

# Unilateral Proptosis and Raised Intraocular Pressure Due to Brachiocephalic Vein Stenosis in a Hemodialysis Patient

Jason Timothy Pan<sup>1\*</sup>, Dayna Wei Wei Yong<sup>2</sup>, Clement Tan<sup>2</sup>, Raj Menon<sup>3</sup>, Hazel Anne Lin<sup>2</sup>

<sup>1</sup>Ministry of Health Holdings (MOHH), Singapore

<sup>2</sup>Department of Ophthalmology, National University Hospital, Singapore

<sup>3</sup>Department of Cardiac, Thoracic and Vascular Surgery, National University Heart Centre, Singapore

\*Correspondence author: Jason Timothy Pan, MBBS (Hons) (S'pore), Ministry of Health Holdings (MOHH), Singapore; Email: [jason.pan@u.nus.edu](mailto:jason.pan@u.nus.edu)

Citation: Pan JT, et al. Unilateral Proptosis and Raised Intraocular Pressure Due to Brachiocephalic Vein Stenosis in a Hemodialysis Patient. *J Ophthalmol Adv Res.* 2026;7(1):1-7.

<https://doi.org/10.46889/JOAR.2026.7109>

Received Date: 07-02-2026

Accepted Date: 25-02-2026

Published Date: 04-03-2026



Copyright: © 2026 The Authors. Published by Athenaem Scientific Publishers.

This is an open access article distributed under the terms of the Creative Commons Attribution 4.0 International License (CC BY 4.0), which permits unrestricted use, distribution, and reproduction in any medium, provided the original work is properly cited.

License URL:

<https://creativecommons.org/licenses/by/4.0/>

## Abstract

**Background:** Central venous stenosis is a known complication in hemodialysis patients, but its association with sight-threatening complications is rare.

**Case Presentation:** A 56-year-old female on hemodialysis presented with progressive binocular diplopia and features of episcleral venous hypertension. On examination she had proptosis, corkscrew vessels, raised Intraocular Pressure (IOP) (30 mmHg) and limitation in elevation and adduction of the left eye. Her Best-Corrected Visual Acuity (BCVA) was 20/30+2 in the right and 20/100-1 in the left. Initial cerebral angiogram was negative for carotid-cavernous fistula. Further questioning revealed she underwent a left brachiocephalic Arteriovenous Fistula (AVF) creation 3 years prior, requiring 3 fistuloplasties due to AVF stenosis. Vascular Surgery was consulted and a Central Venography and left arm Fistulogram was performed, showing a focal occlusion of the left brachiocephalic vein with extensive reflux into the collateral venous channels. This was treated with angioplasty and stenting of the brachiocephalic vein.

**Outcome:** Within 2 days of intervention, proptosis resolved and IOP reduced to 20 mmHg, with further normalization to 15 mmHg at 3-month follow-up, with improved BCVA (20/30) and full ocular motility of the left eye. Discontinuation of IOP-lowering medications and lubricants was possible.

**Conclusion:** This rare case highlights the importance of recognizing central venous stenosis as a potential cause of sight-threatening complications in hemodialysis patients. Early recognition and timely intervention can result in favorable visual outcomes.

**Keywords:** Brachiocephalic Vein Stenosis; Hemodialysis; Proptosis; Raised Intraocular Pressure; Episcleral Venous Hypertension; Central Venous Stenosis

## Introduction

With the rising prevalence of kidney disease, more patients are increasingly reliant on hemodialysis for renal replacement therapy [1]. In patients with AVFs for hemodialysis access, up to 70% of patients with a coexisting ipsilateral central venous stenosis will experience symptomatic venous hypertension due to increased arterIALIZED retrograde flow [2]. This most commonly presents with ipsilateral arm or face swelling [3]. However, sight-threatening complications are occasionally reported. We present a case of central venous stenosis presenting with episcleral venous hypertension to highlight the importance of prompt diagnosis and treatment of sight-threatening complications.

