LETTER TO THE EDITOR

To The Editor

Central Retinal Vein Occlusion and Compressive Optic Neuropathy Secondary to Thyroid Eye Disease

Keywords Copper deficiency, Myeloneuropathy, Hematological disease, MRI

A 53-year-old woman presented with sudden vision loss in the right eye (RE) that had occurred two weeks earlier. There was a past medical history of hypertension, dyslipidemia, and hyperthyroidism treated 15 years ago with radioactive iodine and a 35-year history of smoking 1 pack of cigarettes daily. She reported a 6-month history of mildly blurred vision in RE preceding the acute visual loss, as well as bilateral periorbital swelling. On examination, visual acuity was no light perception (NLP) in RE and 20/20 in left eye (LE) with a brisk right relative afferent pupillary defect (RAPD). Hertel exophthalmometry demonstrated 3 mm of right-sided proptosis. She could not supra- or inferoduct RE and had a mild abduction deficit in the same eye. Motility in LE was intact. She had bilateral periorbital edema with prominence of episcleral vessels mostly in RE on biomicroscopic examination. Ophthalmoscopy demonstrated diffuse optic disc edema, venous tortuosity, and engorgement with scattered intraretinal hemorrhages in all quadrants in RE, consistent with central retinal vein occlusion (CRVO); it was normal in LE (Figure 1A). Laboratory testing revealed undetectable thyrotropin level <0.01mU/L and elevated free thyroxine (T4) of 25 pmol/L. Urgent orbital magnetic resonance imaging (MRI) with contrast demonstrated bilateral proptosis with orbital fat stranding and bilateral enlargement of all extraocular muscles, primarily around their origins and resultant severe crowding of the right orbital apex with no remaining orbital fat visible on the right (Figure 1B-D). There was also restricted diffusion in the distal portion of right intraorbital optic nerve on diffusion-weighted imaging (DWI). A diagnosis of right orbital apex syndrome complicated by CRVO secondary to severe thyroid orbitopathy was made. Treatment with intravenous methylprednisolone 1 g daily was started but because visual acuity did not improve, a decision to proceed with three-wall orbital decompression was made two days later. Unfortunately, visual acuity did not improve postoperatively. A slow taper of oral prednisone commenced and left orbital decompression surgery were planned. One month later, while on 40 mg of oral prednisone, the patient noticed blurry vision in LE. Visual acuity was 20/60 with mild elevation of the optic nerve on ophthalmoscopy and early nerve fiber bundle defect on visual field testing. Urgent left orbital decompression was performed and vision in LE improved to 20/20 with complete resolution of the visual field defect.

While thyroid-related eye disease (TED) manifests with mild symptoms in most patients, a minority of patients may have sight-threatening orbitopathy. TED is seen predominantly in hyperthyroid states but can be associated with hypo- and euthyroidism as well.[1] Irreversible catastrophic loss of vision to NLP secondary to TED with concomitant CRVO has not been previously reported in the literature: our case highlights the importance of early recognition of orbital apex syndrome in TED to prevent blindness.

Dysthyroid optic neuropathy (DON) is the most common cause of severe vision loss in TED and develops due to optic nerve compression, or, less frequently, optic nerve stretching.[2] Mechanical compression typically occurs at the annulus of Zinn secondary to increased volume of the recti muscles in the crowded orbital apex.[3] Inflammatory proliferation of fibroblasts also reduces compliance of orbital soft tissues, thereby limiting orbital volume and increasing risk of optic nerve compression. Finally, reduced venous drainage and proptosis-related stretching of the optic nerve may induce ischemia, which may in turn contribute to DON progression.[3] Impaired outflow of the superior ophthalmic vein can similarly cause intraocular venous stasis and is likewise a risk factor for CRVO. However, it is hypothesized that the presence of collateral circulation and alternate routes of venous drainage within the orbit contribute to the very low reported incidence of CRVO among patients with TED.[4]

Early surgical intervention may halt or reverse vision loss in severe DON. Current guidelines recommend high-dose intravenous glucocorticoids as first-line treatment for sight-threatening DON; subsequent orbital decompression surgery is indicated for patients who show poor improvement within two weeks or display chorioretinal folds or eyeball subluxation at the time of diagnosis.[5] However, high-dose glucocorticoid therapy alone has been shown to improve vision in less than 50% of patients with sight-threatening DON.[6,7] A randomized controlled trial by Curro et al. suggested that patients presenting with optic nerve edema may be less likely to respond to intravenous steroids and should be considered for primary orbital decompression.[8] Surgical decompression may have benefits for patients with severe vision loss outside the acute window: Devoto et al. reported a case series of patients with prolonged NLP vision who achieved visual recovery following delayed orbital decompression, highlighting the potential for optic nerve axons to survive prolonged DON.[8] Decompressive surgery has also been reported to reverse CRVO in severe DON, which may ameliorate retinal ischemia and contribute to better visual outcomes.[4] Taken together, the limited data on management of sight-threatening DON suggest a low threshold to consider orbital decompressive surgery to mitigate severe vision loss, particularly if optic nerve edema or chorioretinal signs of increased orbital pressure are present. Our patient unfortunately did not regain vision following right eye orbital decompression even though optic disc edema and intraretinal hemorrhages resolved postoperatively. We hypothesize that preoperative severe optic nerve ischemia, as demonstrated by restricted diffusion of the intraorbital portion of optic nerve on DWI, was an indicator of poor visual prognosis.

