CASE REPORT

Ocular Lyme borreliosis as a rare presentation of unilateral vision loss

Jeffrey Patterson-Fortin,¹ Anita Kohli,² Maria J Suarez,³ P Elliott Miller¹¹Department of Medicine, Johns Hopkins School of Medicine, Baltimore, Maryland, USA²Scheie Eye Institute, Philadelphia, Pennsylvania, USA³Johns Hopkins Wilmer Eye Institute, Baltimore, Maryland, USA**Correspondence to**
Dr Jeffrey Patterson-Fortin,
jeffreypf@jhmi.edu

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SUMMARY

Ocular Lyme borreliosis is a rare manifestation of Lyme disease. We describe a case of an 80-year-old woman who presented with a 1-month history of unilateral painless central vision loss. Based on a temporal artery biopsy, she was initially diagnosed with giant cell arteritis and treated with a 3-day course of high-dose intravenous steroids. A more detailed history uncovered multiple previous treatments for Lyme disease and residence in an endemic Lyme area. The patient was subsequently diagnosed with ocular Lyme borreliosis and treated with intravenous antibiotics. After 5 weeks of treatment, unilateral vision loss did not progress and optic disc oedema resolved.

BACKGROUND

This clinical case demonstrates the challenges of diagnosing vision loss. The aetiologies of vision loss are many. A detailed and broad initial history is essential to facilitate prompt diagnosis of rarer potential causes to prevent permanent vision loss and, in some cases, save lives. First described in 1977 as an aetiology of arthritis, Lyme disease is a tick-borne illness caused by three species of the spirochete *Borrelia*: *B. burgdorferi*, *B. afzelii* and *B. garinii*.¹ Lyme disease most commonly presents as erythema migrans, usually 7–14 days after a tick bite, and is known to have neurological manifestations, including cranial neuritis, myelitis and meningitis. Ocular Lyme borreliosis occurs in 1% of cases of systemic Lyme disease,² but must be included in the differential diagnosis of unilateral blindness, especially in those with known tick exposure and those residing in Lyme endemic areas.

CASE PRESENTATION

We report a case of an 80-year-old woman, with medical history notable for type 2 diabetes mellitus, bilateral cataracts and a distantly resected right-sided adenoid cystic carcinoma, who was admitted for work up of subacute central vision loss in her left eye.

She described waking from sleep, 1 month prior, and seeing a 'grey line' through the vision in her left eye. She denied having had, at that time, headache, pain with eye movement, jaw claudication, proximal muscle pain, or other symptoms. Her vision symptoms prompted a visit to her general ophthalmologist, who initially diagnosed her with a branch retinal artery occlusion and suggested she see a retinal specialist.

Her retinal specialist noted mild nasal optic disc oedema on the right and moderate optic disc oedema with rare disc splinter haemorrhages on the left. He was concerned for non-arteritic anterior ischaemic optic neuropathy versus giant cell arteritis (GCA), which prompted a visit to our emergency department. There, she was seen by neuro-ophthalmology. Given her medical history notable for a distantly resected right-sided adenoid cystic carcinoma and lack of symptoms of jaw claudication, which is quite sensitive for GCA, she underwent unremarkable MRI and lumbar puncture with a mild lymphocytic pleocytosis (18/cc mm) and elevated protein (59.0 mg/dL). Although she lacked many of the typical symptoms for GCA, given her age and erythrocyte sedimentation rate of 57 mm/h, she was prescribed 1 mg/kg of prednisone and scheduled for a temporal artery biopsy. Bilateral temporal artery biopsy was negative for granulomatous inflammation in both arteries. However, mural scarring and focal loss of internal elastic lamina was suggestive of previous arteritic damage (figure 1). Further, CD45/CLA stains highlighted slightly increased numbers of lymphocytes scattered through the adventitia and CD68 staining identified a few large histiocytes in the arterial media (figure 2). Overall, the patient's biopsy was read as concerning but not definite for GCA.

On follow-up with neuro-ophthalmology, she was again found to have mild optic disc oedema on the right and moderate optic disc oedema on the left. Given continued concern for GCA but with atypical findings, she was admitted to the Osler Medicine Service for further work up of infectious or inflammatory causes and treatment.