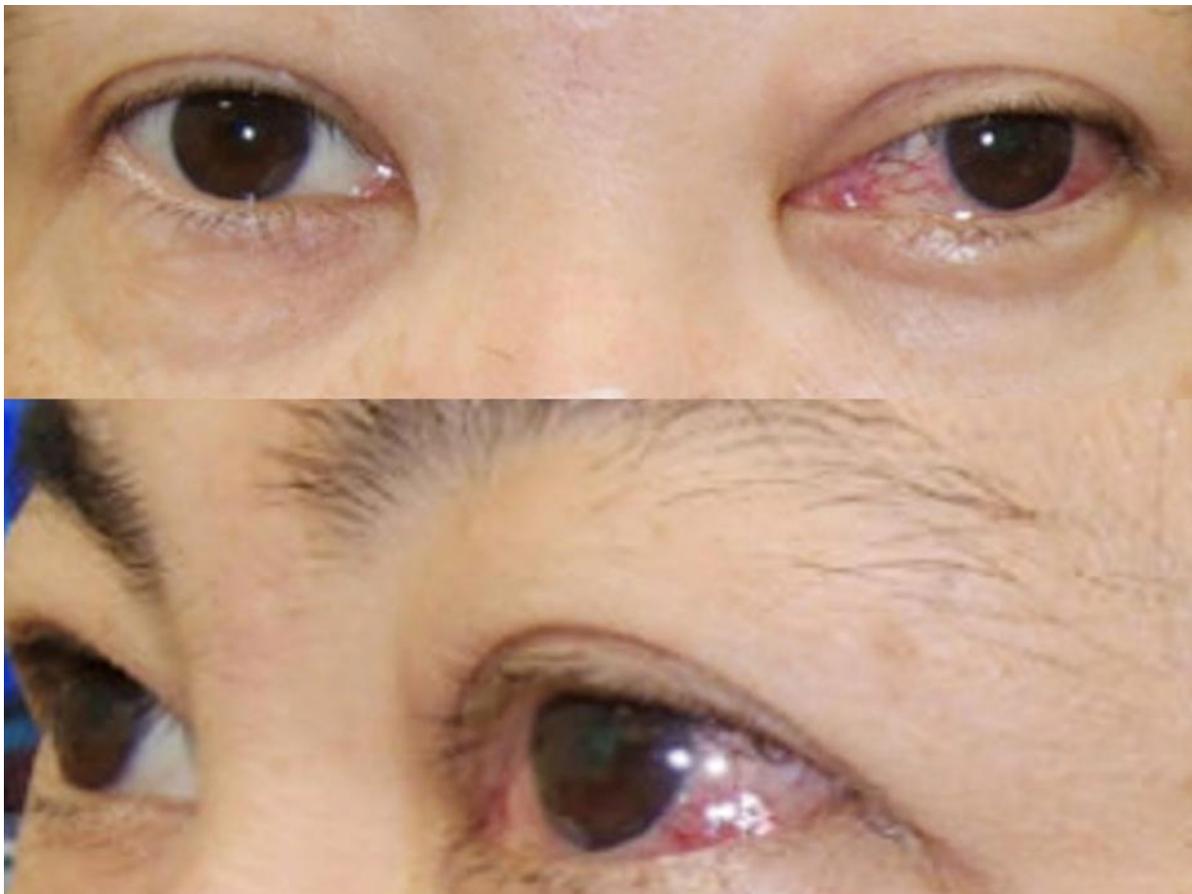
## Case Description

A 56-year-old female with a past medical history notable for end-stage renal failure on hemodialysis was referred to Ophthalmology for progressively worsening binocular diplopia of 1 year's duration, associated with left eye redness. At first presentation, she was found to have the features of episcleral venous hypertension: dilated episcleral veins emerging from the limbus throughout 360 degrees with some "corkscrew" features indicating lengthening in addition to dilatation of the vessels. This was associated with left adduction, supraduction and abduction deficits. These features were suggestive of a Carotid-Cavernous Fistula (CCF) and she was referred to the Neurosurgery department for evaluation. However, digital subtraction angiography did not detect any evidence of CCF and she was discharged from Neurosurgery.