In summary, we describe a unique case of severe DON complicated by CRVO leading to NLP vision, adding to the limited literature regarding this challenging clinical scenario. DON is a complication of TED that may present to neuro-ophthalmologists and requires rapid intervention to limit adverse outcomes, particularly as the incidence of sight-threatening TED is increasing.[2] This case is also a reminder that TED can preferentially involve posterior portion of extraocular muscles and present with only mild proptosis and should also be on a differential diagnosis of patients presenting with CRVO. Urgent orbital decompression should be considered in patients with

https://doi.org/10.1017/cjn.2021.85 Published online by Cambridge University Press

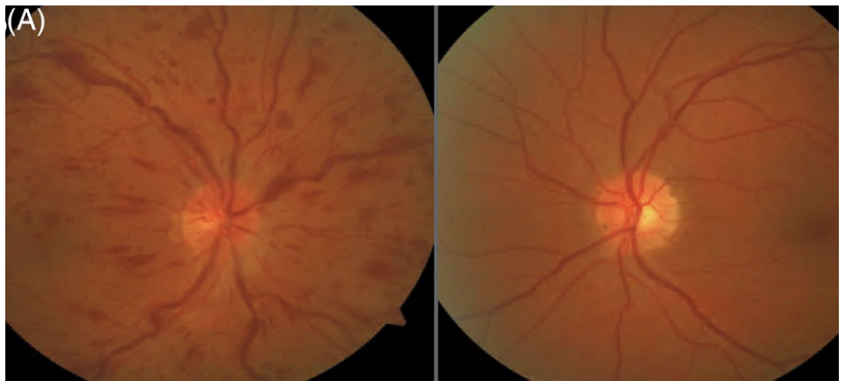

Figure 1A: *Fundus photographs showing dilated and tortuous retinal veins with intraretinal hemorrhages in all four quadrants on the right, consistent with diagnosis of central retinal vein occlusion.*

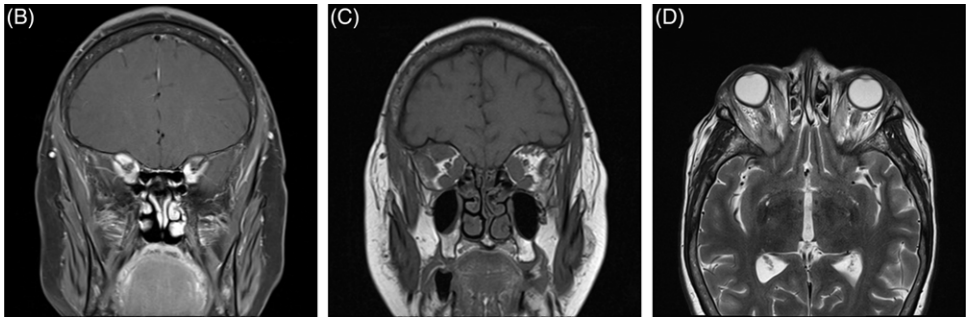

Figure 1B: *T1-weighted post-contrast coronal image demonstrating very severe crowding in the orbital apex, greater on the right; Figure 1C: T1-weighted coronal image through posterior orbits showing severely enlarged all extraocular muscles; Figure 1D: T2-weighted axial image demonstrating enlargement of predominantly posterior portion of all extraocular muscles.*

dysthyroid optic neuropathy. Careful clinical examination to identify optic disc edema, concomitant retinal pathology, and utilization of orbital MRI with DWI sequence may provide important prognostic clues to the extent of ischemic optic neuropathy and should prompt clinicians to recommend early surgical treatment. Future research should investigate the role of diffusion-weighted MRI in predicting treatment response.

Conflict of Interest

None.

Statement of Authorship

All authors contributed equally to the aquisition of data, preparation of the manuscript, reviewing its contents, and writing and revising it.

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References

1. Bahn RS. Graves' ophthalmopathy. N Engl J Med. 2010;362:726–38. doi: 10.1056/NEJMra0905750
2. Tramunt B, Imbert P, Grunenwald S, Boutault F, Caron P. Sight-threatening Graves' orbitopathy: twenty years' experience of a multidisciplinary thyroid-eye outpatient clinic. Clinical Endocrinology. 2019;90:208–13. doi:https://doi.org/10.1111/cen.13880
3. Blandford AD, Zhang D, Chundury RV, Perry JD. Dysthyroid optic neuropathy: update on pathogenesis, diagnosis, and management. Expert Rev Ophthalmol. 2017;12:111–21. doi: 10.1080/17469899.2017.1276444

https://doi.org/10.1017/cjn.2021.85 Published online by Cambridge University Press

4. Grob SR, Yoon MK. Central retinal vein occlusion resolving after orbital decompression in thyroid eye disease. Ophthalmic Plast Reconstr Surg. 2017;33:S188–90. doi: 10.1097/IOP.0000000000000635
5. Bartalena L, Baldeschi L, Boboridis K, et al. The 2016 European Thyroid Association/European Group on Graves' Orbitopathy Guidelines for the Management of Graves' Orbitopathy. Eur Thyroid J. 2016;5:9–26. doi: 10.1159/000443828
6. Wakelkamp IMMJ, Baldeschi L, Saeed P, Mourits MP, Prummel MF, Wiersinga WM. Surgical or medical decompression as a first-line treatment of optic neuropathy in Graves' ophthalmopathy? A randomized controlled trial. Clin Endocrinol. 2005;63:323–8. doi:https://doi.org/10.1111/j.1365-2265.2005.02345.x
7. Currò N, Covelli D, Vannucchi G, et al. Therapeutic outcomes of high-dose intravenous steroids in the treatment of dysthyroid optic neuropathy. Thyroid. 2014;24:897–905. doi: 10.1089/thy.2013.0445
8. Devoto MH, Golnik K, Bernardini FP, Alencar VM. Improvement from no light perception after orbital decompression for Graves' optic neuropathy. Ophthalmology. 2014;121:431–432.e1. doi: 10.1016/j.ophtha.2013.09.031

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