American Journal of Ophthalmology Case Reports 23 (2021) 101165

Contents lists available at ScienceDirect

American Journal of Ophthalmology Case Reports

journal homepage: www.ajocasereports.com/

Central retinal vein occlusion after laparoscopic sleeve gastrectomy in an 18-year-Old female

Michael J. Ammar, Connie M. Wu, Matthew R. Starr *, Carl D. Regillo

The Retina Service of Wills Eye Hospital, Mid Atlantic Retina, Philadelphia, PA, USA

ARTICLE INFO

Keywords:
Central retinal vein occlusion
CRVO
Homocysteine
Bariatric surgery
Nutritional deficiency

ABSTRACT

Purpose: To describe a case of central retinal vein occlusion (CRVO) in a young adult found to have elevated homocysteine after bariatric surgery and to review risk factors for CRVO in younger patients.
Observations: An 18-year-old female presented with a CRVO and severe cystoid macular edema (CME). She was normotensive, not on medications, and without known heritable hypercoagulable disease. Her medical history was notable for bariatric surgery and subsequently she was found to have nutritional deficiency, anemia, and elevated homocysteine. Her elevated homocysteine may have induced a hypercoaguable state that predisposed her to developing a CRVO. Treatment with bevacizumab dramatically improved her macular edema and visual acuity. Nutritional supplementation was initiated.
Conclusions: Elevated homocysteine in the setting of nutritional deficiency from prior bariatric surgery may cause a hypercoaguable state and is a potential risk factor for CRVO.
Importance: With the increasing prevalence of obesity and bariatric surgery, it is important to consider associated nutrient deficiency as a potential cause of induced hypercoagulability and increased risk for CRVO. Identification of these at-risk patients is especially important given this condition is easily treatable and may be present in younger individuals. To the best of our knowledge, this is the first reported case of a CRVO with elevated homocysteine in the setting of nutrient deficiencies from laparoscopic sleeve gastrectomy.

1. Introduction

Central retinal vein occlusions (CRVOs) are relatively rare in patients under the age of 55 years or those who lack classic risk factors including hypertension, hyperlipidemia, and ocular hypertension or glaucoma.[1] Risk factors for CRVOs in younger adults include autoimmune conditions such as Behçet syndrome, sarcoidosis and granulomatosis with polyangiitis; inherited hypercoagulable states including factor V Leiden, Protein C and S deficiency, and antithrombin deficiency; and acquired hypercoagulable states, including lupus anticoagulant and homocystinuria. Elevated homocysteine (HCY) can induce a prothrombotic state.[2,3] Hyperhomocysteinemia is a rare inherited condition in which there are elevated levels of homocysteine and can be associated with cardiovascular disease and other systemic findings such as ectopia lentis.[4] The prevalence of a genetic defect leading to hyperhomocysteinemia is roughly 5 % while secondary causes are far more common.[5] For example, HCY can be elevated as a result of nutrient deficiencies and has been strongly linked with bariatric surgeries.[6]

With the increasing prevalence of obesity and the decreasing average age of bariatric surgery patients, physicians must consider bariatric surgery-induced nutritional deficiency as potential risk factor for CRVO.[7] Our case describes a young female without known hypercoagulable risk factors and not on medications who presented with a severe ischemic CRVO. She was subsequently found to have had a history of laparoscopic sleeve gastrectomy (LSG) one year prior and secondary anemia with elevated homocysteine levels. To the best of our knowledge, this is the first known reported case of a CRVO with elevated homocysteine in the setting of nutrient deficiencies from LSG.

2. Case report

An 18-year-old female presented to the retina clinic with decreased vision in her left eye for 5 days duration. She denied any systemic or topical medications. Review of systems was only notable for fatigue. Vital signs were normal. Visual acuity in her right eye (OD) was 20/20 and her left eye (OS) was 20/200. Intraocular pressure (IOP) was 14 mmHg OD and 15 mmHg OS. Here ocular examination showed normal anterior segments in both eyes and normal posterior segment OD. The

* Corresponding author. Retina Service of Wills Eye Hospital, Mid Atlantic Retina, 840 Walnut St. Suite 1020, Philadelphia, PA, 19107, USA.
E-mail address: mstarr1724@gmail.com (M.R. Starr).

