



Central retinal vein occlusion associated with creatine supplementation and dehydration

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ABSTRACT

Purpose: Central retinal vein occlusions (CRVO) are relatively common; however, they are rare in young, otherwise healthy individuals. We report a case of CRVO associated with creatine supplementation and dehydration in a 25-year-old man.

Observations: A 25-year-old man developed a non-ischemic CRVO in the right eye. Comprehensive thrombophilia screening was unrevealing. Further questioning revealed that the patient was an avid weightlifter and had been taking creatine as a nutrition supplement daily for the past 5 years at a higher than recommended dose. At the time of CRVO onset, he was also restricting water intake in order to lose weight.

Conclusions and Importance: We conclude that the CRVO occurred in the context of creatine use and water restriction, leading to increased risk for thrombosis. Given the increased popularity for nutritional supplements to enhance fitness, it is important for individuals to recognize the association between CRVO, creatine supplementation, and hydration status.

1. Introduction

Creatine is a naturally occurring compound and is a popular supplement used by many athletes as it is thought to boost performance and increase muscle mass. We report a case of a central retinal vein occlusion in an otherwise healthy young man and discuss the causal link to excessive consumption of creatine supplement and dehydration. (see Fig. 1)

2. Case report

A 25-year-old man presented for a fourth consultation on a central retinal vein occlusion in his right eye that started 5 months previously. His symptoms began with a painless blind spot in the right eye, and he waited 1 month before seeking medical attention. He also noticed that everything appeared smaller at a distance in his right eye. He reported that with his previous retinal specialists, he had received 3 intravitreal anti vascular endothelial growth factor injections for macular edema with some improvement in visual acuity.

On our examination, the patient's best corrected visual acuity was 20/40 in the right eye and 20/20 in the left eye. His intraocular pressure was 20 mm Hg in the right eye and 19 mm Hg in the left eye. Slit lamp

examination of the right eye revealed a normal anterior segment with clear cornea, deep and quite anterior chamber, round and reactive pupil with no iris neovascularization, and a clear crystalline lens. Fundus examination was notable for a mildly edematous optic nerve, tortuous retinal veins, few macular cysts and peripheral flame shaped retinal hemorrhages. Notably absent was any sign of uveitis or retinal vasculitis. Slit lamp examination of the left eye was unremarkable. Optical coherence tomography (OCT) of the right eye was performed revealing attached posterior hyaloid, preserved foveal depression, few inner nuclear layer cysts, temporal hyper-reflective dots in the outer plexiform layer consistent with exudates, and patchy loss of the ellipsoid layer. OCT of the left eye was normal. OCT-angiography of the right eye revealed increased tortuosity of larger retinal vessels, retinal circulation flow voids affecting the deep greater than superficial vascular plexus, consistent with ischemic injury from central retinal vein occlusion. OCT-angiography of the left eye was normal (FIGURE).

Comprehensive thrombophilia screening, including tests for protein C and protein S deficiency, antithrombin III, lupus anticoagulant antibodies, anticardiolipin antibodies, homocysteine, factor V Leiden, and antinuclear antibodies, was negative. Furthermore, the patient had no family history of thromboembolism.

Upon further questioning, we found that the patient was an avid

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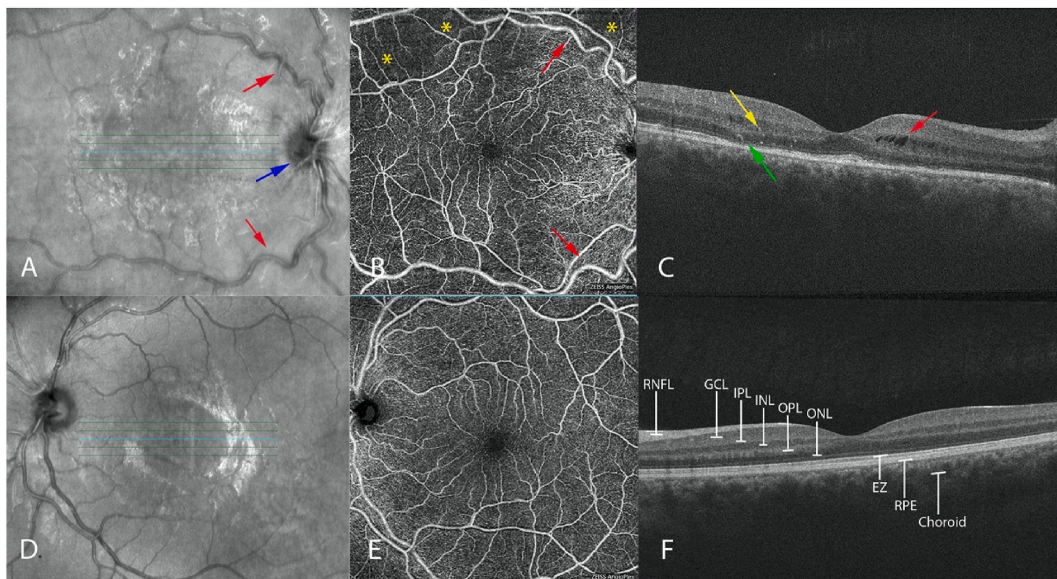


