CASE REPORT

Giant cell arteritis mimicking infiltrative leptomeningeal disease of the optic nerves

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SUMMARY

A 67-year-old man presented with several days of progressive, painless left eye vision loss. He reported mild jaw claudication but denied headache, scalp tenderness or constitutional symptoms. Examination revealed palpable temporal arteries, blurring of the left optic disc, and 20/100 vision in the left eye with mild relative afferent pupillary defect. Inflammatory markers were sent, and methylprednisolone was initiated for presumptive giant cell arteritis (GCA). Erythrocyte sedimentation rate was normal, however, and C reactive protein was only mildly elevated, prompting further investigation. Orbital MRI revealed nodular enhancement of the optic nerve sheaths bilaterally from optic nerve head to chiasm, raising concern for an infiltrative leptomeningeal process such as sarcoidosis or lymphoma. Methylprednisolone was temporarily stopped while a broad work up for inflammatory and neoplastic causes was pursued. Fluorodeoxyglucose-positron emission tomography ultimately revealed hypermetabolism in the temporal, ophthalmic and occipital arteries suggesting GCA, which was confirmed by temporal artery biopsy. Steroids were restarted, and the patient's vision stabilised.

BACKGROUND

Giant cell arteritis (GCA) is an inflammatory vasculopathy that can cause vision loss via ischaemic optic neuropathy. When a patient presents with features atypical for GCA, other causes of optic neuropathy are considered. We report a case of GCA with normal erythrocyte sedimentation rate (ESR) and orbital MRI demonstrating nodular enhancement of the optic nerve sheaths bilaterally, extending from the optic nerve head to the chiasm. Fluorodeoxyglucose-positron emission tomography (FDG-PET) revealed hypermetabolism of the temporal arteries, with GCA ultimately confirmed by temporal artery biopsy (TAB). This case illustrates that GCA can mimic infiltrative leptomeningeal disease of the optic nerves, likely due to small-vessel arteritis within the nerve sheath, and demonstrates a role for FDG-PET in identifying small-to-medium vessel inflammation.

CASE PRESENTATION

A 67-year-old man presented to the emergency department with 5 days of progressive, painless left eye vision loss. In the emergency department, he was evaluated by ophthalmology and subsequently by neurology. He reported blurring of the superior hemifield, worst in the superior nasal quadrant. On questioning, he endorsed mild jaw claudication but

denied headache or scalp tenderness. He had no constitutional symptoms and no history of vision loss or other neurological symptoms.

On examination, he had palpable temporal arteries bilaterally. Visual acuity was 20/30 in the right eye and 20/100 in the left eye. Visual field and Ishihara testing were normal in the right eye. In the left eye, visual fields demonstrated a superior nasal quadrantanopia, with decreased but present vision in the superior temporal quadrant. Ishihara testing revealed 1 of 10 colour plates. Pupils were equal and round but with a trace relative afferent pupillary defect in the left eye; the left pupil constricted from 6 to 4 mm with direct light, with an additional 1 mm of consensual constriction with light stimulation of the right eye. Fundus examination revealed diffuse blurring of the left optic disc margin. The remainder of the patient's neurological examination was normal.

INVESTIGATIONS

On the basis of history and examination, there was concern for GCA causing anterior ischaemic optic neuropathy. Inflammatory markers were sent, after which the patient received a dose of intravenous methylprednisolone. He was admitted to the inpatient neurology service, with continued input from the ophthalmology consult service. ESR returned at only 27 mm/h, however, and C reactive protein was only mildly elevated at 0.7 mg/dL (upper limit of normal 0.5 mg/dL). The lack of highly elevated inflammatory markers prompted investigation in other potential aetiologies. MRI of the brain/orbits was performed and demonstrated marked nodular enhancement of the bilateral optic nerve sheaths extending from optic nerve head to chiasm, with infiltration into the adjacent retrobulbar fat (figure 1A, B).

The MRI findings raised concern for an infiltrative leptomeningeal process, with neoplastic conditions such as lymphoma or leptomeningeal carcinomatosis on the differential diagnosis. Owing to the possibility of lymphoma, steroids were stopped while further diagnostics were pursued. Optic nerve sheath biopsy was considered but deemed too risky for the patient's remaining vision. He therefore underwent a broad work up for a neoplastic or inflammatory/auto-immune aetiology. CT of the chest/abdomen/pelvis was unremarkable. Cerebrospinal fluid (CSF) revealed elevated protein (91 mg/dL) but no pleocytosis, and normal glucose. CSF flow cytometry and cytopathology were negative. All infectious studies from CSF were negative. CSF demonstrated normal IgG index with no oligoclonal bands. A broad serum

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Figure 1 Postcontrast T1-weighted MRI. Coronal (A) imaging revealing marked thickening and enhancement of the optic nerve sheath bilaterally, with infiltration into retrobulbar fat. Axial (B) imaging revealing a nodular appearance of the enhancement extending from the optic nerve head to the chiasm. (C) Fluorodeoxyglucose-positron emission tomography demonstrating hypermetabolism of the temporal (yellow arrows) and ophthalmic (white arrows) arteries bilaterally.

work up for other infectious and autoimmune aetiologies was negative.