https://doi.org/10.1016/j.ajoc.2021.101165
Received 23 June 2021; Accepted 20 July 2021
Available online 21 July 2021

fundoscopic examination OS revealed venous tortuosity, diffuse intraretinal hemorrhages, cotton wool spots, and significant cystoid macular edema (Fig. 1). Optical coherence tomography (OCT) and fluorescein angiography (FA) (Figs. 2 and 3) confirmed the presence of cystoid macular edema and associated features consistent with a severe, ischemic CRVO. Additional medical and surgical history was obtained, revealing a prior history of cholecystectomy, appendectomy, and tonsillectomy. She was not on oral contraceptives or any other medications. However, her records from an outside hospital revealed a history of bariatric surgery the year prior with a laparoscopic sleeve gastrectomy (LSG). She had a history of poor follow-up and noncompliance with her medications and supplements. She was previously closely followed and treated by a team of physicians at an outside hospital for chronic multifactorial anemia intermittently requiring blood transfusions, attributed to nutrient deficiencies in the setting of recent bariatric surgery. She had been evaluated by gastroenterology with an unremarkable endoscopy and was lost to general medical follow-up thereafter.

Given her CRVO in the setting of her nutritionally deficient state and history of bariatric surgery, an extensive lab workup was initiated which included dilute russel's viper venom, factor V Leiden, anticardiolipin antibodies, antithrombin III, homocysteine, folate, B12, complete blood cell count (CBC), complete metabolic panel, prothrombin time, partial thromboplastin time, and erythrocyte sedimentation rate. CBC showed a hemoglobin (Hgb) of 9.3 g/DL and hematocrit of 29.7 % consistent with anemia. Outside records revealed that the patient was chronically anemic the year prior with a Hgb of 6.3 g/DL at its lowest documented value, requiring inpatient admission and blood transfusion. In addition, her homocysteine (HCY) level was highly elevated at 34.5 μmol/L (5–15 μmol/L normal) and folate low at 3.5ng/mL. She never completed her B12 testing but it had been noted to be low historically. The remainder of the work-up was unremarkable.

The patient had severe macular edema OS in the setting of her CRVO without signs of neovascularization (Fig. 2, top). Treatment options were discussed and the patient received intravitreal bevacizumab with significant improvement in the CME and visual acuity (Fig. 2, bottom). Hematology was consulted and agreed that her elevated homocysteine may have contributed to a prothrombotic state. They instructed her to restart nutritional supplements recommended previously by her outside nutritionists and gastroenterologists, including iron, folate, and B12. She was also instructed to follow-up with her bariatric surgery team and primary care physician. Panretinal photocoagulation was withheld as there was no neovascularization (Fig. 3). She was planned to undergo additional laboratory workup and follow up with potential intravitreal injections but she was lost to follow-up again despite numerous attempts to reschedule.

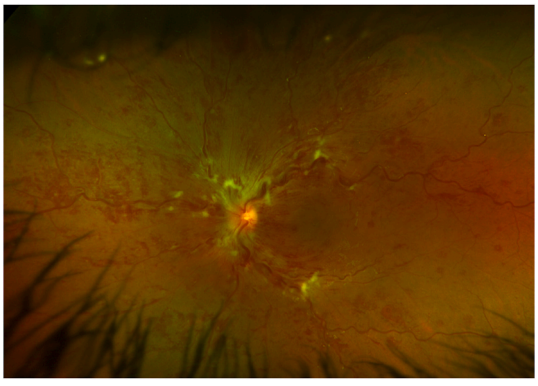

Fig. 1. Central retinal vein occlusion fundus photo. Widefield fundus image of the left eye showing a central retinal vein occlusion with optic disc edema, venous tortuosity, diffuse intraretinal hemorrhages, and cotton wool spots.

3. Discussion

CRVOs most commonly occur in older individuals with cardiovascular risk factors. Less often, they may present in younger individuals with systemic risk factors or hypercoaguable states. Elevated HCY has consistently been shown to be a cardiovascular risk factor for stroke and other cardiovascular diseases.[2] The mechanism for this is postulated to be a multifactorial process contributing to a prothrombotic state.[3] Obesity is at near epidemic levels and bariatric surgery is becoming increasingly prevalent, particularly among younger patients.[7] HCY can be elevated as a result of nutrient deficiencies and has been strongly linked with bariatric surgeries.[6] Studies have shown that elevated HCY is associated with an increased risk of central retinal vein occlusion.[8–12] Homocystinuria is a very rare genetic condition that is associated with intellectual impairment, ocular and skeletal abnormalities, and a high risk of thromboembolism.[12] However, HCY levels can be very high in inherited cases, and the condition is uncommon. Nutritional deficiencies are much more common causes of elevated HCY and need to be identified quickly as they can easily treated.[6]

