Superior ophthalmic vein dilation, should radiologists always be concerned for underlying acute vascular, orbital or neurological pathology?

Smith, Henry[1]; Korah, Ipeson[1]
[1]Townsville University Hospital, Queensland, Australia

INTRODUCTION: Identification of superior ophthalmic vein dilation on computed tomography studies is critical as it may indicate underlying serious orbital and neurological pathology such as carotiocavernous fistula, cavernous or orbital venous thrombosis, orbital infection or intracranial pathology with raised intracranial pressure. However, it may also be observed in patients with multiple systemic conditions and has been reported in patients without a clear aetiology. The purpose of this study was to investigate the prevalence of dilated superior ophthalmic veins on routine computed tomography studies and to assess underlying causes in identified cases.

METHOD: A retrospective review of non-contrast CT head studies was conducted at a tertiary hospital to identify cases of dilated ophthalmic veins (> 4mm). In identified cases, the patient chart and imaging were reviewed to determine possible underlying causes, whether the dilation was longstanding or had resolved on follow up imaging.

RESULTS: 2585 cases were reviewed, and 127 studies (111 patients, 4.9%) were identified as having superior ophthalmic vein dilation greater than 4 mm. 49 studies (1.9%) had dilation greater than 5 mm. Common associations included mechanical ventilation, acute intracranial pathology and arteriovenous fistulas for haemodialysis (figure 1). Less common possible causes included acute cardiac pathology, orbital venolymphatic malformation and pneumonia with large volume fluid resuscitation. Many patients had no clear cause for dilation identified (74/111). On review of previous and follow up imaging, multiple cases of dilation appeared to be longstanding or re-solved spontaneously on follow up imaging. No cases of acute vascular pathology were diagnosed.

CONCLUSION: Dilation of the superior ophthalmic veins is not a particularly uncommon finding on routine computed tomography studies. It is important for radiologists to identify as it may be a sign of acute underlying neurological, vascular or orbital pathology. However, there are multiple other associations, and in a subset of patients this finding may be incidental and not associated with underlying pathology. Being aware of this will help guide radiologists to facilitate appropriate further investigations and management.



(Figure 1) Dilatation in the setting of arteriovenous fistula for haemodialysis (arrows).

REFERENCES:

1. Standring S, Gray H. Gray's anatomy: The anatomical basis of clinical practice (2008). Edinburgh: Churchill Livingstone/Elsevier.
2. Romano N, Urru A, Sasso R, Castaldi A. Imaging of Superior Ophthalmic Vein: A Pictorial Overview. Clin Imaging. 2022;89:136-46.
3. Adam C, Shields C, Gutman J et al. Dilated Superior Ophthalmic Vein: Clinical and Radiographic Features of 113 Cases. Ophthalmic Plast Reconstr Surg. 2018;34(1):68-73.
4. Wei R, Cai J, Ma X, Zhu H, Li Y. Imaging Diagnosis of Enlarged Superior Ophthalmic Vein. Zhonghua Yan Ke Za Zhi. 2002;38(7):402-4