Fig. 1. (A) Optical coherence tomography (OCT) fundus image of the right eye showing tortuous retinal veins (red arrows) and edematous optic nerve head (blue arrow). (B) OCT Angiography (OCT-A) of the right eye showing increased tortuosity of the retinal veins (red arrows) and area of retinal circulation flow voids along the superior arcade (yellow asterisks), consistent with ischemic injury from central retinal vein occlusion. (C) B-scan OCT of the right eye showing preserved foveal depression, few inner nuclear layer cysts (red arrow), temporal hyperreflective dots in the outer plexiform layer consistent with exudates (yellow arrow) and patchy loss of the ellipsoid layer (green arrow). (D) OCT fundus image of the left eye is normal. (E) OCT-A of the left eye showing normal circulation pattern. (F) B-scan OCT of the left eye is normal with abbreviated description of the different layers recognized on routine reading of an OCT: Retinal Nerve Fiber Layer (RNFL), Ganglion Cell Layer (GCL), Inner Plexiform Layer (IPL), Inner Nuclear Layer (INL), Outer Plexiform Layer (OPL), Outer Nuclear Layer (ONL), Ellipsoid Zone (EZ), Retinal Pigment Epithelium/Bruch's Membrane Complex (RPE), Choroid.

weightlifter and had been taking creatine as a sport nutrition supplement daily for the past 5 years, at a dose of 5 grams per day. He reported that he was in a cutting phase of weight training when he developed the CRVO, and that he had intentionally lost 25 pounds in a period of a couple of months. He admitted to restricting water intake in an effort to further reduce weight. We asked if he had had any other medical problems in the past several years, and the patient's mother reminded the patient that he had had an episode of rhabdomyolysis several years prior. Regarding that episode, the patient reported that he had been taking the same dose of creatine supplementation at the time and was also in a cutting phase of training with reduced water intake.

3. Discussion

Creatine is a popular supplement. Its use has spread widely to both professional and recreational athletes without significant concern of adverse effects to health. However, creatine supplementation may cause an increase of muscle stores of phosphocreatine, which causes water to be drawn into the muscle by osmotic effect.¹ This, in addition to decreased water intake, could lead to dehydration, which is one of the risk factors for central retinal vein occlusion.^{2,3} Our patient suffered an episode of rhabdomyolysis several years ago, during which he was hospitalized and received intravenous fluids over several days. Creatine supplementation has previously been linked to cases of exercise-induced rhabdomyolysis in athletes.⁴ The patient, who weighed 83 kg, reported taking creatine at a maintenance dose of 5 grams per day over a period of 5 years (0.06 gm/kg/day), which is considerably greater than the standard 0.03 gm/kg/day for 4–6 weeks as a maintenance dose.⁵ Having excluded all other causes of thrombophilia, we deduced that excessive creatine supplementation leading to dehydration was most likely associated with central retinal vein occlusion.

4. Conclusions

As creatine supplementation use becomes more widespread among

athletes who are always striving to improve performance, it is imperative that we warn them of the dehydrating potentials of creatine and consequently its thrombotic risk. Continuous and adequate hydration is a must during consumption of creatine supplementation.

Patient consent

Oral informed consent was obtained from the patient for publication of this case report. This report does not contain any personal identifying information.

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Authorship

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

Declaration of competing interest

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