On admission, her vitals were as follows: blood pressure, 156/65 mm Hg; heart rate, 66 bpm; temperature, 36.5°C; oxygen saturation, 95% on room air and respiratory rate, 12 breaths/min. She appeared well and in no distress. Her pupils were equal in size. The left pupil was notable for slowed reactivity and afferent pupillary defect (RAPD). Extraocular muscle movements were normal. Visual acuity in the right eye was measured at 20/25 while the left eye was measured at 20/800, but with intact peripheral vision. Colour vision was 10/10 and 0/10 in the right and left eyes, respectively. Intraocular pressure was 22 in the right eye and 21 mm Hg in the left. Funduscopy examination showed bilateral non-proliferative retinopathy and moderate disc oedema bilaterally. Furthermore, the patient lacked both temporal bone tenderness and scalp tenderness on palpation. Other systemic and neurological examinations were normal, including cranial nerve examination.

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Figure 1 Temporal artery biopsy. Mural scarring and focal loss of internal elastic lamina (VVG, ×100 original magnification).

INVESTIGATIONS

The patient's complete blood count showed a white cell count of $11.9 \times 10^3/\text{mm}^3$, haemoglobin level of 14.1 g/L, haematocrit of 41.6% and platelet count of $330\,000/\mu\text{L}$. Liver and renal function tests were within normal limits. Erythrocyte sedimentation rate was 40 mm/h and C reaction protein was 0.6 mg/dL. Serologies for perinuclear antineutrophil cytoplasmic antibodies (p-ANCA), cytoplasmic antineutrophil cytoplasmic antibodies (c-ANCA), syphilis treponemal test and QuantiFERON TB Gold were negative. MRI was notable for normal appearing orbits. MR angiography of the chest lacked signs of a vasculitis. On further questioning, the patient reported a history of treated Lyme disease, although with no recent exposure. As expected, her IgG Lyme disease antibody was positive and the IgM was pending at the time of discharge due to patient preference to be discharged home.

DIFFERENTIAL DIAGNOSIS

The combination of lymphocytes and histiocytes within the temporal artery wall, and lymphocytic pleocytosis and hyperproteinaemia in the cerebrospinal fluid (CSF), made GCA the most likely diagnosis given no more salient diagnosis to explain the patient's vision loss. The differential diagnosis included anterior ischaemic optic neuropathy, non-arteritic anterior ischaemic optic neuropathy and other inflammatory disease. Less likely

possibilities included infiltrative, neoplastic and infectious aetiologies, given the patient's symptom stability.

TREATMENT

Although the patient was started on oral steroids 2 weeks prior to hospital admission, she never received pulse dose steroids, which are associated with a higher frequency of sustained remission after discontinuation of treatment.³ Consequently, for her presumed GCA, she was treated with 1 g intravenous methylprednisolone daily for 3 days and was discharged home on an oral steroid taper.

OUTCOME AND FOLLOW-UP

Following discharge, the patient was continued on her steroid taper for a presumed diagnosis of GCA. Once the serum Western blot resulted (positive for IgM antibodies to *B. burgdorferi* for all bands and C6 peptide markedly positive), a diagnosis of ocular Lyme borreliosis was made. This diagnosis was corroborated by the patient living in an endemic area, a negative syphilis treponemal test, negative imaging for multiple sclerosis, moderate bilateral optic disc oedema, a positive serum Lyme titre and a positive Western blot and CSF pleocytosis.⁴

Steroids were discontinued and the patient was started on ceftriaxone 2 g intravenously every 12 h initially for a 2-week course. On follow-up at 2 weeks, vision was essentially unchanged but with decreasing disc oedema. Lyme IgG and IgM Western blot was positive for all bands on repeat and C6 peptide remained markedly elevated. The decision to continue antibiotics for at least 4 weeks was made.⁵ The patient received 5 weeks of intravenous antibiotics. At follow-up at 8 weeks, the optic disc oedema had resolved but left vision loss remained unchanged. Vision in the right eye continued to be preserved.

DISCUSSION

Acute vision loss is a frightening experience for patients. Aetiologies of acute vision loss can be categorised in three anatomic categories: anterior ocular structures, and retinal and optic neuropathies. Anterior pathologies (corneal oedema, hyphaema, vitreous haemorrhage and acute angle-closure glaucoma) can be excluded by the history, RAPD and slit-lamp examination. Most retinal pathologies (branch retinal artery occlusion, retinal detachment, acute maculopathy, amaurosis fugax and branch retinal vein occlusion) are visible on ophthalmoscopy: the findings of bilateral optic disc oedema in this case indicated that the cause was an optic neuropathy.

