OPEN ACCESS

Ocular ischaemic syndrome due to giant cell arteritis

Ethan Charles Wilkinson ,[1,2] Michael McLucas,[3] Tom Ayton,[4] Anthony Dunlop[5]

[1]Ophthalmology, Hunter New England Local Health Network - HNELHN, New Lambton Heights, New South Wales, Australia
[2]The University of Sydney Faculty of Medicine and Health, Sydney, New South Wales, Australia
[3]Tamworth Rural Referral Hospital, Tamworth, New South Wales, Australia
[4]Sydney Hospital and Sydney Eye Hospital, Sydney, New South Wales, Australia
[5]John Hunter Hospital, New Lambton Heights, New South Wales, Australia

Correspondence to
Dr Ethan Charles Wilkinson; wilkinson.ethan@gmail.com

Accepted 4 March 2025

To cite: Wilkinson EC, McLucas M, Ayton T, *et al*. *BMJ Case Rep* 2025;**18**:e262251. doi:10.1136/bcr-2024-262251

SUMMARY

Giant cell arteritis (GCA) is a large vessel vasculitis with devastating visual consequences if left untreated. Classically, GCA has a predilection for the short posterior ciliary arteries which supply the optic nerve head, causing sudden painless visual loss with the development of arteritic anterior ischaemic optic neuropathy (AAION). Other ocular manifestations of GCA include central retinal artery occlusion, oculomotor nerve palsy, posterior ischaemic optic neuropathy and ocular ischaemic syndrome (OIS). OIS is a rare clinical entity, typically stemming from severe, unilateral carotid artery disease. It may present with anterior segment ischaemia heralded by hypotony and corneal oedema. Rarely, it may occur in cases of GCA. We describe an atypical presentation of OIS and oculomotor nerve palsy with contralateral AAION in an elderly patient with a delayed diagnosis of biopsy-proven GCA. This case exemplifies the importance of suspicion, early diagnosis and initiation of treatment in GCA to prevent irreversible loss of vision.

BACKGROUND

Giant cell arteritis (GCA) is the most common form of systemic vasculitis. It is classified as a large vessel vasculitis affecting the aorta and its branches.[1] It has reported prevalence of 19–25 cases per 100 000 people over the age of 50 with a preponderance for Caucasian women.[2] GCA typically affects second to fifth-order branches of the arteries arising from the arch of aorta, especially those supplying the head and neck. It is of autoimmune aetiology with an association with HLA-DR4 alleles. The pathophysiology is thought to be driven by Th1 CD4+T-lymphocytes' recruitment of monocytes and macrophages as a granulomatous process. This results in both systemic and local responses. Systemic response arises through the release of interleukin (IL)-1 and IL-6 by activated monocytes. Local effects may be seen histologically, where GCA presents with skip lesions causing fragmentation of the internal elastic lamina, presence of multinucleated giant cells and inflammatory involvement of all layers of the arterial wall.[3] Clinically, systemic effects result in the presence of malaise, myalgia, fever, anorexia and weight loss. Local effects are dependent on the distribution of arteries affected. These effects may include new onset headache with or without scalp tenderness with superficial temporal artery involvement, jaw claudication with internal maxillary involvement and vision loss with involvement of the ophthalmic arteries and their branches. Additionally, GCA may affect the aorta with risk of aneurysm formation, aortitis, stenosis and dissection.[4]

GCA may result in irreversible loss of vision in up to 30% of patients.[5] Improvements in diagnosis and treatment have resulted in a trend of decreasing incidence of visual loss, though when established, it is largely permanent.[6] Irreversible vision loss is most commonly due to arteritic anterior ischaemic optic neuropathy (AAION) with a predilection for involvement of the short posterior ciliary arteries. Typically, 16–20 short posterior ciliary arteries arise from the ophthalmic artery to supply the choroid posterior to the equator and the optic nerve head through the anastomotic circle of Zinn-Haller.[7] When these vessels are affected in GCA, chalky optic disc pallor, with or without retinal ischaemia, may be present. Less commonly, the ophthalmic artery may be affected by GCA.[5 8] The ophthalmic artery supplies the entire globe with important branches including the short posterior ciliary arteries as described above, the central retinal artery and the vessels of the anterior segment. The vessels of the anterior segment form the major arterial circle of the iris which receives blood from the two long posterior ciliary arteries and the seven anterior ciliary arteries which arise from the muscular branches of the ophthalmic artery. Additionally, the ophthalmic artery can provide small branches to supply the nerves to the extraocular muscles including the oculomotor nerve.[7]

Treatment of GCA involves timely commencement of immunosuppression to reduce ischaemic complications. In the absence of treatment, irreversible vision loss has been reported to occur in 15–35% of cases of GCA. Furthermore, in the absence of immunosuppression, visual loss in one eye confers a 50% risk of visual loss in the contralateral eye within 5 days.[9 10] Hence, timely treatment is critical in preserving vision.