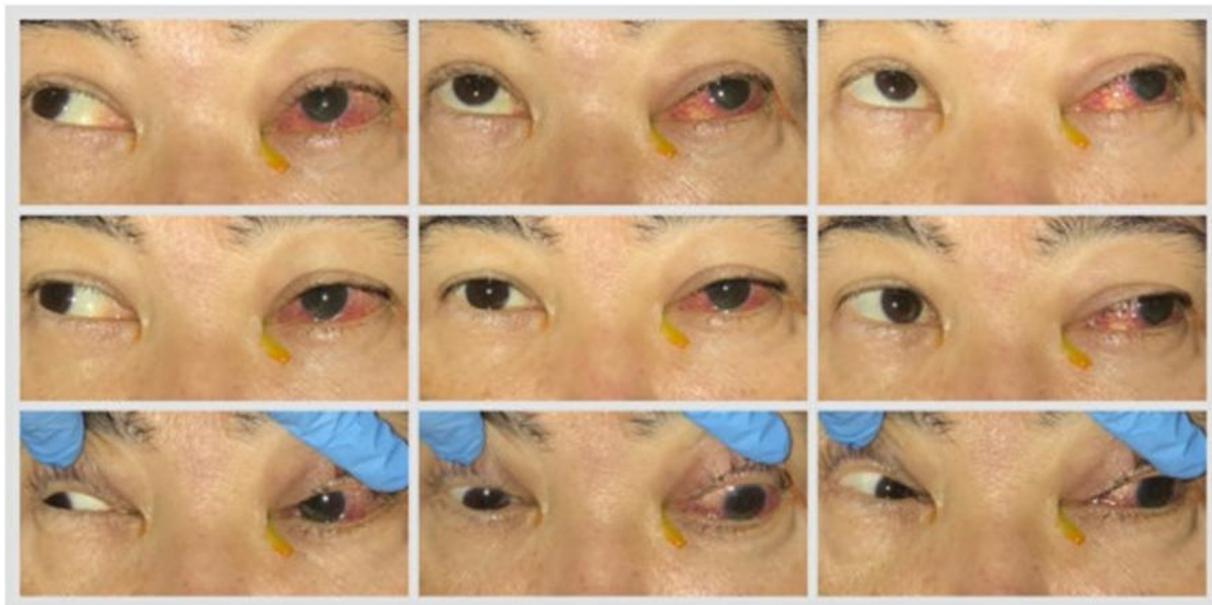
She was subsequently referred to the Neuro-Ophthalmology service. Previously noted left-sided proptosis (Based 70 mm. Right eye 13 mm, left eye 18 mm), exotropia and episcleral corkscrew vessels were still present (Fig. 1). Her Best-Corrected Visual Acuity (BCVA) was 20/30+2 in the right and 20/100-1 in the left. Intraocular Pressure (IOP), measured by Goldmann applanation tonometry, was 16 mmHg in the right eye and 30 mmHg in the left eye. Measurements were performed prior to hemodialysis sessions to minimise dialysis-related IOP fluctuations. Pupils were reactive with no anisocoria. There was no relative afferent pupillary defect and visual fields and colour vision were normal. Ocular motility assessment revealed limitation in left eye elevation and adduction (Fig. 2). Fundus examination showed normal optic discs bilaterally. There was no facial or upper limb swelling.

Magnetic Resonance Imaging (MRI) of the orbits and anterior visual pathway without contrast was performed initially to exclude compressive orbital pathology (contrast-enhanced MRI was deferred due to concerns of nephrogenic systemic fibrosis secondary to Gadolinium-based contrast). Imaging did not reveal orbital masses; however, the superior ophthalmic vein appeared distended, raising suspicion of venous congestion rather than arterialisated shunting. She started on Topical Latanoprost 0.005% every night and Topical Brinzolamide 1% twice daily to her left eye. After 2 months of topical IOP lowering medications, her BCVA had improved to 20/40-2 on the left. However, the IOP was still 24 mmHg on the left eye. There were persistent supraduction, adduction and depression deficits in the left eye and it remained proptosed with corkscrew vessels. Additionally, punctate epithelial erosions with subepithelial scarring were noted at the inferior cornea, for which lubricating eye drops were commenced. Topical Brimonidine 0.2% three times a day was added to further lower IOP. Further questioning revealed she had undergone a left brachiocephalic Arteriovenous Fistula (AVF) creation 3 years before for hemodialysis, but this subsequently required 3 fistuloplasties and drug-eluting balloon insertions because of AVF stenosis. A referral to Interventional Radiology was made in view of possible raised internal jugular venous pressure from AVF stenosis as a possible cause of proptosis and raised IOP.