FDG-PET was performed and revealed FDG hypermetabolism in the ophthalmic, temporal and occipital arteries concerning for GCA (figure 1C). High-dose steroids were resumed and TAB was performed, which demonstrated diffuse granulomatous inflammation with multinucleated giant cells, consistent with GCA.

DIFFERENTIAL DIAGNOSIS

On the basis of initial history and examination, GCA was highest on the differential diagnosis. The normal inflammatory markers shed doubt on the diagnosis, however, and the subsequent orbital MRI, with extensive nodular enhancement of the optic nerve sheaths, raised concern for an infiltrative meningeal process. Neoplastic and inflammatory/autoimmune conditions were high on the differential diagnosis. Within the neoplastic category, lymphoma, optic nerve glioma and metastatic leptomeningeal carcinomatosis were strong considerations. Within the inflammatory/autoimmune category, sarcoidosis was considered given its propensity to produce nodular granulomatous lesions similar to those seen in our patient's MRI. The autoimmune vasculitides (eg, Wegener's granulomatosis) were also considered. These diseases not only produce nodular leptomeningeal lesions but can also produce vasculitis apparent on FDG-PET. Another inflammatory condition that can produce optic nerve oedema as well as vasculitis apparent on FDG-PET is the non-parenchymal (or vascular) form of neuro-Behçet's disease (NBD).¹ In NBD, papilloedema often results from increased intracranial pressure secondary to venous sinus thrombosis. Any sized vessels can be affected by vasculitis in NBD, and a role for FDG-PET in the diagnosis of NBD has recently been established.² Infection (eg, tuberculosis), optic neuritis and pseudotumour cerebri were much lower on the differential.

The broad work up outlined above was negative for systemic inflammatory, neoplastic or infectious processes. FDG-PET was suggestive of GCA, which was subsequently confirmed by TAB.

TREATMENT

On presentation, high-dose treatment with intravenous methylprednisolone was initiated due to suspicion for GCA. Concern for lymphoma led to temporary cessation of steroids, however, as steroids can decrease diagnostic yield and exacerbate disease in lymphoma. When subsequent investigations confirmed GCA, steroids were resumed. The patient received 1 g intravenous methylprednisolone daily for 3 days, followed by 60 mg prednisone daily with plans for a slow taper.

OUTCOME AND FOLLOW-UP

With steroid treatment, the patient's left eye vision stabilised, and his right eye vision remained intact. He remains on an oral prednisone taper with close follow-up in ophthalmology clinic.

DISCUSSION

This case illustrates that GCA can mimic infiltrative leptomeningeal disease of the optic nerves on MRI, with nodular optic nerve sheath enhancement along the entire length of the pre-chiasmatic nerve. In this way, GCA can mimic other neoplastic (eg, lymphoma, optic nerve glioma, metastatic leptomeningeal carcinomatosis) and inflammatory/autoimmune (eg, sarcoidosis, Wegener's granulomatosis, NBD) conditions.¹ Awareness of such findings in GCA is crucial, as they can lead clinicians astray from the correct diagnosis, as in this case. Less extensive enhancement of the optic nerve sheath has been reported previously in GCA,^{3–5} with biopsy demonstrating inflammation with multinucleated giant cells in small arteries within the sheath.⁵ Arterial involvement within the nerve sheath therefore appears to underlie the MRI findings.

Diagnosis in this case was further complicated by the ESR of only 27 mm/h. Although an ESR >50 mm/h is part of the American College of Rheumatology (ACR) criteria for diagnosing GCA,⁶ it is important to remember that 4–14% of cases have a normal ESR.⁷ In this case, TAB confirmed the diagnosis. TAB remains the gold standard for GCA diagnosis, although its utility depends on clinical context. In patients who meet ≥ 3 of the ACR criteria without biopsy, the added utility of TAB is questionable, given a false-negative rate of up to 9%.⁸ In atypical cases such as the one presented here, however, TAB can be critical to diagnosis and should be performed in an emergent manner.

Finally, this case demonstrates that FDG-PET has sufficient resolution to identify hypermetabolism suggestive of vasculitis in small-to-medium-sized arteries of the head/scalp. FDG-PET has previously been used to identify large artery involvement of the aorta and its major branches in GCA,^{9–11} but findings of hypermetabolism in the temporal, ophthalmic and occipital arteries have not been previously demonstrated. This case

suggests that FDG-PET should be considered in the diagnostic work up of patients with possible but atypical GCA, even in the absence of constitutional symptoms that might herald great vessel involvement.

Contributors MDK and JCP conceptualised the report. MDK performed the data collection. MDK, JNR, RMS and JCP were involved in analysis or interpretation of the data. MDK and JCP drafted or revised the manuscript.

Competing interests None.

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Learning points

- Giant cell arteritis (GCA) can present with nodular optic nerve sheath enhancement on MRI that mimics infiltrative leptomeningeal disease, likely due to small-vessel arteritis within the nerve sheath.
- Fluorodeoxyglucose-positron emission tomography has adequate resolution to identify vasculitis within the small-to-medium-sized arteries of the head and scalp, and should be considered in the diagnostic work up of patients with possible GCA.
- Approximately 4–14% of GCA cases involve normal inflammatory markers (erythrocyte sedimentation rate and C reactive protein).

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