We present a case of severe bilateral vision loss with features of ocular ischaemic syndrome (OIS) with contralateral AAION in biopsy-proven GCA with a delay in diagnosis and initiation of treatment. This case exemplifies the importance of early diagnosis and treatment initiation in cases of possible GCA.

CASE PRESENTATION

An elderly, previously independent woman in her late 80s presented with sudden, complete, left-sided vision loss on awakening. Three weeks prior, she had developed jaw claudication and horizontal diplopia which was thought to be vertiginous in nature. Subsequently, a referral to local optometry services was made by the primary care physician. Optometry services reported the presence of a partial left oculomotor nerve palsy and right optic disc swelling with a referral made to a private ophthalmology clinic. Her vision at the time of the

private ophthalmology review was 6/9 in the right eye and 6/6 in the left eye. She was subsequently diagnosed with non-AAION (NAAION) with a recommendation for right eye patching. An MRI brain was obtained with normal findings. While the eye was patched, vision deteriorated suddenly with no medical attention sought. At the time of presentation to our department, she was seeing light perception only in the right eye and counting fingers in the left. Intraocular pressure (IOP) in the left eye was 4 mm Hg by iCare measurement suggesting ischaemia of the ciliary body with resulting hypotony. Her left scalp was tender with loss of her temporal pulse. No features of polymyalgia rheumatica were present. Slit lamp examination revealed left-sided cornea oedema with prominent Descemet membrane folds as seen in figure 1 below.

Posterior examination on the left eye was obstructed by corneal oedema. On the right, features of AAION were present with a chalky pale optic disc with 360 degrees of swelling and patchy peripapillary changes as seen in figure 2. Additionally, examination revealed an adduction and upgaze limitation of the left eye and an associated ptosis, consistent with a partial oculomotor nerve palsy. Her medical history was significant only for hypertension. Prior to the onset of diplopia, she had been living completely independently with an unrestricted driving licence. Earlier that year, she was an active member of the local golf club.

Her presentation was highly concerning for GCA, with pulsed intravenous methylprednisolone commenced urgently to limit the risk of further progression and ischaemic complications.

INVESTIGATIONS

In addition to a highly suggestive clinical presentation, the diagnosis of GCA was further supported by investigations. Her erythrocyte sedimentation rate (ESR) was elevated at 111 mm/hour with a C reactive protein (CRP) of 74 mg/L supporting the suspicion of an inflammatory aetiology. A superficial temporal artery Doppler ultrasound revealed the presence of a positive 'halo sign' bilaterally. This is an increasingly accepted sign of GCA which may allow for non-invasive diagnostic confirmation. This is seen in figure 3 below. The hypoechoic ring surrounding the arterial flow is due to tissue oedema.[11]

Optical coherence tomography (OCT) confirmed the presence of optic nerve head swelling in the right eye consistent with AAION as seen in figure 4. Corneal oedema prevented scanning in the left eye.

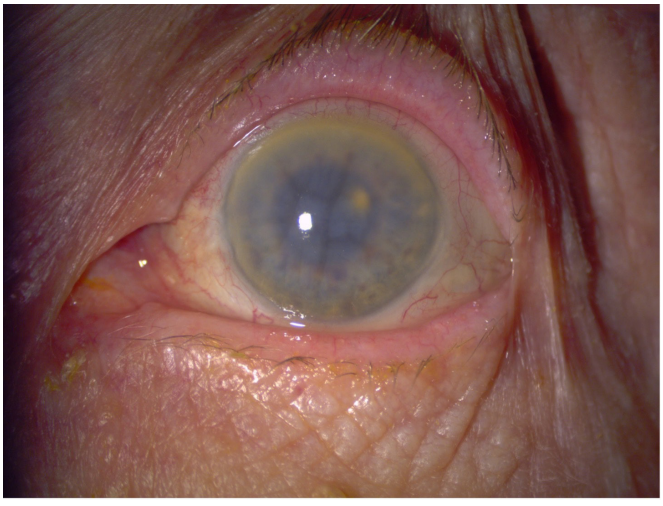

Figure 1 Slit lamp examination of the left eye showing corneal oedema and Descemet membrane folds.