In this case, the patient had undergone LSG after a long history of obesity complicated by cholecystectomy and other health issues. LSG is a restrictive, permanent bariatric procedure which involves removing 85 % of the stomach and stapling the remaining portions back together.[13] wt loss as a result of LSG is correlated with significantly reduced risk of diabetes, obstructive sleep apnea, and metabolic syndrome, however reductions in hypertension and hyperlipidemia are less proven.[14] One of the physiologic and anatomic consequences of LSG is potentially lower levels of intrinsic factor.[15] The area of the stomach removed in LSG contains cells responsible for recreating this glycoprotein. Intrinsic factor is necessary for B12 absorption in the small intestine, and lack of intrinsic factor has been linked to decreased absorption of B12 and elevated levels of homocysteine.[16] Normally, B12 is a necessary cofactor that in combination with homocysteine and folic acid generates methionine. If B12 levels and/or folate levels are low, homocysteine can become elevated. Decreased B12 levels are similarly found in pernicious anemia, in which intrinsic factor producing cells are destroyed in an autoimmune process. In this case, it is possible that LSG lead to decreased intrinsic factor which in combination with the patient's poor adherence to diet and necessary nutritional supplements lead to elevated homocysteine levels. This multifactorial hyperhomocysteinuria possibly produced a hypercoagulable state which lead to the development of a CRVO.

As bariatric surgery becomes more prevalent, there will be increasing numbers of patients in ophthalmology clinics who are at risk for nutritional deficiencies. One of the manifestations of these nutrient deficient states as we've described in this report is a hypercoagulable state. In this case, better compliance with follow up appointments, a strict diet regimen, and nutritional supplements may have prevented a hypercoagulable state. One of the ophthalmic manifestations of a hypercoagulable state is a retinal vein occlusion. Therefore, we advocate that in the setting of a retinal vein occlusion in a younger patient, physicians should inquire about a history of bariatric surgery and investigate other risk factors for nutritional deficiencies.

4. Conclusion

We present the first case of a CRVO in a young adult in the setting of LSG complicated by nutritional deficiency, anemia, and elevated HCY levels. Treatment with intravitreal bevacizumab resulted in significant improvement in CME and visual acuity. In young adults presenting with CRVO, it is important to obtain a careful surgical and dietary history including assessment of treatable risk factors for prothrombotic conditions, such as prior bariatric surgery-induced HCY.

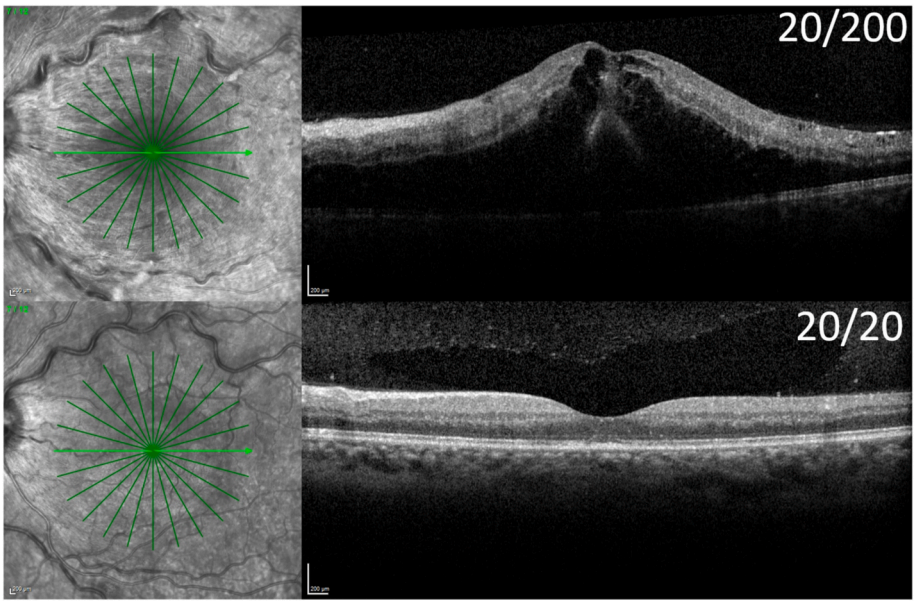

Fig. 2. Cystoid macular edema on optical coherence tomography. Optical coherence tomography demonstrating severe cystoid macular edema at presentation (above) compared to resolution after intravitreal bevacizumab (below).

