Child Neurology: *Bartonella henselae* Neuroretinitis in 2 Patients

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Abstract

Neuroretinitis due to *Bartonella henselae* infection is a rare cause of vision loss in children. Two pediatric cases of acute unilateral vision loss accompanied by edema of the optic nerve on fundoscopic examination are presented. Severe causes of vision loss were excluded. During the course of the disease, macular stellate exudates emerged on control fundoscopic examinations, and diagnosis of neuroretinitis was made. A causative agent was confirmed by serologic examination, as high titers of IgM and IgG antibodies to *Bartonella henselae* were detected. Both patients significantly recovered after oral antibiotic treatment.

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Neuroretinitis is a very rare cause of vision loss in children. It is characterized by edema of the optic disc, acute unilateral vision loss, dyschromatopsia, and macular stellate exudates (macular star), which develop after 1 or 2 weeks.[1] Single episodes are the most common; however, recurrent attacks may occur.[2] The first description of this disease was given by Theodor Leber in 1916, calling it stellate maculopathy. Later, Gass termed this disease neuroretinitis since he was able to prove by fluorescein angiography that the site of the leakage was the optic disc.[3]

The etiology of neuroretinitis often remains unrecognized in children and adolescents. The possible causes can be infectious, noninfectious, or idiopathic. Infectious agents can be classified into the following categories: viruses (mumps, varicella, rubella, measles, Epstein-Barr, cytomegalovirus, herpes simplex, and hepatitis B), bacteria (*Bartonella henselae*, tuberculosis, and *Salmonella*), fungi (histoplasmosis and actinomycosis), nematodes (toxocara), spirochetes (Lyme disease, leptospirosis, and syphilis), and protozoa (toxoplasmosis).[3-5] Noninfectious causes include malignancies, diabetes mellitus, and systemic or vascular diseases.

Bartonella henselae is an aerobic Gram-negative bacterium whose natural reservoir is domestic cats. It belongs to the family of Bartonellaceae, *Bartonella* genus, and is best known as the cause of cat scratch disease (CSD)[6] and the single most common cause of neuroretinitis.[2] The epidemiology of *Bartonella* neuroretinitis is still unknown, but the global incidence of CSD in children was roughly 9.4/100,000/y.[7] *Bartonella henselae* infection in humans can manifest as either a local or systemic infection. Fever with isolated lymphadenopathy or prolonged fever or hepatosplenic disease most commonly occurs with a history of feline exposure (typical CSD). In addition to neuroretinitis, other ocular presentations may occur, including Parinaud oculoglandular syndrome, vitritis, panuveitis, papillitis, vitreal detachment, macular hole, retinal white spots, retinal vasoproliferative lesions, and branch retinal artery and venous occlusions.[8] The most common systemic forms are summarized in Table 1.

The clinical picture of *Barotonella* neuroretinitis usually begins with flu-like symptoms followed by acute vision loss.[9] Unilateral vision loss is most common, although cases with bilateral vision loss have been described. Unilateral vision loss can also be associated with bilateral and asymptomatic disc edema in the other eye (Table 2).[10-14]

Here, we present 2 patients with neuroretinitis in the form of unilateral acute vision loss and optic nerve edema, followed by the appearance of macular stellate exudates. In both cases, significant IgM and IgG antibody titers to *Bartonella henselae* were detected.

Case Reports

Case 1

A 7-year-old girl presented to the child neurologist with blurry vision and pain in the left eye that had persisted for around 24 hours. Several days prior, she experienced malaise and headache but no documented fever. An ophthalmologic examination revealed severe vision loss (20/400) and relative afferent pupillary defect in the left eye; the vision was normal in her right eye. A fundoscopic examination at admission revealed a swollen optic nerve with retinal hemorrhages and macular edema in her left eye and a swollen optic nerve in her right eye. Neurologic examination was normal except for decreased visual acuity in the left eye. Physical examination detected mild left-sided cervical lymphadenopathy. A broad differential diagnostic workup of acute vision loss with bilateral papilledema and retinal hemorrhages was conducted. Optic neuritis from demyelinating, autoimmune, toxic, or infectious causes was excluded. Increased intracranial pressure of any cause was excluded (brain magnetic resonance including arteriography and venography was normal; CSF opening pressure was normal—24 cmH_20 (reference range: 6–25 cmH_2O). CSF revealed normal protein level—0.24 g/L (reference range: 0.18–0.58 g/L), normal glucose level—3.2 mmol/L (reference range: 2.5–4.4 mmol/L), and 12 white blood cells (11 lymphocytes and 1 polymorphonuclear leukocyte; reference range—up to 5 white blood cells). No CSF erythrocytes or xanthochromia were documented. Traumatic, cardiac, and hematologic causes of retinal hemorrhages were excluded. To empirically treat for autoimmune/inflammatory