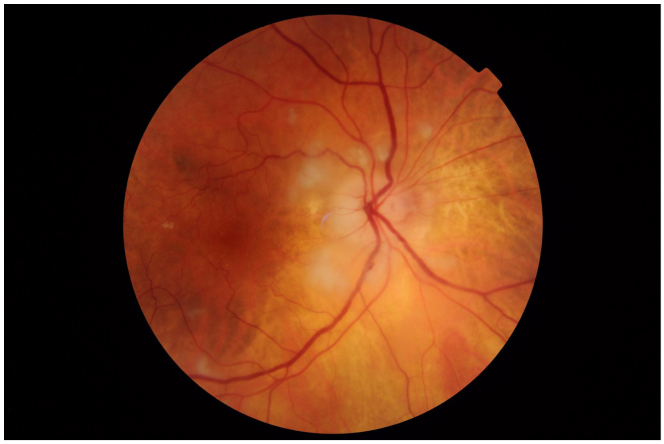

Figure 2 Fundus photograph of the right eye showing a chalky optic disc, cotton wool spots and scattered patchy peripapillary atrophic changes.

A temporal artery biopsy confirmed the diagnosis of GCA, revealing marked intimal fibrosis, patchy infiltrate throughout all layers of the vessel wall and the presence of a giant cell. Additionally, there was fragmentation, thickening and duplication of the internal elastic lamina. A repeat MRI of the brain and orbits with magnetic resonance angiography (MRA) was unremarkable with normal intracranial vascular flow and no optic nerve enhancement. Thus, a diagnosis of GCA was made using the 2022 European Alliance of Associations for Rheumatology classification criteria, on the basis of both positive superficial temporal artery biopsy and Doppler ultrasound, ESR >50 mm/hour and CRP >10 mg/L, sudden visual loss and jaw claudication.[1]

DIFFERENTIAL DIAGNOSIS

The main differential diagnosis discussed within this case is NAAION. NAAION is caused by obstruction of short posterior ciliary artery flow, classically presenting with altitudinal field loss, commonly on awakening. It is typically seen in patients with crowded optic discs and underlying vascular risk factors or periods of significant hypotension. Conversely, patients with GCA typically have few comorbidities at baseline, as seen in the above case.[12] Occult GCA may create diagnostic uncertainty. It is present in up to 20% of cases of biopsy-proven GCA, with normal inflammatory markers and absence of systemic symptoms.[13] Another differential of OIS is unilateral atherosclerotic carotid artery stenosis. This is unlikely in this case as the patient had no vascular risk factors, no past vascular disease with normal

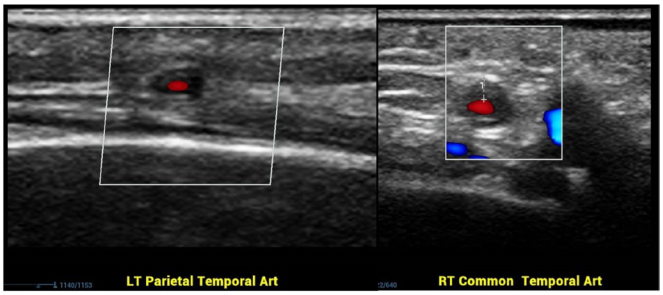

Figure 3 Halo sign on superficial temporal artery Doppler ultrasound.

