DOI: 10.1017/cjn.2024.344
This is a manuscript accepted for publication in *Canadian Journal of Neurological Sciences*.
This version may be subject to change during the production process.

Fourth Nerve Palsy as the Presenting Manifestation of Giant Cell Arteritis

Samira Jafari, MD [1,2], Jonathan A. Micieli, MD [1,2]

[1]Department of Ophthalmology and Vision Sciences, University of Toronto, Toronto, Ontario, Canada
[2]Kensington Vision and Research Centre, Toronto, Ontario, Canada

Address correspondence and reprint requests to: Dr. Jonathan A. Micieli, Kensington Vision and Research Centre, 340 College Street, Suite 501, Toronto, Ontario, Canada, M5T 3A9. Phone: (416) 928-1335, Fax: (416) 928-5075. E-mail: jmicieli@kensingtonhealth.org

Financial Support: None

Keywords: Giant cell arteritis, Fourth nerve palsy, Cranial vasculitis, Temporal artery biopsy, Corticosteroid therapy.

Conflicts of interest: the authors do not have any conflicts of interest to disclose.

Giant Cell Arteritis (GCA) is a systemic vasculitis that predominantly affects medium and large arteries, often involving cranial vessels. While all patients over the age of 50 presenting with a new onset of diplopia should be evaluated for GCA, the manifestation of diplopia as a symptom of this condition is rare. A literature review reveals a small number of documented cases associated with cranial nerve palsies (1); however, documented cases with isolated fourth nerve palsy are exceedingly rare. Furthermore, limited information about treatment responses in such atypical presentations is available. This report introduces a unique case of GCA presenting as an isolated fourth nerve palsy, underscoring the importance of considering GCA in rare neurological presentations and enhancing our understanding of its clinical spectrum.

An 85-year-old woman with a medical history of osteoporosis, cataract surgery, and jaw osteonecrosis on teriparatide injections was referred for double vision. She reported a 3-week history of vertical diplopia, worsening with right gaze and left head tilt, which resolved upon covering either eye. Detailed history revealed concurrent new-onset right-sided headaches, reduced appetite, and lower energy levels. Neuro-ophthalmological examination revealed left hypertropia 3 prism diopter (PD), worse at right gaze and with a head tilt to the left (5 PD). Her hypertropia was worse in down gaze 5 PD compared to the up gaze 2 PD. There were 3 degrees of left eye excyclotorsion, and her fusional amplitude was 1 PD. Visual acuity was 20/50 OD and 20/20 OS, with equal and reactive pupils, full extraocular movements, and no ptosis. The reduced visual acuity was longstanding and documented consistently previously after her cataract surgery over ten years ago. Cranial nerve function, except for the fourth nerve, was normal. A CT scan of the head was unremarkable. Laboratory investigations showed elevated inflammatory markers: Erythrocyte Sedimentation Rate (ESR) 17mm/h (Reference Range 2-24 mm/h), C-reactive protein (CRP) 95.2 mg/l (Unequivocal inflammatory response >10 mg/L)

, and a platelet count of 355 x 10^9/L (Reference Range 155-371 X10^9/L). Prednisone 1mg/kg was initiated due to the elevated CRP, and a temporal artery biopsy (TAB) performed the following week revealed a muscular artery with an inflammatory cell infiltrate involving all three layers, including lymphocytes, macrophages, and multinucleated giant cells adjacent to the internal elastic lamina. Symptoms resolved rapidly with steroid therapy, including resolution of double vision within two days and headache within one week. Appetite and energy levels returned to normal. At the 2-week follow-up, visual acuity was 20/50 OD and 20/20 OS, with no deviation in the primary position.

