected eye)	15	15	18	13
Humphrey 24-2 SITA Fast VF	Normal	Normal	Normal	Normal
Location of CWS	Superior to disc	Superior to macula	Superior to macula	Superior to disc
Medications	OCP	None	None	OCP
Presenting blood pressure	114/76	119/82	124/82	95/63
Extensive workup	Negative	Negative	Negative	Negative

IOP = intraocular pressure; VF = visual field; OCP = oral contraceptive pill; CWS = cotton wool spot.

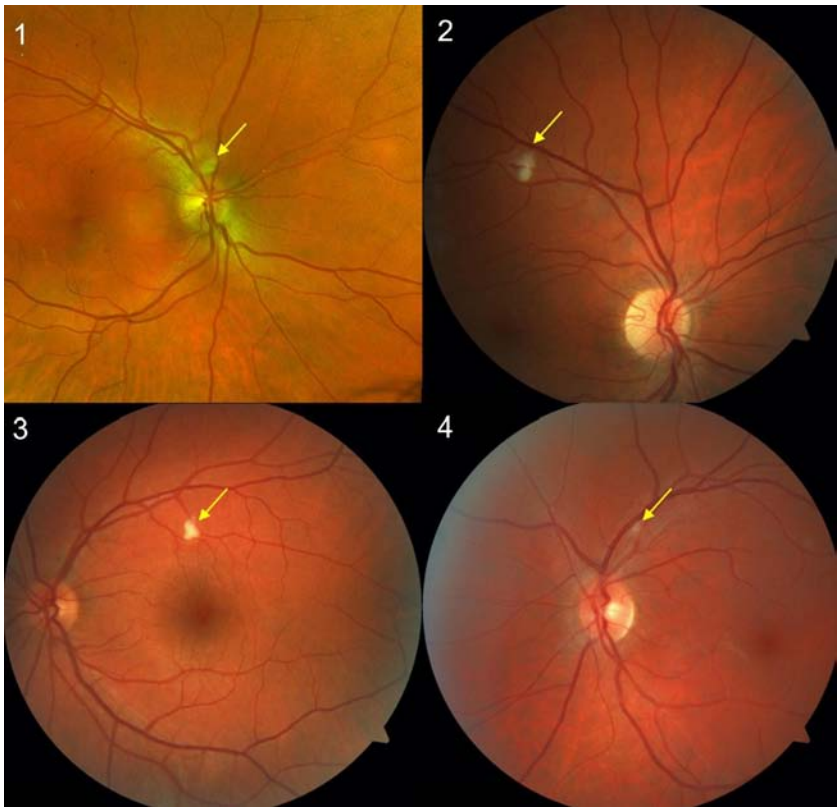

Fig. 1—Fundus photographs showing cotton wool spots (yellow arrows) in each patient. Labels correspond to patient number.

well known to be associated with vasospasm and may result in retinal arteriolar occlusion that can be reversible or leave permanent retinal ischemia and visual field defects.[2] CWSs have been reported previously in patients with new visual disturbances accompanied by a history of recent migraine, but additional reports on this topic are very limited.[3,4] Here we present 4 patients with a single CWS associated with migraine and a negative exhaustive work-up.

A total of 4 patients (2 male and 2 female) had CWS findings with a history of migraine, and 1 patient (patient 3) developed new typical visual auras without headache 1 month after the discovery of the CWSs. Informed consent was obtained from all 4 patients, and the case details are summarized in Table 1.

Patients 1, 2, and 4 presented to a neuro-ophthalmology clinic because of a new scotoma in a single eye, and patient 3 had an incidentally discovered CWS during a routine eye examination for narrow angles. The 3 patients presenting with new monocular scotomas had CWS findings in the affected eye. The scotomas were described as sudden in all patients and took the form of a smudge, grain of rice, or a line and were located inferiorly, corresponding to the superior location of each CWS. Patients 1 and 2 had an associated migraine headache at the time of the visual disturbance. In the 3 patients with preexisting migraine, the mean duration of migraine diagnosis was 15.3 years, and 2 patients had migraine with visual aura, whereas 1 patient (patient 4) had migraine without visual aura. All patients met the *International Classification of Headache Disorders*, third edition (ICHD-3), definition for migraine with or without aura. No patients had a history of trauma, radiation, or use of vasospastic agents including cocaine.