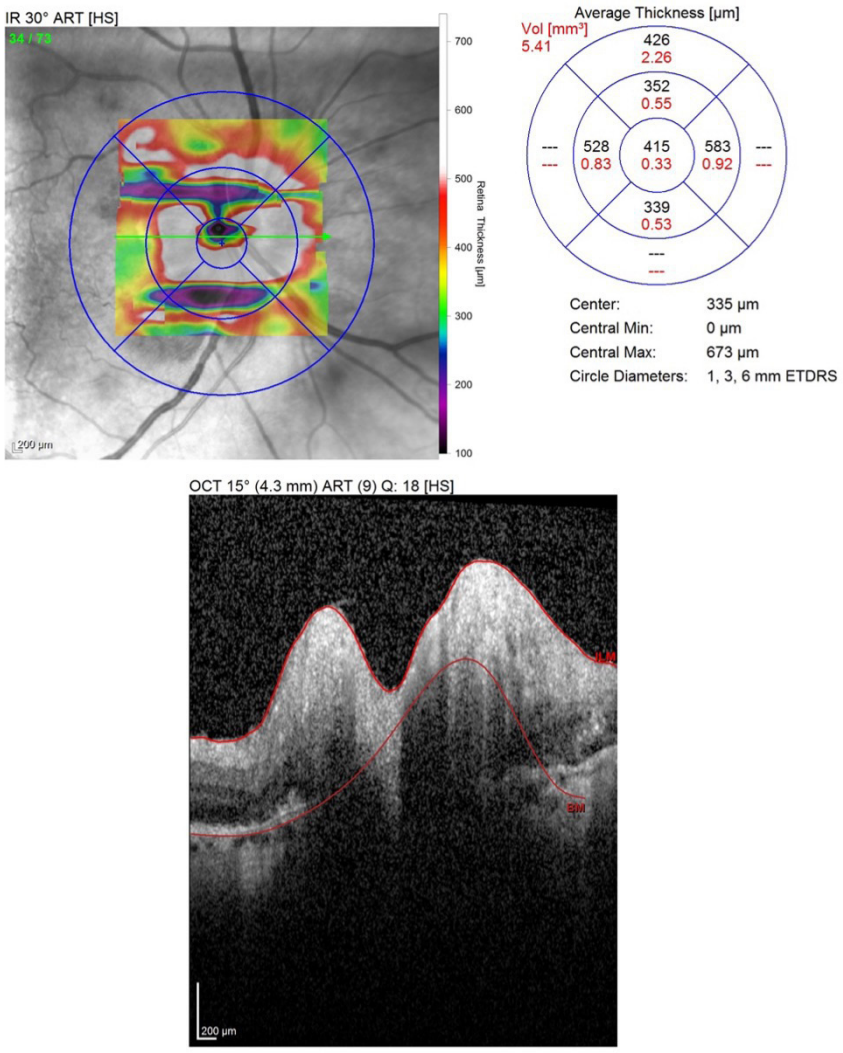

Figure 4 Optical coherence tomography of the right optic nerve head showing marked optic nerve head swelling.

flow and appearance of the intracranial vessels on MRA and features of AAION in the contralateral eye. In the case above, a diagnosis of GCA can be made on the basis of jaw claudication, biopsy and ultrasonographic findings and raised inflammatory markers.

TREATMENT

Urgent administration of 1000 mg of pulsed intravenous methylprednisolone was commenced in keeping with the American College of Rheumatology guidelines for newly diagnosed GCA with visual symptoms. Trimethoprim/sulfamethoxazole was provided for *Pneumocystis jirovecii* pneumonia prophylaxis, and proton pump inhibitor therapy was initiated for peptic ulcer prophylaxis. After a 3-day course of pulsed intravenous methylprednisolone, she was stepped down to 50 mg oral prednisolone. Tocilizumab was commenced concurrently as a monoclonal antibody towards the IL-6 receptor in keeping with the GiACTA protocol.[14]

OUTCOME AND FOLLOW-UP

Within 5 days of commencing steroid therapy, the corneal oedema had improved markedly with a posterior view able to be obtained, although a hazy one. Follow-up at 1 month showed vision of 6/24 and IOP 4 mm Hg with resolution of the corneal oedema. In the right eye, the vision was light perception only. A view posteriorly was obtained as seen in figure 5. Standard automated perimetry revealed preservation of a small region of the superior central vision accounting for the return of visual acuity as seen in figure 6. OCT revealed relative preservation of

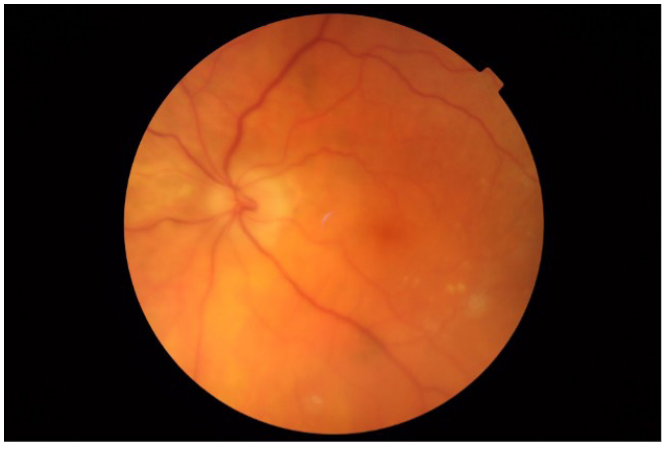

Figure 5 Fundus photograph of the left eye on resolution of corneal oedema.

