Case report

The development and spontaneous resolution of a full-thickness macular hole in bartonella henselae neuroretinitis in a 12-year-old boy

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ABSTRACT

Purpose: To describe an unusual case of *Bartonella henselae* neuroretinitis complicated by macular hole (MH) development.
Observations: A full-thickness macular hole developed in a 12-year-old boy in association with serology-confirmed *Bartonella henselae* neuroretinitis. Following a period of observation, the MH closed without intervention.
Conclusion and importance: MH may occur as a complication of neuroretinitis secondary to Cat-Scratch Disease.

1. Introduction

A 12-year old boy developed a full-thickness macular hole approximately two months after being diagnosed with bartonella henselae neuroretinitis. After a period of several months of observation, the macular hole spontaneously closed.

2. Case report

A 12-year-old male presented to the ophthalmology clinic with a 4-day history of blurred central vision in his right eye. He also reported progressively worsening headaches, nausea, vomiting, and chills in the context of sustaining a scratch from his household cat one month prior.

Visual acuity (VA) was counting fingers (CF) in the right eye and 20/20 in the left eye. The intraocular pressure was 13 mmHg bilaterally and external examination of both eyes was normal. An afferent pupillary defect was noted in the right eye. Fundoscopic examination revealed grade 4 optic disc edema and profound macular edema with retinal whitening in the distribution of the cilioretinal artery in the right eye (Fig. 1A).

Optical coherence tomography (OCT) of the right eye revealed severe macular edema and subretinal fluid (Fig. 1B). Fluorescein angiography demonstrated a cilioretinal artery occlusion and optic disc leakage (Fig. 1C). An MRI of the brain and orbits revealed a focus of abnormal enhancement along the junction of the right optic disc and right optic nerve. The patient was admitted for further diagnostic testing and initiated on anticoagulation with enoxaparin.

Laboratory workup was notable for a positive anti-nuclear antibody, an elevated c-reactive protein, and an elevated erythrocyte sedimentation rate. A hypercoagulability panel was significant for elevated Beta-2 Glycoprotein (B2GP) IgM and IgG titers; notably partial thromboplastin time was not prolonged and lupus inhibitor testing was negative. *Bartonella henselae* IgM and IgG titers later returned elevated at ≥ 1:80 (reference range < 1:20) and ≥ 1:1024 (reference range < 1:64) respectively.

The patient was diagnosed with *Bartonella henselae* neuroretinitis with post-infectious anti-phospholipid antibody syndrome. He was admitted to the pediatric hospitalist service and was started on rifampin and doxycycline as well as methylprednisolone, enoxaparin, and hydroxychloroquine.

VA remained stable at CF throughout his hospital stay. Serial ocular examinations of the right eye revealed the gradual appearance of cell and flare in the anterior chamber and an evolving fundoscopic examination with improvement in the optic nerve and cystoid macular edema and an increasingly prominent macular star (Fig. 1D). Notably, the patient was afebrile during his entire hospitalization and serial physical examinations were consistently negative for lymphadenopathy. The patient was ultimately discharged on enoxaparin, doxycycline and rifampin for a total of a 4 week course.