5. Sotoudeh H, Shafaat O, Aboueldahab N, Vaphiades M, Sotoudeh E, Bernstock J. Superior Ophthalmic Vein Thrombosis: What Radiologist and Clinician Must Know? Eur J Radiol Open. 2019;6:258-64.
6. Poon C, Sze G, Johnson M. Orbital Lesions: Differentiating Vascular and Nonvascular Etiologic Factors. AJR Am J Roentgenol. 2008;190(4):956-65.
7. Lima B & Perry J. Superior Ophthalmic Vein Enlargement and Increased Muscle Index in Dysthyroid Optic Neuropathy. Ophthalmic Plast Reconstr Surg. 2013;29(3):147-9.
8. Teope J & Takahashi Y. Bilateral Superior Ophthalmic Vein Involvement in a Case With Orbital Sarcoidosis. Ophthalmic Plast Reconstr Surg. 2024;40(4):e114-6.
9. Lewczuk N, Zdebik A, Bogusławska J, Turno-Kręcicka A, Misiuk-Hojło M. Ocular Manifestations of Pulmonary Hypertension. Surv Ophthalmol. 2019;64(5):694-9.
10. Brightbill T, Martin S, Bracer R. The Diagnostic Significance of Large Superior Ophthalmic Veins in Patients with Normal and Increased Intracranial Pressure: CT and MR Evaluation. Neuroophthalmology. 2001;26(2):93-101.
11. Foroozan R, Buono L, Savino P, Sergott R. Idiopathic Dilated Episcleral Veins and Increased Intraocular Pressure. Br J Ophthalmol. 2003;87(5):652-4.
12. Kuroda K, Tsutsumi S, Sugiyama H, Sugiyama N, Ueno H, Ishii H. Does the Superior Ophthalmic Vein Dilate in Acute Intracranial Hypertension Due to Hemorrhagic Stroke? Radiol Case Rep. 2023;18(7):2522-5.
13. Jiing-Feng Lirng, Jong-Ling Fuh, Zin-An Wu, Shiang-Ru Lu, Shuu-Jiun Wang. Diameter of the Superior Ophthalmic Vein in Relation to Intracranial Pressure. AJNR Am J Neuroradiol. 2003;24(4):700-3.
14. Rana K, Juniat V, Slattery J, Patel S, Selva D. Dilated Superior Ophthalmic Vein: Systemic Associations. Int Ophthalmol. 2023;43(10):3725-31.
15. Jeon Y, Yi K, Choi C, Kim Y, Park Y. [Dilatation of Superior Ophthalmic Vein and Visual Disturbance by Central Venous Stenosis: A Case Mimicking Cavernous Sinus Dural Arteriovenous Fistula]. Taehan Yongsang Uihakhoe Chi. 2021;82(6):1619-27.
16. Nakamata A, Yogi A, Harakuni T, Ishigami K, Murayama S. Symptomatic Jugular Venous Reflux with Dilatation of the Superior Ophthalmic Vein Mimicking Cavernous Dural Arteriovenous Fistula. Radiol Case Rep. 2019;14(9):1167-70.
17. Schultz H, Bacorn C, Cristiano B et al. Bilateral Dilated Superior Ophthalmic Veins in a Patient With an Arteriovenous Dialysis Fistula. Ophthalmic Plast Reconstr Surg. 2024;40(1):e19-23.
18. Wang Y, Lai Y, Wang J, Huang T. A Case of Engorged Superior Ophthalmic Vein. J Neuroophthalmol. 2022;43(4):e334-6.
19. Nabavizadeh S, Sundararajan S, Schmitt J, Loevner L. Reversible Dilation of the Superior Ophthalmic Vein in Intubated Patients. AJNR Am J Neuroradiol. 2018;39(8):1505-8.
20. Ferrara J & Thornton K. Bilateral Dilation of the Superior Ophthalmic Veins—Consequential or Incidental. The Neurohospitalist. 2022;12(3):583-4.
21. Reddy A, Foroozan R, Edmond J, Hinckley L. Dilated Superior Ophthalmic Veins and Posterior Ischemic Optic Neuropathy After Prolonged Spine Surgery. J Neuroophthalmol. 2008;28(4):327-8.
22. Tsutsumi S, Kawai S, Sugiyama N, Ueno H, Suzuki M, Ishii H. Diameters of the Optic Sheath and Superior Ophthalmic Vein Can Expand and Contract at Positional Changes: A Magnetic Resonance Imaging Study. Surg Radiol Anat. 2024;46(2):153-8.
23. Villafuerte D. Bilateral Idiopathic Superior Ophthalmic Vein Dilation. J Osteopath Med. 2022;122(10):533-4.

24. Rana K, Juniat V, Rayan A, Patel S, Selva D. Normative Measurements of Orbital Structures by Magnetic Resonance Imaging. Int Ophthalmol. 2022;42(12):3869-75.
25. Ozgen A & Aydingöz U. Normative Measurements of Orbital Structures Using MRI. J Comput Assist Tomogr. 2000;24(3):493-6.
26. Tsutsumi S, Nakamura M, Tabuchi T, Yasumoto Y. The Superior Ophthalmic Vein: Delineation with High-Resolution Magnetic Resonance Imaging. Surg Radiol Anat. 2015;37(1):75-80.
27. Mehrhoff F, Zolnierz M, Barry A et al. Morphometry of the Superior Ophthalmic Vein Unaffected by Dilating Factors. Journal of Clinical Ophthalmology and Research. 2024;12(1):18-23.