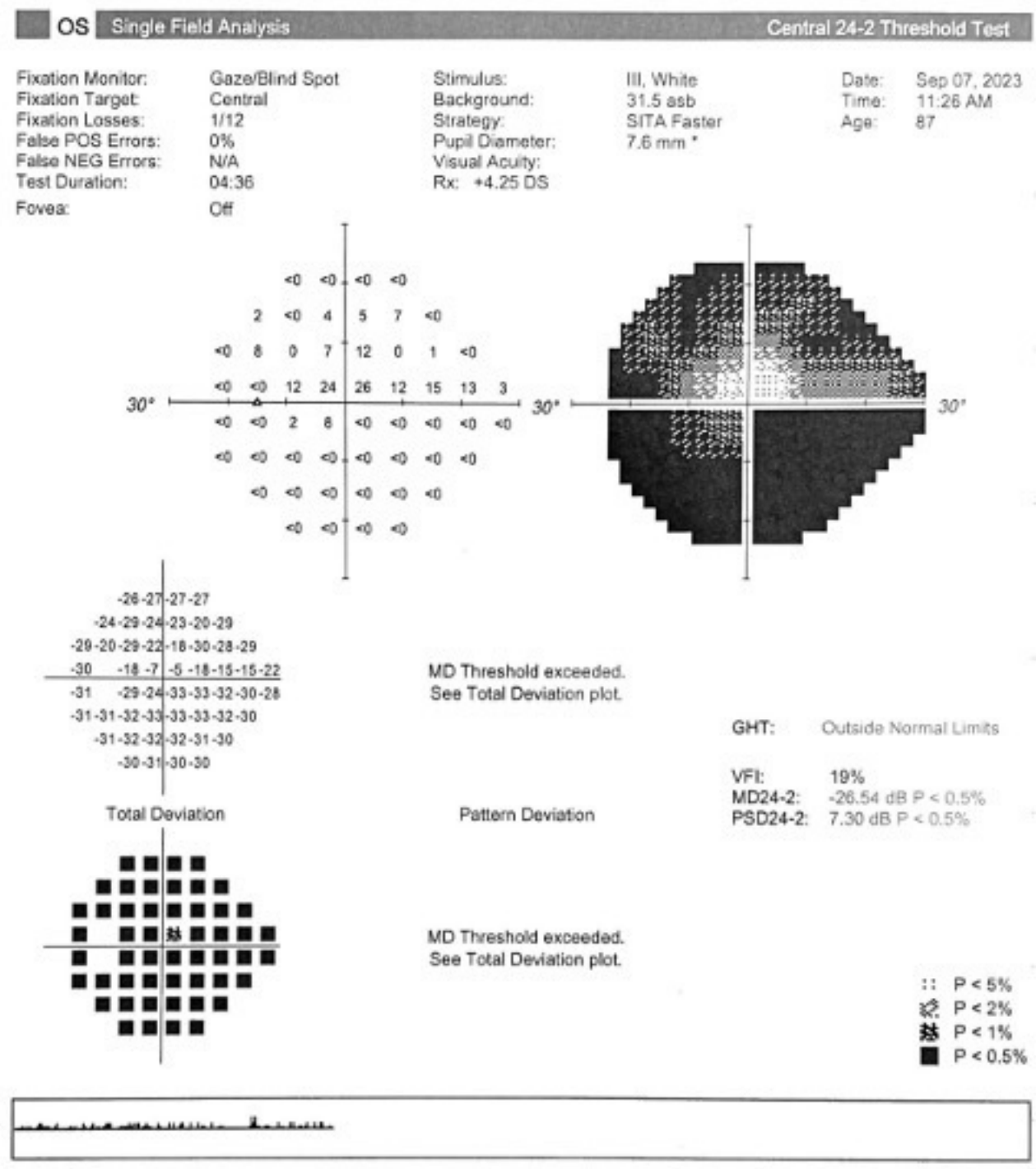

Figure 6 Visual field testing of the left eye.

retinal nerve fibre layer thickness with resolving cytotoxic retinal oedema secondary to the ischaemic primary insult.