The patient was seen 6 weeks after discharge with persistently decreased vision in the right eye. VA was 20/400, and examination was notable for a macular star and the formation of a macular hole (MH) (Fig. 2A). OCT confirmed the development of a full-thickness macular hole (Fig. 2B). The decision was made to monitor closely. At the next
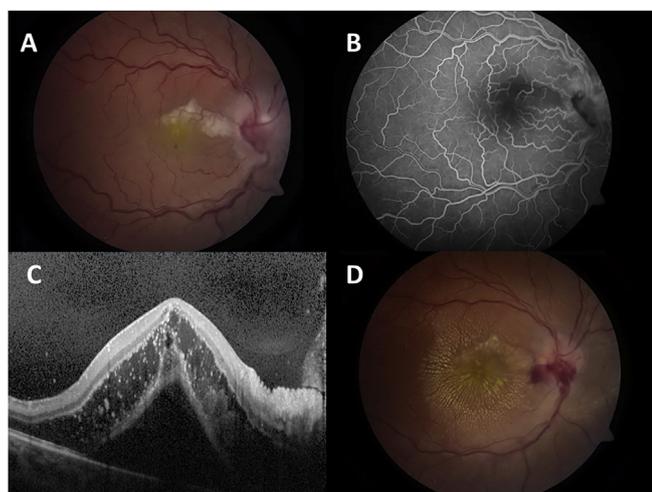
Fig. 1. A: Fundus photograph of right eye at time of presentation, demonstrating optic nerve edema and retinal whitening in the distribution of the cilioretinal artery with macular edema. B: Fluorescein angiography and the time of presentation showing no filling of the cilioretinal artery. C: Optical coherence tomography of the right eye at presentation demonstrating severe cystoid macular edema and subretinal fluid. D: One week after presentation, there was development of a macular star in the affected right eye with preretinal hemorrhage over the inferior aspect of the optic nerve.
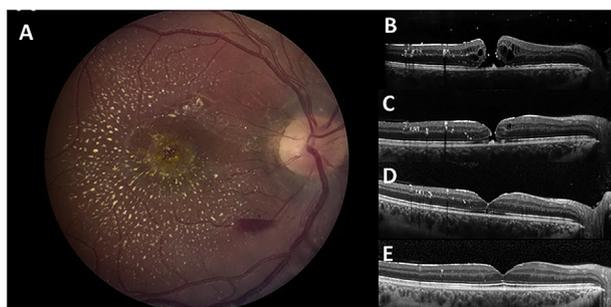

Fig. 2. A: Fundus appearance 6 weeks after hospital discharge showing persistent macular star and the development of macular hole (MH). B: Optical coherence tomography (OCT) showing macular hole formation with attached hyaloid 6 weeks after hospital discharge. C: 6 weeks following discovery of MH, OCT shows MH smaller in size. D: OCT demonstrating MH closed 6 months following its development. E. Restoration of more normal foveal contour on OCT 13 months after development of MH.

follow-up visit 3 weeks later, the patient's right eye VA was 20/200; slit lamp and fundoscopic examination, as well as OCT, were nearly identical to those from the previous visit with no change noted in the appearance of the MH. However, at 6 week follow-up, VA was 20/300 and OCT demonstrated the MH was decreased in size compared to prior (Fig. 2C).

Three months later, the patient returned for examination during which time VA was 20/200. Fundoscopic exam and OCT revealed the spontaneous closure of the MH nearly 6 months following its development (Fig. 2D). The patient was seen again 9 months later (13 months after development of MH) at which time the right eye VA had improved to 20/100, and exam and OCT demonstrated persistent closure of the MH with continued improvement in the foveal contour (Fig. 2E).

At the time of this manuscript preparation, the patient has had no additional inflammatory or ischemic sequelae.

3. Discussion

Cat Scratch Disease (CSD) is a systemic infection caused by the

facultative intracellular gram negative rod *Bartonella henselae*.[1–3] The disease is commonly transmitted through physical contact with a cat (i.e. a scratch), or through the commonly associated vector, the cat flea, during which time the epidermis is broken, allowing entry of *B. henselae* into systemic circulation.[4–6] The clinical presentation of CSD often appears as flu-like symptoms including fever, headache, and malaise with or without an associated cat scratch or rash.[1–6] Our patient's presentation was therefore unusual in that he remained afebrile and without lymphadenopathy throughout his entire hospitalization, suggesting he had been infected weeks prior to presentation. While CSD is typically a self-limited disease, numerous complications may occur, and ocular complications are estimated to occur in 5–10% of cases.[3–5,7–12] The most common of these ocular complications is neuroretinitis which is estimated to occur in 1–2% of all cases of CSD.[4]