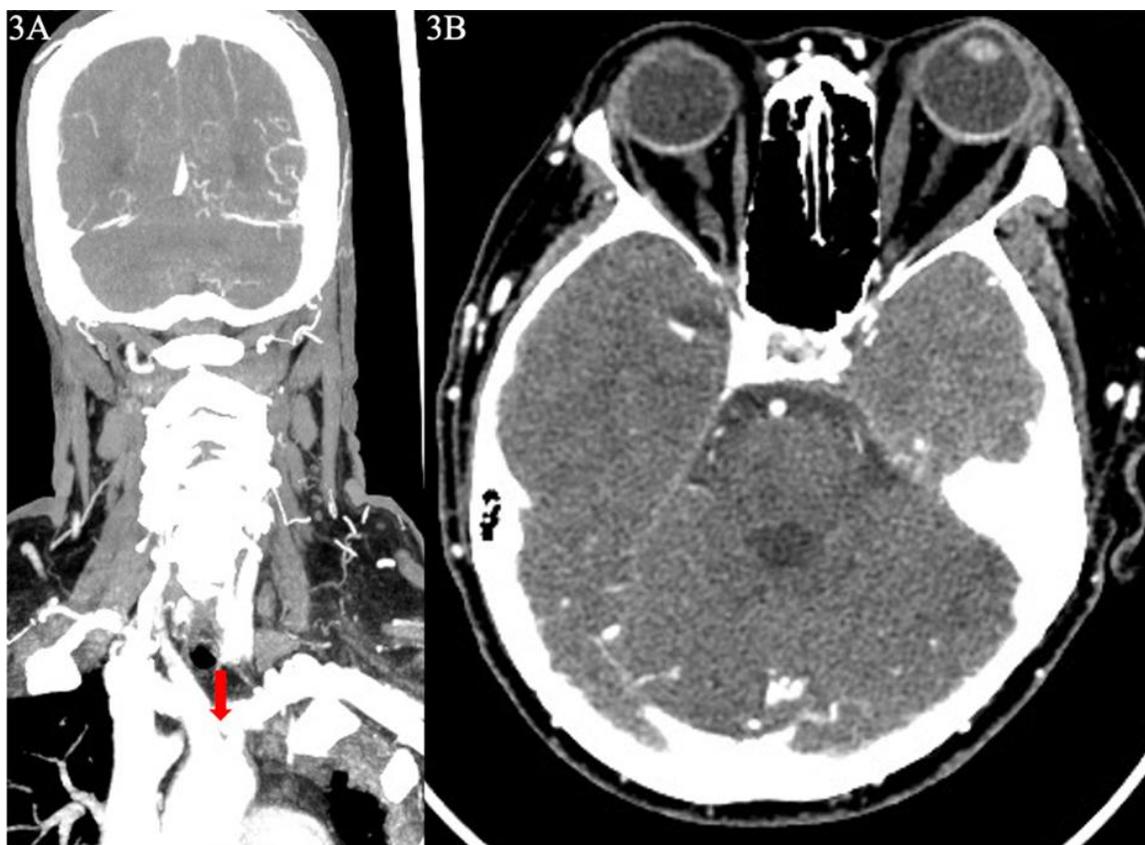
One month later, Computed Tomography (CT) Venogram showed marked narrowing of the left brachiocephalic vein as it crossed the brachiocephalic artery (Fig. 3), as well as delayed enhancement of the left cavernous sinus (Fig. 3). While this raised initial suspicion of a chronic Dural Arteriovenous Fistula (DAVF), digital subtraction angiography performed previously did not demonstrate any arteriovenous shunting, effectively excluding DAVF. The absence of early arterial filling of the cavernous sinus confirmed a venous outflow obstruction rather than a high-flow fistula. Doppler ultrasound of the neck veins was not performed, as cross-sectional venography provided definitive anatomical localisation of the stenosis. Vascular Surgery was consulted and a Central Venography and left arm Fistulogram was performed, showing a focal occlusion of the left brachiocephalic vein with extensive reflux into the collateral venous channels. An angioplasty was performed by the vascular surgeon and post-angioplasty angiogram revealed almost complete recoil of the left brachiocephalic vein stenosis (Fig. 4). Left brachiocephalic stenting was then done to maintain patency of the AVF for hemodialysis access and brisk flow with no residual stenosis and no reflux into collateral veins was attained (Fig. 5). At her Ophthalmology review 2 days after the stenting, her BCVA was 20/30 and IOP was 20 mmHg in the left eye. There was no residual proptosis and her ocular motility was full of no residual exotropia. She reportedly discontinued all her pressure lowering drops and lubricants one month after, as her visual symptoms had significantly improved following the brachiocephalic stenting. At her review 3 months after the stenting, her BCVA was 20/30 and IOP was 15 mmHg. We surmise that the cause of her initial symptoms and signs was left venous congestion secondary to left brachiocephalic stenosis.