DISCUSSION

While GCA commonly affects the short posterior ciliary arteries resulting in AAION, it rarely affects the ophthalmic artery to cause OIS. The globe is normally relatively protected from OIS due to the presence of multiple anastomoses between internal and external carotid artery systems. Therefore, for OIS to arise, obstruction must be at the level of the common carotid or involving both the ophthalmic artery and one or more external carotid artery branches. Collateral supply to the ophthalmic artery may be derived from the superficial temporal artery, branches of the internal maxillary artery and the facial artery.[15] In this case, involvement of the external carotid is evident in symptoms of jaw claudication and superficial temporal artery involvement on biopsy, with apparent internal carotid involvement with the presentation of OIS. Relative preservation and improvement of vision over the 1-month period of observation may be due to resolving retinal and optic nerve head oedema with residual optic nerve function. This may be in combination with potential collateral supply by a patent cilioretinal artery supplying the inferomacular region.

Hamed *et al* present four cases of ocular ischaemic syndrome secondary to biopsy-proven GCA, signified by the presence of retinal or optic nerve head ischaemia, corneal oedema with Descemet's membrane folds and hypotony.[16] Similar to the above case, the corneal oedema tended to improve with steroid therapy; however, visual outcomes remained extremely poor owing to the underlying retinal or optic nerve head ischaemia.[16] Pellegrini *et al* discuss a case of a diagnostic dilemma in a patient with corneal decompensation secondary to bilateral rapidly-progressive OIS due to biopsy-proven GCA.[17] In this case, the corneal oedema resolved with steroid therapy while vision remained poor with no light perception bilaterally.[17] Husain *et al* reported OIS in a case of occult GCA with mild anterior chamber inflammation and significant choroidal infarction.[18] Furthermore, Casson *et al* present a similar case in the context of multiple weeks of jaw claudication and systemic manifestations preceding onset.[19] All these cases report an element of diagnostic delay, thereby reinforcing the need for early diagnosis and prompt initiation of immunosuppressive therapy.[16–19] Conversely, a concerning case reported by Hwang *et al* describes unilateral OIS due to biopsy-proven GCA progressing to involve the contralateral eye within 1 week despite prompt treatment with intravenous methylprednisolone. This resulted in no light perception in either eye.[20] Our case is the only known case to the authors at the time of publication to have some residual functional vision. Interestingly, it is also the only case reported in which tocilizumab has been used, providing further evidence for its efficacy. Nevertheless, GCA is a true ophthalmic emergency associated with devastating visual outcomes, especially if there is a delay in the initiation of immunosuppressive therapy. It has a high prevalence among the elderly population and should always be considered when assessing this demographic. This case highlights the need for urgent and thorough ophthalmic assessment in elderly patients with new onset visual changes for concerns of GCA.

Learning points

- Always consider giant cell arteritis (GCA) in elderly patients with ocular findings.
- A diagnosis of non-arteritic anterior ischaemic optic neuropathy should be made with careful consideration of arteritic anterior ischaemic optic neuropathy.
- GCA is a true ophthalmic emergency with prompt initiation of immunosuppressive therapy vital to reduce the risk of irreversible loss of vision.

Acknowledgements We acknowledge GM as the consultant rheumatologist involved in the care of the patient, who assisted with the consent process. We would also like to thank CG, the orthoptist who assisted in performing visual field testing.

Contributors The following authors were responsible for drafting of the text, sourcing and editing of clinical images, investigation results, drawing original diagrams and algorithms and critical revision for important intellectual content: ECW, MML, TA and AD. The following authors gave final approval of the manuscript: ECW, MML, TA and AD.ECW is the project lead and responsible for the ethical conduct of the research, creating the initial draft and taking the clinical photographs, OCT and visual fields present. ECW acted as guarantor. MML assisted in creating the initial drafts and contributed rheumatological input. TA was responsible for the diagnosis of the case and provided ophthalmological input as the most senior ophthalmologist directly involved in the case. AD is a consultant ophthalmologist who provided valuable insights and revisions to the final draft.