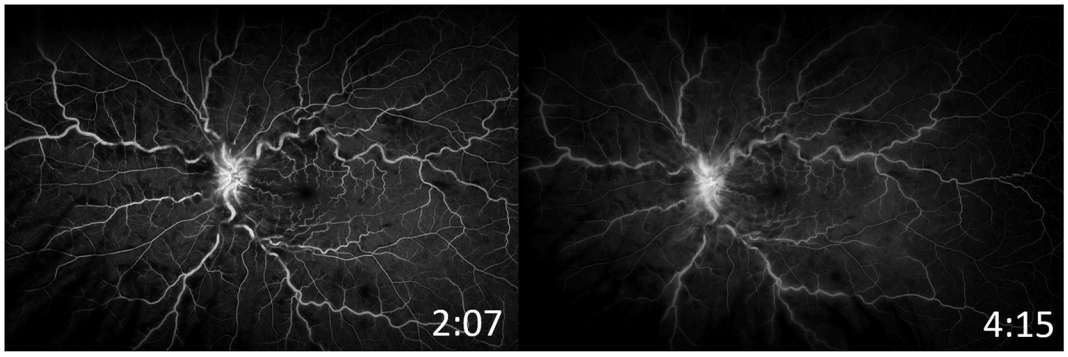

Fig. 3. Fluorescein angiography demonstrating central retinal vein occlusion and absence of neovascularization. Fluorescein angiography showed optic disc leakage, venous tortuosity, and blockage consistent with scattered intraretinal hemorrhages. A late frame (right) does not show evidence of neovascularization.

Patient consent

The patient consented to publication of the case orally. This report does not contain any personal information that could lead to the identification of the patient.

Funding

Funded by J. Arch McNamara, MD Fund for Retina Research and Education.

Authorship

All authors attest that they meet the current ICMJE criteria for Authorship.

Declaration of competing interest

The following authors have no relevant financial disclosures: MJA, CMW, MRS, CDR.

Acknowledgements

None.

References

1. Blair K, Czyz CN. Central retinal vein occlusion. *Wis Med J*. 1999;98(8):51–54, 2019 Nov 18. StatPearls [Internet]. Treasure Island (FL): StatPearls Publishing; 2020 JanFanapour PC, Yug B, Kochar MS. Hyperhomocysteinemia: an additional cardiovascular risk factor.
2. Cattaneo M. Hyperhomocysteinemia, atherosclerosis and thrombosis. *Thromb Haemostasis*. 1999;81(2):165–176.
3. Andrès E, Affenberger S, Vinzio S, et al. Food-cobalamin malabsorption in elderly patients: clinical manifestations and treatment. *Am J Med*. 2005;118(10): 1154–1159.
4. Ajith TA. Ranimenon. Homocysteine in ocular diseases. *Clin Chim Acta*. 2015;450: 316–321.
5. Brustolin S, Giugliani R, Félix Tm TM. Genetics of homocysteine metabolism and associated disorders Braz. *J. Med. Biol. Res.* 2010;43:1–7.
6. Komorniak N, Szczuko M, Kowalewski B, Stachowska E. Nutritional deficiencies, bariatric surgery, and serum homocysteine level: review of current literature. *Obes Surg*. 2019;29(11):3735–3742.
7. Mocanu V, Dang JT, Sun W, Birch DW, Karmali S, Switzer NJ. An evaluation of the modern north American bariatric surgery landscape: current trends and predictors of procedure selection. *Obes Surg*. 2020;30(8):3064–3072.
8. Dong N, Wang B, Chu L, Xiao L. Plasma homocysteine concentrations in the acute phase After central retinal vein occlusion in a Chinese population. *Curr Eye Res*. 2013;38(11):1153–1158.

9. Bharathi Devi SR, Suganeswari G, Sharma T, Thennarasu M, Angayarkanni N. Homocysteine induces oxidative stress in young adult central retinal vein occlusion. *Br J Ophthalmol*. 2012;96(8):1122–1126.
10. Vine AK. Hyperhomocysteinemia: a risk factor for central retinal vein occlusion. *Am J Ophthalmol*. 2000;129(5):640–644.
11. Martin SC, Rauz S, Marr JE, Martin N, Jones AF, Dodson PM. Plasma total homocysteine and retinal vascular disease. *Eye*. 2000;14(4):590–593.
12. Cahill M. Raised plasma homocysteine as a risk factor for retinal vascular occlusive disease. *Br J Ophthalmol*. 2000;84(2):154–157. https://doi.org/10.1136/bjo.84.2.154.
13. Colquitt JL, Pickett K, Loveman E, Frampton GK. Surgery for weight loss in adults. *Cochrane Database Syst Rev*. 2014 Aug 8;(8), CD003641.
14. Sharples AJ, Mahawar K. Systematic review and meta-analysis of randomised controlled trials comparing long-term outcomes of roux-en-Y gastric bypass and sleeve gastrectomy. *Obes Surg*. 2020 Feb;30(2):664–672.
15. Alvarez-Leite JI. Nutrient deficiencies secondary to bariatric surgery. *Curr Opin Clin Nutr Metab Care*. 2004;7(5):569–575.
16. Virji A. Murr MM Caring for patients after bariatric surgery. *Am Fam Physician*. 2006;73:1403–1408.