Table 1 Clinical Presentations of *B. henselae* Infection

Organ system involvement	Clinical presentation
Neurologic presentation	Headaches, encephalopathy, mental status changes, seizures, status epilepticus, cerebral arteritis, facial nerve palsy, meningomyeloradiculopathy, weakness, hyperreflexia or hyporeflexia, transverse myelitis, radiculopathy, Guillain-Barre syndrome, and extensor plantar response
Other ocular presentations[a]	Follicular conjunctivitis, papillitis, Parinaud oculoglandular syndrome, retinal white spots, panuveitis with diffuse choroidal thickening, vitritis, and branch retinal artery and vein occlusions
Pulmonary presentation	Pleural thickening and pneumonia
Cardiac presentation	Endocarditis
Hematologic presentation	Hemolytic anemia and thrombocytopenic purpura
Hepatosplenic presentation	Abdominal pain, microabscesses in the spleen and/or liver, and prolonged fever
Renal presentation	Glomerulonephritis
Dermatologic presentation	Granuloma annulare, urticarial and maculopapular eruptions, papule, erythema marginatum, erythema nodosum, and leukocytoclastic vasculitis
Orthopedic presentation	Arthralgia, arthritis, and osteomyelitis
Mimics of various malignancies' presentation	Prolonged fever, head and neck and abdominal lymphadenopathy, night sweats, and weight loss

[a] Other ocular presentations besides neuroretinitis.
The table was adapted according to Ref. 8.

Table 2 Differential Diagnosis of Acute Visual Loss Accompanied by Optic Disc Swelling (Adapted According to Refs. 10-14)

Clinical presentation	Causes
Optic disc swelling	Optic neuritis/neuropathy
	Leber hereditary optic neuropathy
	Optic disc drusen
	Retinal artery/vein occlusion
	Uveitis/chorioretinitis
	Intracranial malignancies
	Nutritional and toxic optic neuropathy
	Diabetic papillopathy
	Paraneoplastic disorders
	Orbital tumors
	Intracranial hypertension
Optic disc swelling with macular star formation	Infectious
	Cat scratch disease/*Bartonella species*
	Lyme disease/*Borrelia species*
	Syphilis/*Treponema pallidum*
	Tuberculosis/*Mycobacterium species*
	Toxocariasis
	Toxoplasmosis
	Viral diseases
	Noninfectious
	Sarcoidosis
	Behcet disease
	Severe high blood pressure
	Diabetes mellitus
	Intracranial hypertension
	Branch retinal vein occlusion
	Anterior ischemic optic neuropathy
	Idiopathic

causes of acute vision loss, corticosteroid therapy with methylprednisolone (30 mg/kg/d) for 5 days was administered. There was no clinical improvement after corticosteroid therapy. A control fundoscopic examination after 10 days revealed macular stellate exudates in her left eye (Figure 1A). An infectious cause of neuroretinitis was suspected, as *Bartonella henselae* is the most common causative agent. The diagnosis was confirmed based on the indirect immunofluorescence test at week 3: the IgM antibody titer to *Bartonella henselae* was 1:400, and the IgG antibody titer was 1:2,560. The patient recalled a cat scratch 2–3 weeks before the vision loss. Oral azithromycin was administered for 3 weeks (8 mg/kg/d). The nerve swelling and relative afferent pupillary defect resolved (the macular stellate exudates were milder), and the patient regained visual acuity of 20/22 in the left eye.