Funding The authors have not declared a specific grant for this research from any funding agency in the public, commercial or not-for-profit sectors.

Competing interests None declared.

Patient consent for publication Consent obtained directly from patient(s).

Provenance and peer review Not commissioned; externally peer reviewed.

ORCID iD

Ethan Charles Wilkinson http://orcid.org/0009-0007-0171-4266

REFERENCES

1 Ponte C, Grayson PC, Robson JC, *et al*. 2022 American College of Rheumatology/EULAR classification criteria for giant cell arteritis. *Ann Rheum Dis* 2022;81:1647:1647–53:.
2 Therkildsen P, de Thurah A, Hansen IT, *et al*. Giant cell arteritis: A nationwide, population-based cohort study on incidence, diagnostic imaging, and glucocorticoid treatment. *Semin Arthritis Rheum* 2021;51:360–6.
3 Colburn N. Vasculitides. In: Colburn N, ed. *Review of Rheumatology*. London: Springer, 2012: 279–362.
4 Ford JA, Gewurz D, Gewurz-Singer O. Tocilizumab in giant cell arteritis: an update for the clinician. *Curr Opin Rheumatol* 2023;35:135–40.
5 Donaldson L, Margolin E. Vision loss in giant cell arteritis. *Pract Neurol* 2022;22:138–40.
6 Singh AG, Kermani TA, Crowson CS, *et al*. Visual manifestations in giant cell arteritis: trend over 5 decades in a population-based cohort. *J Rheumatol* 2015;42:309:309–15:.
7 Snell R, Lemp M. *Clinical anatomy of the eye*. 2nd edn. Wiley-Blackwell, 2013.
8 Hayreh SS. Giant cell arteritis: Its ophthalmic manifestations. *Indian J Ophthalmol* 2021;69:227–35.
9 Camellino D, Matteson EL, Buttgereit F, *et al*. Monitoring and long-term management of giant cell arteritis and polymyalgia rheumatica. *Nat Rev Rheumatol* 2020;16:481–95.
10 González-Gay MA, Blanco R, Rodríguez-Valverde V, *et al*. Permanent visual loss and cerebrovascular accidents in giant cell arteritis: Predictors and response to treatment. *Arthritis & Rheumatism* 1998;41:1497–504.
11 Schmidt WA, Kraft HE, Vorpahl K, *et al*. Color duplex ultrasonography in the diagnosis of temporal arteritis. *N Engl J Med* 1997;337:1336–42.
12 Elfishawi M, Rakholiya J, Gunderson TM, *et al*. Lower Frequency of Comorbidities Prior to Onset of Giant Cell Arteritis: A Population-Based Study. *J Rheumatol* 2023;50:526–31.
13 Salmon J, Kanski J. *Kanski's clinical ophthalmology: a systematic approach*. 9th edn. Edinburgh: Elsevier, 2020.
14 Stone JH, Tuckwell K, Dimonaco S, *et al*. Trial of Tocilizumab in Giant-Cell Arteritis. *N Engl J Med* 2017;377:317–28.
15 Geibprasert S, Pongpech S, Armstrong D, *et al*. Dangerous extracranial-intracranial anastomoses and supply to the cranial nerves: vessels the neurointerventionalist needs to know. *AJNR Am J Neuroradiol* 2009;30:1459–68.
16 Hamed LM, Guy JR, Moster ML, *et al*. Giant cell arteritis in the ocular ischemic syndrome. *Am J Ophthalmol* 1992;113:702–5.
17 Pellegrini F, Prosdocimo G, Bonsanto D, *et al*. Thick corneas, large pupils, and a giant problem. *Surv Ophthalmol* 2018;63:595–9.
18 Husain R, Graham E, Thomas D, *et al*. Ocular Ischaemic Syndrome Secondary to Occult Giant Cell Arteritis. *Neuroophthalmology* 2008;32:295–8.
19 Casson RJ, Fleming FK, Shaikh A, *et al*. Bilateral ocular ischemic syndrome secondary to giant cell arteritis. *Arch Ophthalmol* 2001;119:306–7.
20 Hwang JM, Girkin CA, Perry JD, *et al*. Bilateral ocular ischemic syndrome secondary to giant cell arteritis progressing despite corticosteroid treatment. *Am J Ophthalmol* 1999;127:102–4.