GCA exhibits a wide range of neurological symptoms, with cranial nerve palsies being particularly noteworthy. Isolated cases of third and sixth nerve palsies linked to GCA have been documented; however, reports of isolated fourth nerve palsy remain rare. In our case, the patient initially sought medical consultation due to double vision, which was diagnosed as a right fourth nerve palsy confirmed by the 3-step test. Additional symptoms included a new headache and diminished appetite. Notably, her platelet count and sedimentation rate were normal, highlighting the critical role of CRP and ESR in diagnosing GCA. This case contributes valuable insights into the rapid resolution and natural history of fourth nerve palsies in GCA, suggesting that the

https://doi.org/10.1017/cjn.2024.344 Published online by Cambridge University Press

underlying pathophysiology likely involves microvascular ischemia, potentially affecting the branches of the posterior cerebral artery that supply the trochlear nerve, leading to ischemic demyelination.

Our literature review has uncovered previous cases of cranial nerve palsies as initial indicators of GCA. For instance, Thurtell et al. reported four cases of third nerve palsy associated with GCA, demonstrating various degrees of completeness and response to treatment (2). Similarly, Wan et al. documented an isolated sixth nerve palsy case with elevated inflammatory markers and confirmatory findings on TAB, which responded favourably to treatment (3). Ross et al. reported an 80-year-old male with right third nerve palsy treated with intravenous methylprednisolone followed by oral prednisone (1). Despite treatment, while his lethargy and generalized weakness resolved, his vision remained with no light perception (NLP), and the right optic disc became pale, with only a mild residual deficit in the up gaze. Another case involved a 73-year-old man with third nerve palsy who showed significant improvement in headache, appetite, and energy levels following treatment with intravenous dexamethasone and oral prednisone. At two months follow-up, right ptosis and limited eye movements of the right eye improved (1).

Trochlear nerve palsy is typically associated with common microvascular comorbidities such as hypertension and type 2 diabetes. A study by Oh et al. of 80 patients with fourth cranial nerve palsies identified various etiologies, including vascular causes, trauma, brain lesions, and decompensated fourth nerve palsy, but did not describe any cases stemming from vasculitis (4). Furthermore, a study by Borruat et al. described an isolated trochlear nerve palsy that was later associated with systemic symptoms leading to a diagnosis of polyarteritis nodosa, underscoring the need to consider a range of systemic vasculitides, including GCA, in cases presenting with isolated cranial nerve palsies (5).

In conclusion, GCA can present with diverse neurological manifestations, including cranial nerve palsies, illustrating the importance of a thorough diagnostic approach in atypical presentations of GCA to prevent severe complications. Our case marks a rare but significant instance of isolated fourth nerve palsy due to GCA, a finding not previously documented in the available literature. We show that reversal back to normal is possible with prompt recognition and treatment.

https://doi.org/10.1017/cjn.2024.344 Published online by Cambridge University Press

Statement of Authorship

SJ: Writing- Original draft, Methodology, Validation, Investigation, Preparation, Visualization

JAM: Supervision, Conceptualization, Validation, Reviewing and Editing

References

1. Ross M, Bursztyn L, Superstein R, Gans M. Multiple cranial nerve palsies in giant cell arteritis. *Journal of Neuro-Ophthalmology*. 2017;37:398-400.

2. Thurtell MJ, Longmuir RA. Third nerve palsy as the initial manifestation of giant cell arteritis. *Journal of Neuro-Ophthalmology*. 2014;34:243-245.

3. Wan K. Case Report: Giant Cell Arteritis presenting with 6th Nerve Palsy without Ischemic Optic Neuropathy. *CRO (Clinical & Refractive Optometry) Journal*. 2022;33.

4. Oh SY, Oh SY. Clinical outcomes and aetiology of fourth cranial nerve palsy with acute vertical diplopia in adults. *Eye (Basingstoke)*. 2020;34:1842-1847.

5. Borruat FX, Kawasaki A, Titzé P, Carota A. Transient trochlear nerve palsy as the presenting neurological sign of panarteritis nodosa. In: *Revue Neurologique*. Vol 161. Elsevier Masson SAS; 2005:567-570.

https://doi.org/10.1017/cjn.2024.344 Published online by Cambridge University Press