**Figure 1:** Left-sided proptosis, exotropia and corkscrew vessels.



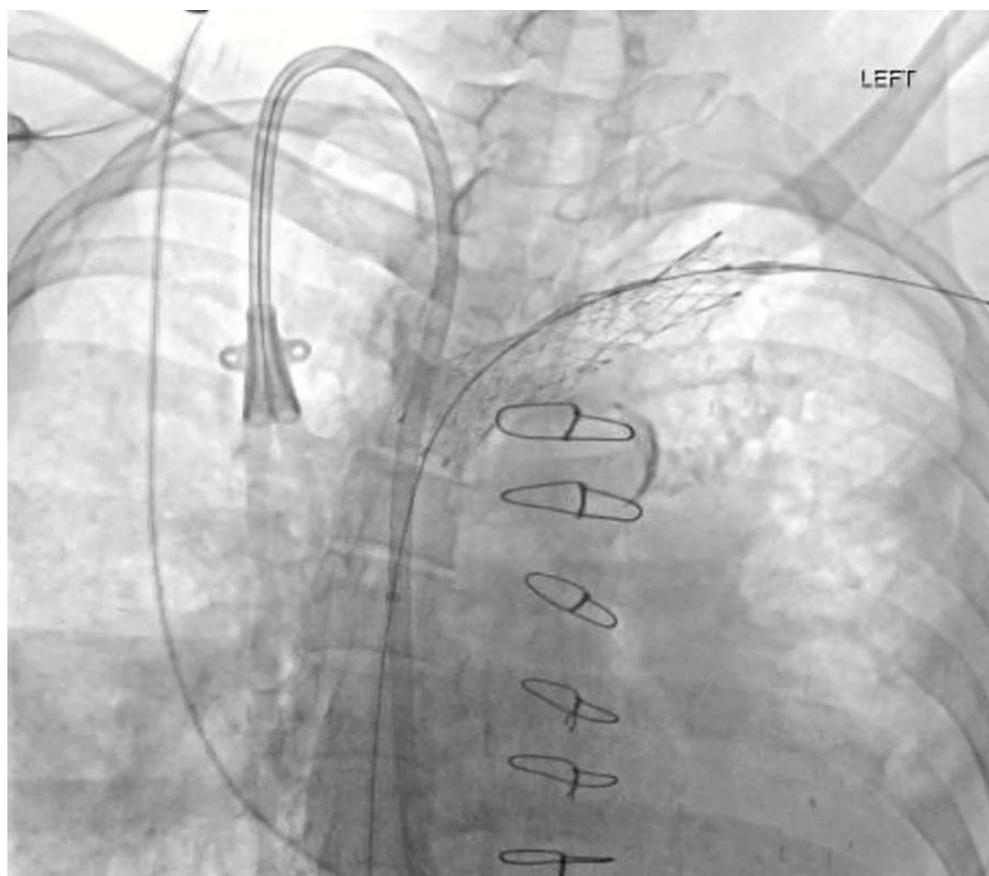
**Figure 2:** Ocular motility assessment showing limitations in elevation and adduction in the left eye.