All symptomatic patients were examined during the symptomatic period and had normal intraocular pressures, visual fields, and visual acuities in both eyes. The scotomas were too small to be detected on Humphrey 24-2 SITA-Fast visual fields or to affect visual acuities. Fundus examination revealed an isolated CWS (n = 3) and a CWS with an associated hemorrhage (n = 1, patient 2). The CWSs in all patients were located superiorly, within 1 disc diameter of the optic nerve in 2 patients and beyond 1 disc diameter and along the superior arcade in 2 patients (Fig. 1). The subjective scotoma fully reversed in 2 patients, and time to resolution ranged from 1 to 9 days. One patient had an improved but persisting small scotoma that was not detectable on formal testing with Humphrey 24-2 SITA-Fast visual fields. The CWS findings resolved at 3-month follow-up, and at 6 months, no patient had new or recurrent symptoms.

In all cases, blood pressure was less than 140/90 mm Hg and the following investigations were normal or negative: hemoglobin A1C, random glucose, erythrocyte sedimentation rate, C-reactive protein, anti-phospholipid antibodies,

antithrombin assay, factor V mutation, fibrinogen, homocysteine, lupus anticoagulant, protein C/S assay, prothrombin gene mutation, serum protein electrophoresis, antinuclear antibody, anti-neurotrophil cytoplasmic antibody, rheumatoid factor, C3/4, HIV and VDRL/RPR, computed tomography or magnetic resonance angiography of the head and neck, and magnetic resonance imaging of the brain. These extensive investigations were carried out as recommended by the *Wills Eye Manual* to ensure that no known secondary cause was missed because migraine was considered a diagnosis of exclusion.[5] No published guidelines exist on the workup for CWSs, and this reference was chosen as a guide for this study.

CWSs have classically been described as focal infarcts of the retinal nerve fibre layer but are better regarded as lesions outlining axoplasmic transport disruption.[1] It has been emphasized that CWSs should not be considered a normal finding, and patients require investigation for underlying causes.[1] Here we report 4 otherwise healthy patients who had exhaustive and negative work-ups for systemic associations with CWSs but had a history of migraine or developed typical migraine aura without headache after the incidental finding of a CWS. Three patients presented with new visual disturbances, and 2 patients had a concomitant migraine headache at the time of presentation. Although the prevalence of migraine in the general population (6% in males, 15%–17% in females) must be considered, these cases suggest that CWSs may be associated with migraine and should be considered in the differential diagnosis of this examination finding.[6] There is no established work-up for CWSs, but it should be guided by clinical context and pretest probabilities. The extensive investigations performed in our patients were performed on a research basis to ensure that any potential secondary cause was excluded.[5]

CWSs have been previously described in the context of migraine. Jamison et al.[3] reported that they observed 3 patients with a new visual disturbance associated with a recent migraine and a CWS. They described 1 patient in detail, a 38-year-old male with a 10-day history of a severe migraine headache with blurry unilateral central vision.[3] These symptoms resolved within 6 months. The authors also described a 36-year-old male with a crescent-shaped area in the left superior temporal visual field that was associated with a frontal headache and nausea.[4] The visual symptom developed over hours and was preceded 2 days prior by a migrainous aura of abnormal taste and smell. Examination revealed a CWS 1 disc diameter from the optic disc. The mechanism of CWSs in migraine patients is presumably related to retinal arteriolar vasospasm because this has been documented previously with fundus photography and videography in patients with migraines.[7] A subset of patients is left with permanent vision loss as a result of retinal artery occlusions.[7] Patients with migraines are also more likely to have vasospastic syndromes, and clinical manifestations may range from poor temperature regulation to low blood pressure, especially at night. The exact mechanism of retinal vasospasm remains unknown but is likely a result of disruption of the balance of endothelin-1 and nitric oxide because retinal circulation lacks autonomic supply.[7] The CWS also may be a marker of general vasospastic activity, as seen in patient 3, who developed migrainous symptoms after the CWS was discovered. It is also possible that these CWSs were not related to migraine, and this can be addressed by larger-scale studies.

In conclusion, CWSs may be discovered in the assessment of patients with new visual disturbances or be an incidental finding. This case series suggests that CWSs may be associated with migraine, but this diagnosis should be made only after exclusion of other known causes of CWSs.

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Footnotes and Disclosure

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