Aetiologies of acute optic neuropathies include ischaemia, inflammation, infection, compression, trauma, tumour, demyelination, papilloedema, chiasmal strokes and idiopathic. Given

Figure 2 Temporal artery biopsy. Presence of adventitial chronic inflammation (A, B) (H&E, ×100 and ×200 original magnification, respectively) and slight increased number of lymphocytes (C) (CD45/CLA, ×400 original magnification).

the patient's age and the sudden onset with neither pain nor systemic symptoms, an ischaemic cause was most likely, and the differential was initially non-arteritic anterior ischaemic optic neuropathy versus GCA. Temporal artery biopsies were obtained and although equivocal, given her age and CSF findings of lymphocytic pleocytosis and hyperproteinaemia, the patient was initially treated for GCA. Lumbar puncture is not commonly performed for diagnosis of GCA but, given the patient's atypical presentation, namely lack of jaw claudication, which is quite sensitive for GCA, CSF analysis was performed, and should be considered along with further investigations and consideration of alternative causes. Indeed, Träisk *et al*⁶ reported three cases of ocular Lyme borreliosis presenting as suspected anterior ischaemic optic neuropathy with all initially misdiagnosed as GCA prior to being ultimately diagnosed as ocular Lyme borreliosis. Consequently, given our patient's atypical presentation, substantial Lyme infection history and residence in an endemic Lyme area, she was tested for Lyme disease and ultimately diagnosed with ocular Lyme borreliosis.

In the USA, from 2003 to 2012, nearly 280 000 cases of Lyme disease were reported. The majority of patients present with fatigue (54%), anorexia (26%), headache (42%), neck stiffness (35%), myalgias (44%), arthralgias (44%), regional lymphadenopathy (23%) and fever (16%).⁷ Optic neuropathy in ocular Lyme borreliosis is a rare manifestation. A review of the literature by Träisk *et al*⁸ found 11 cases of Lyme borreliosis leading to optic neuropathy, three from North America and the rest from Europe. The majority of the cases were in individuals older than 60 years and affected both eyes with vision less than or equal to 20/100. Interestingly, previous tick or unspecified insect bites were reported in half of the cases. Our patient was 80 years old and had visual acuity of 20/800 in the left eye.

To diagnose ocular Lyme borreliosis, Sibony *et al*⁴ recommend a patient meet the following criteria: endemic Lyme exposure, negative syphilis test, negative multiple sclerosis testing and a positive serum Lyme titre. Furthermore, at least one or more of the following must be present: encephalitis, meningitis with CSF pleocytosis, intrathecal antibody production or positive CSF PCR for *B. burgdorferi* DNA, recent clinical signs of Lyme disease, or a clinical diagnosis of erythema migrans. Alternatively, the European Federation of Neurological Societies (EFNS) recommends the following three criteria be fulfilled for definite ocular Lyme borreliosis and two of the three for possible ocular Lyme borreliosis: neurological symptoms, CSF pleocytosis and *B. burgdorferi*-specific antibodies produced intrathecally.⁹

Our patient was from an endemic Lyme area and had been treated for Lyme disease on three previous occasions. Her 1-month history of unilateral central vision loss was not accompanied by pathognomonic erythema migrans nor by recollection of a tick bite. Previous infection and treatment for Lyme disease does not prevent reinfection nor does it decrease the development of erythema migrans.¹⁰ Laboratory findings were negative for syphilis. CSF analysis showed pleocytosis and hyperproteinaemia. No abnormalities were found on MRI, but MRI was notable for no suggestion of multiple sclerosis. Furthermore, our patient met two of three criteria recommended by the EFNS. Therefore, ocular Lyme borreliosis was

the most likely diagnosis. Oral doxycycline is the treatment of choice in uncomplicated Lyme disease. However, in ocular Lyme borreliosis, the treatment of choice is an intravenous cephalosporin or penicillin for 14–21 days.⁵ Lyme disease should be considered in any patient presenting with vision loss, especially if from an endemic area or with known exposure.

Learning points

- ▶ Given the many causes of sudden vision loss, a broad and detailed initial history is essential to rule out rarer potential causes.
- ▶ Infective causes of bilateral disc swelling/bilateral reduced vision need to be ruled out before treating inflammatory causes with high-dose steroids.
- ▶ Lyme disease can present with neurological manifestations, including optic nerve involvement.
- ▶ Given that ocular Lyme borreliosis is a late manifestation of Lyme disease, clinical signs of Lyme disease may not be present at the time of physical examination.
- ▶ Neurological manifestations of Lyme disease, including ocular Lyme borreliosis should be treated with intravenous cephalosporin or penicillin.

Contributors JP-F examined the patient and wrote the manuscript. PEM examined the patient. MJS analysed the temporal artery biopsy. AK provided ophthalmological expertise. All the authors contributed to and approved the final manuscript.

Competing interests None declared.

Patient consent Obtained.

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