**Figure 3:** Computed Tomography (CT) Venogram showing marked narrowing of the left brachiocephalic vein (red arrow) as it crossed to the brachiocephalic artery (3A). Delayed enhancement of the left cavernous sinus, as well as tenting of the left globe can be seen (3B).



**Figure 4:** Left arm angioplasty revealing left brachiocephalic vein occlusion (red arrow) with retrograde flow into the internal jugular vein.



**Figure 5:** Angioplasty and stenting of the left brachiocephalic vein.

### Discussion

Central venous stenosis may result in orbital venous hypertension through impaired cranial venous drainage and retrograde flow into the internal jugular vein, cavernous sinus and superior ophthalmic vein. This can mimic carotid-cavernous fistula clinically, presenting with proptosis, corkscrew episcleral vessels, raised Intraocular Pressure (IOP) and ophthalmoplegia. The differential diagnosis includes carotid-cavernous fistula, dural arteriovenous fistula, thyroid eye disease, orbital inflammatory disease and orbital mass lesions. Unlike high-flow arteriovenous shunts, venous outflow obstruction produces passive venous congestion without arterialisation, which may explain the more insidious onset in our patient. Elevation of Episcleral Venous Pressure (EVP) directly impairs aqueous humour outflow through Schlemm's canal, as described by the Goldmann equation:  $IOP = (F/C) + EVP$ , where F represents aqueous formation and C represents outflow facility. Increases in EVP therefore result in a proportional rise in IOP even when aqueous production remains unchanged. In our patient, venous outflow obstruction from brachiocephalic vein stenosis likely increased orbital and episcleral venous pressure, thereby elevating IOP and producing secondary ocular hypertension. The partial response to topical IOP-lowering medications reflects modulation of aqueous production, but definitive resolution required correction of the underlying venous obstruction.

Sight-threatening complications of AVFs are extremely rare, but have been reported (Table 1). Gomez, et al., reported a case of ipsilateral proptosis due to axillary-subclavian vein thrombosis in a patient with an AVF, whose symptoms resolved following closure of the AVF [4]. Similarly, Varelas, et al., reported a patient with brachiocephalic vein stenosis presenting with ipsilateral arm and face swelling, associated with bilateral proptosis, which also resolved with endovascular stenting and anticoagulation [5]. Interestingly, our patient did not exhibit significant ipsilateral arm or facial swelling, which are more typical manifestations of central venous stenosis. This may be attributable to the development of compensatory collateral venous channels that partially decompressed peripheral venous circulation while still permitting retrograde cranial venous congestion. The orbit, being a low-resistance venous compartment, may therefore manifest symptoms even in the absence of overt peripheral venous hypertension. To our knowledge, only one previous case of unilateral proptosis and raised IOP associated with ipsilateral brachiocephalic vein stenosis has been reported. In this case, the patient presented with an IOP of 40 mmHg and mild proptosis on the side of the AVF and was also initially diagnosed as CCF [6.] This resolved with occlusion of the AVF, which reduced retrograde flow and

venous hypertension. In our patient, a trial of IOP lowering medications was initiated while awaiting Vascular Surgery review, to which the patient responded with partial resolution of symptoms and improvement in BCVA and IOP, but no improvement in the proptosis and ocular motility. While ligation of the AVF could have reduced retrograde venous flow, this would have compromised hemodialysis access in a patient awaiting renal transplantation. Endovascular stenting was therefore preferred to restore antegrade venous drainage while preserving AVF function. Risks of stenting in End-Stage Renal Disease (ESRD) patients include restenosis, thrombosis and need for re-intervention; however, reported short- to medium-term patency rates are favourable [7]. In our case, stenting achieved rapid haemodynamic correction with complete resolution of ocular signs.

Our follow-up period was limited to three months, which restricts assessment of long-term stent patency and recurrence of ocular symptoms. Longer follow-up would strengthen the durability of the reported outcome and represents a limitation of this report. Optical Coherence Tomography and repeat visual field testing were not performed post-intervention, representing a limitation in objectively excluding early glaucomatous damage.