Neuroretinitis, first described by Dr. Theodor Karl Gustav von Leber in 1916, is a specific form of optic neuropathy characterized by the presence of acute unilateral decreased visual acuity, optic disc edema, and exudates arranged in a "star-like" pattern around the macula.[13,14] While optic disc edema with a macular star is characteristic of neuroretinitis, this presentation is not specific, and various other etiologies such as hypertensive retinopathy, papilledema, or diabetic papillitis may also cause this combination of findings.[1,15] Neuroretinitis itself has numerous etiologies including a myriad of infectious pathogens, sarcoidosis, inflammatory bowel disease, and polyarteritis nodosa.[16–19] Some of the most common infectious etiologies of neuroretinitis include CSD (*B. henselae*), toxoplasmosis, syphilis, tuberculosis, leptospirosis, and Lyme disease.[20–27] *Bartonella henselae* accounts for up to two-thirds of all reported neuroretinitis cases.[1,2]

The pathogenesis of neuroretinitis begins with an optic disc vasculitis that results in lipid-rich fluid leaking from optic disc vasculature into the outer plexiform layer of the retina.[28] The macular star is thought to be formed by the migration of the aqueous portion of this lipid-rich fluid through the external limiting membrane to beneath the neurosensory retina, ultimately leaving behind lipid-rich deposits in a star-like pattern around the macula above the external limiting membrane.[28,29] The origin of the initial optic disc vasculitis is still a subject of debate but is thought to depend on the inflammatory response to the preceding flu-like illness present in many cases of neuroretinitis.[1]

Although CSD is usually a self-limited disease process, the use of antibiotics in patients with complications or at risk for developing complications such as neuroretinitis is a current subject of debate. The majority of studies on this subject are small and retrospective. Some small studies suggest a benefit of doxycycline, ciprofloxacin, rifampin, gentamycin, or TMP/SMX with regards to shorter duration of ocular disease and improved visual outcomes in CSD.[30–34] Because of contradictory reports regarding the benefit of antibiotics and a paucity of data, there is no established standard of care for the management of CSD.

MH formation following inflammatory conditions such as neuroretinitis has been hypothesized to occur by one of the following mechanisms: (1) liquefaction and contraction of the premacular vitreous, (2) tangential forces applied to the macula by the formation of an epiretinal membrane, or (3) intraretinal weakening secondary to inflammation, CME or other cause.[7,35] Notably, our patient's MH developed in the absence of posterior vitreous detachment. We suspect that the presence of massive cystoid macular edema followed by rapid resolution of this edema led to increased tangential traction on the weakened retina resulting in macular hole. Several prior cases of MH formation following neuroretinitis have previously been described; however, to the best of our knowledge, no case report to date documents the spontaneous resolution of a MH in CSD.[7–10]

There is little data on spontaneous closure rates of macular holes of either inflammatory or idiopathic etiology. However, the spontaneous closure of idiopathic macular holes is infrequent and estimated to occur in only 3.5% of cases as determined by one large review of 142 eyes of 138 patients.[35] Given similar environments of background intraocular

inflammation, we hypothesize that MH resulting from *B. henselae* neuroretinitis may not be unlike those that result from similar inflammatory etiologies such as posterior uveitis. Bonnin et al. noted three cases of patients who had developed MH associated with posterior uveitis secondary to toxocariasis, sarcoidosis, and syphilis.[36] After treating the posterior uveitis component of their conditions, all three of these patients' MH resolved spontaneously when reviewed on follow-up OCT. These findings and our case suggest that MH secondary to inflammatory causes may spontaneously resolve, and therefore a period of observation is warranted prior to proceeding with surgical repair.

4. Conclusions

Full-thickness MH may occur as an unusual complication of CSD neuroretinitis, and in this setting, may spontaneously close after a period of several months of observation. To the best of our knowledge, we have described the first reported case of this phenomenon. More research is needed to determine the mechanism by which spontaneous closure of MH occurs and the optimal treatment regimen for neuroretinitis secondary to CSD.

Patient consent

Consent to publish the case report was not obtained. This report does not contain any personal information that could lead to the identification of the patient.

Appendix A. Supplementary data

Supplementary data to this article can be found online at https://doi.org/10.1016/j.ajoc.2019.100515.

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