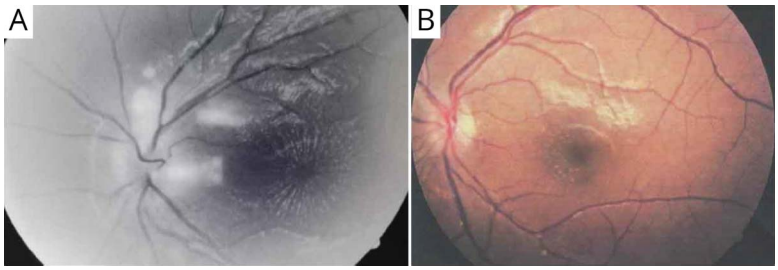
Case 2

A 10-year-old girl presented to the child neurologist with slightly blurred vision in the left eye that lasted for about a week. She had no other complaints. An ophthalmologic examination revealed mild vision loss (20/22) in the left eye; vision was normal in the right eye. A fundoscopic examination at admission revealed a swollen optic nerve in her left eye and a normal finding in her right eye. Neurologic examination was normal. Physical examination at admission was normal, but latter ultrasonography showed bilateral axillary and inguinal reactive lymphadenopathy. A differential diagnostic workup toward unilateral papilledema was conducted. Increased intracranial pressure was suspected with no improvement on oral acetazolamide therapy. Brain magnetic resonance including arteriography and venography was normal. A control fundoscopic examination after 2 weeks revealed macular stellate exudates in her left eye (Figure 1B). A diagnosis of *Bartonella henselae* neuroretinitis was suspected. The diagnosis was confirmed based on the indirect immunofluorescence test at week 4: the IgM antibody titer to *Bartonella henselae* was 1:1,600, and the IgG antibody titer was 1:10,240. The patient later recalled a cat scratch before visual disturbances. Treatment with oral doxycycline was initiated for a period of 4 weeks (5 mg/kg/d). The optic disc edema and stellate macular exudates resolved, and the patient regained full visual acuity in the left eye. Informed consents were signed by patients and their parents.

Discussion

Both patients presented with acute unilateral vision loss associated with optic disc swelling that lasted more than 24 hours and was not accompanied by additional neurologic signs or symptoms. In case 1, the patient experienced preceding symptoms of malaise and headache, cervical lymphadenopathy, pain in the affected eye, and bilateral optic disc swelling on admission. In case 2, there were no additional signs or symptoms on admission. In cases of acute vision loss, the differential diagnostic workup is broad.[11-14] The etiology of acute vision loss depends on laterality, the presence of optic disc swelling, transient (<24 hours) or persistent (>24 hours) symptoms, tempo of progression and pattern of fluctuations, associated pain, and the presence of additional systemic, neurologic, or ophthalmologic signs and symptoms.[11-14] Psychogenic causes should not be neglected; however, organic causes should be excluded first.[12] Etiologic considerations in acute vision loss with optic disc swelling are summarized in Table 2.[10-14]

Figure 1 Fundus Photography Examples



(A) Fundus photography of the left eye in case 1 showing fully formed stellate macular exudates; (B) fundus photography of the left eye in case 2 showing partially formed stellate macular exudates. Both findings are typically seen in *Bartonella henselae* neuroretinitis.

As described previously, a detailed diagnostic workup was conducted in both of our cases. Because neuroretinitis is very rare in children and macular stellate exudates develop after 1 or 2 weeks after onset of visual disturbances,[1] it is important to exclude urgent and life-threatening causes of acute vision loss.[13] After detection of stellate macular exudates on fundoscopic examination, the diagnosis of neuroretinitis is usually straightforward. Although the most common cause of neuroretinitis is an atypical presentation of CSD caused by *Bartonella henselae*, other infectious and inflammatory causes should be excluded.[2] The positive titers of IgM antibodies detected by enzyme immunoassay last up to 3 months and indicate acute disease, whereas positive titers of IgG antibodies can be detected for up to a year.[8] There are controversies regarding treatment of *Bartonella* neuroretinitis because milder cases can be self-limited and resolve within months in immunocompetent individuals.[2] However, many disorders carrying greater risk of morbidity can mimic neuroretinitis (e.g., optic neuritis or increased intracranial pressure), and these should be treated promptly before definite diagnosis of neuroretinitis is established,[2] as in our cases. As shown here, both patients recovered after administration of oral antibiotics. Some studies recommend that antibiotics be administered empirically to patients with vision loss and concomitant systemic signs including lymphadenopathy prior the definite diagnosis.[2,15] Namely, the patient in case 1 had mild systemic signs and profound vision loss and clearly benefited from antibiotic therapy, whereas the patient in case 2 had mild vision loss and diffuse reactive lymphadenopathy and also recovered after antibiotic treatment.

Conclusion

Pediatric neuroretinits due to *Bartonella henselae* infection is a rare cause of acute vision loss with good prognosis. Associated lymphadenopathy should raise suspicion, and if there is a positive history of cat exposure, empiric antibiotics should be considered before final serologic confirmation of *Bartonella henselae* infection.

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Continued

Appendix *(continued)*

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