Author (Year)	Venous Lesion	Laterality of Ocular Signs	Peak IOP (mmHg)	Orbital Findings	Management	Outcome
Gómez-Arbeláez et al. (2021) <sup>4</sup>	Axillary–subclavian vein thrombosis	Unilateral	Not reported	Proptosis	AVF ligation	Resolution of proptosis
Varelas et al. (1999) <sup>5</sup>	Central venous obstruction post catheterization	Bilateral	Not reported	Bilateral proptosis, ophthalmoplegia	Endovascular treatment + anticoagulation	Resolution
Kiernan et al. (2015) <sup>6</sup>	Brachiocephalic vein stenosis	Unilateral	40 mmHg	Mild proptosis, raised IOP	AVF occlusion	IOP normalization

**Table 1.** Reported cases of ocular manifestations secondary to central venous outflow obstruction in hemodialysis patients

## Conclusion

Central venous stenosis in hemodialysis patients can rarely lead to sight-threatening complications due to venous congestion. This should be promptly recognised by the ophthalmologist, as early recognition and timely intervention can result in favorable visual outcomes following recanalization of the stenosed vein or ligation of the AVF, both of which reduce retrograde flow to the head and neck and orbits and dramatically improve proptosis, raised IOP, BCVA and diplopia.

## Conflict of Interest

The authors declared no potential conflicts of interest with respect to the research, authorship and/or publication of this article.

## Funding Statement

This research did not receive any specific grant from funding agencies in the public, commercial or non-profit sectors.

## Data Availability Statement

Data can be made available upon reasonable request.

## Ethical Statement

Written informed consent was obtained from the patient for publication of this case report and accompanying images. Institutional ethics approval was deemed exempt for a single case report according to institutional guidelines.

## Informed Consent Statement

Written informed consent was obtained from the individual(s) for the publication of any potentially identifiable images or data included in this article.

## Authors' Contributions

All authors contributed equally to this paper.

## References

1. Bello AK, Okpechi IG, Osman MA. Epidemiology of haemodialysis outcomes. *Nat Rev Nephrol.* 2022;18(6):378-95.
2. Teruya TH, Abou-Zamzam AM Jr, Limm W, Wong L, Wong L. Symptomatic subclavian vein stenosis and occlusion in hemodialysis patients with transvenous pacemakers. *Ann Vasc Surg.* 2003;17(5):526-9.
3. Narendra JB, Sreenivas J, Karthikeyan VS, Nagaraja NH. Innominate vein stenosis in association with ipsilateral hyperdynamic brachio basilic fistula causing ipsilateral limb and hemifacial swelling. *Indian J Nephrol.* 2017;27(6):452-5.
4. Gómez-Arbeláez D, García-Gutiérrez A, González-Fajardo JA. Unilateral proptosis (exophthalmos) caused by axillary-subclavian venous thrombosis in a patient with upper extremity arteriovenous dialysis fistula. *Methodist Debaquey Cardiovasc J.* 2021;17(3):24-7.
5. Varelas PN, Bertorini TE, Halford H. Bilateral ophthalmoplegia and exophthalmos complicating central hemodialysis catheter placement. *Am J Kidney Dis.* 1999;33(5):966-9.
6. Kiernan M, Bhogal M, Wong K, Sivaprakasam R, Ashman N, Ali N. Sight-threatening intraocular pressure due to an upper arm dialysis fistula. *Lancet.* 2015;386(9988):101-2.
7. Bakken AM, Protack CD, Saad WE, Lee DE, Waldman DL, Davies MG. Long-term outcomes of primary angioplasty and primary stenting of central venous stenosis in hemodialysis patients. *J Vasc Surg.* 2007;45(4):776-83.

## About the journal



Journal of Ophthalmology and Advance Research is a peer-reviewed, open-access scholarly journal published by Athenaeum Scientific Publishers. The journal publishes original research articles, case reports, reviews, editorials, and commentaries within its defined scope, with the aim of supporting scientific research and clinical knowledge in ophthalmology.

All manuscripts are evaluated through an independent peer-review process conducted in accordance with the journal's editorial policies and established publication ethics. Editorial decisions are made solely on the basis of academic merit.

**Manuscript submission:** <https://athenaeumpub.com/submit-manuscript/>