Vascular Fundus Changes Observed In Patients With A High Probability of CCSVI

Driscoll DL[1], Francomano CA[1], Driscoll RA[2]
Harvey Institute For Human Genetics[1], Total Eye Care[2]

Introduction

With the advent of research indicating patients with multiple sclerosis (MS) are much more likely than normals to exhibit chronic cerebrospinal venous insufficiency (CCSVI), the authors hypothesize that poor venous drainage through the internal jugular veins may be visualized by close observation of the retinal blood vessels.

CCSVI has been implicated in Alzheimer's disease, MS and other neurodegenerative conditions potentially involving poor brain perfusion. Through clinical observation, the authors noticed that patients with Ehlers-Danlos Syndrome (EDS, a disorder of connective tissue) are especially prone to CCSVI in conjunction with stenosis of veins in other areas of their bodies. EDS patients are known to have weakened and abnormal collagen affecting their ligaments, organs and vessels.

Patients with EDS are also more prone to developing MS than the general population, and a simultaneous diagnosis of EDS and MS is not unusual.

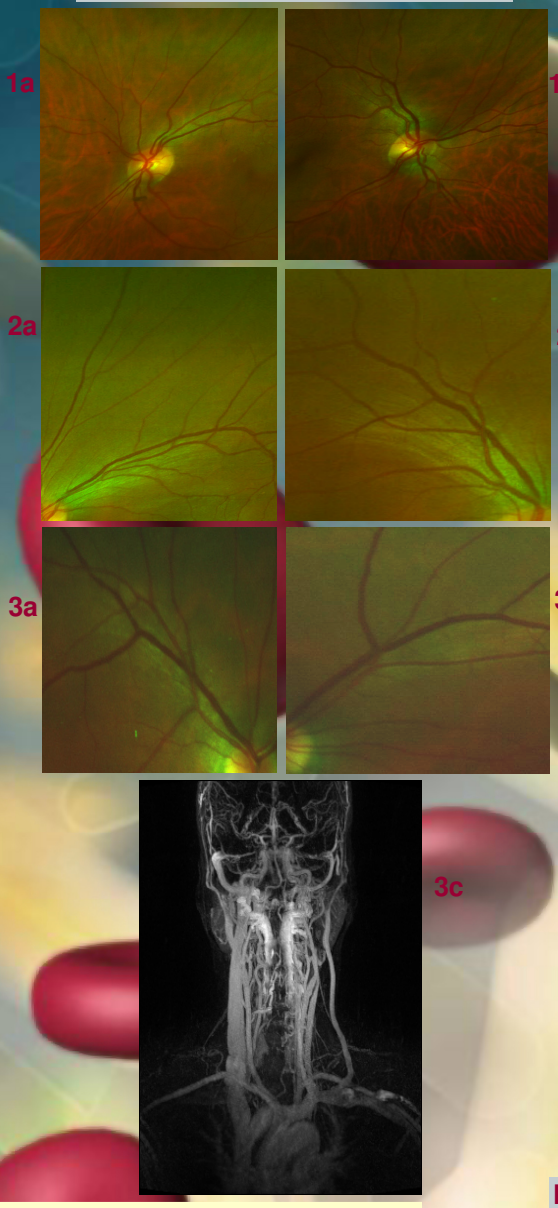
Purpose

The investigators hypothesize that patients with EDS, MS, or both EDS and MS will show vascular fundus irregularities, offering credence to the theory of CCSVI. Such objective data can be elusive, excepting fMRI, sonograms, MRV's and the results of venous angioplasty. Direct observation of vessels as is allowed by viewing the ocular fundus may be an invaluable tool in the diagnosis of CCSVI and/or poor oxygen perfusion of tissues in the skull.

Because CCSVI is a vascular disorder, the investigators hypothesize that they are able to screen candidates for CCSVI with thorough examination of the vessels of the fundus

Methods

- In this double-blind pilot study, detailed fundus images of 60 patients (120 eyes) – 30 affected patients and 30 age-matched "normals" were obtained.
- All patients received a Beighton scale evaluation (the measure of flexibility used as a screening tool for Ehlers-Danlos Syndrome), pachymetry, Goldmann tonometry and an autorefractor reading.
- The "blinded" investigator attempted to identify the affected patients by evaluation of the vessels of the fundus, as compared to age-matched normals.



Results

- The "blinded" doctor was able to differentiate the patients with EDS/POTS or EDS/POTS/MS over age matched normals with approximately 90% accuracy. This accuracy dropped to 68% for patients with multiple sclerosis only.
- The changes noticed in the vascular fundi included engorged and beaded veins, suggesting sluggish venous outflow, generally worse in one eye. In the study entitled "Optical coherence tomography findings in patients with chronic cerebrospinal venous insufficiency", conducted by Dr. Marian Simka et.al., greater OCT pathology was found in the eye on the side of the more stenosed jugular vein. In this trial also, it was noted that the eyes possessing the more highly beaded and engorged veins were also the eyes with the most stenosed IJV's, when fMRI results were known.
- Also evident in the majority of patients was an abnormal A/V ratio (artery to vein ratio). Normally, patients exhibit a 2/3 A/V ratio. In patients with MS, EDS or both MS and EDS, veins tended to be too large, and arteries tended to be too small.
- Finally, the majority of patients exhibited arterioles which were narrowed (as in hypertension), or demonstrated "copper wiring" or "silver wiring" as in arteriosclerosis, even in the young patient. This was more apparent with a longer duration of symptoms.

Discussion and Conclusions

Results of this study indicate that retinal vessels may indeed reflect CCSVI, likely exhibiting as poor drainage from the fundus secondary to poor IJV outflow. If such vascular abnormalities reflected systemic venous weakness, we would not expect to see the irregularities as worse in one eye. Thus, the authors presume that these engorged venules reflect sluggish outflow of venous blood from the ipsilateral IJV (internal jugular vein), or another vein between the fundus and the IJV.

Fundus findings also indicate more obvious vessel abnormalities in the Ehlers-Danlos Syndrome patients (with or without multiple sclerosis) than in the MS patient. The authors presume this is due to abnormal collagen in the EDS patient existing from birth, as opposed to the MS patient, whose vascular collagen is believed to change later in life, but further study is needed in EDS.

This study also indicates that in order for doctors to appreciate the vascular irregularities, very high magnification is necessary – more magnification than what is typically utilized in the routine eye examination. Highly magnified fundus images, perhaps in conjunction with OCT (Ocular Coherence Tomography) may allow doctors to visualize or suspect CCSVI in an otherwise routine eye examination. This is most easily accomplished when one side is more affected than the other, and is more reliable in the EDS or EDS/MS patient than in the MS patient without EDS.

Figure Key

1a: MS, left eye
1b: MS, right eye
2a: MS, likely EDS, left eye
2b: MS, likely EDS, right eye
3a: EDS, left eye (has CCSVI)
3b: EDS, right eye (has CCSVI –IJV valve more affected in this eye)
3c: same patient; notice how right fundus corresponds to worse stenosis on right side.

References

Vilisaar J, Harikrishnan S, Suri M, Constantinescu CS. Ehlers-Danlos Syndrome and multiple sclerosis: a possible association. Mult Scler. 2008 May;14(4):567-70. Epub 2008 Jan 21.

Singh AV, Zamboni P. Anomalous venous blood flow and iron deposition in multiple sclerosis. J Cereb Blood Flow Metab. 2009 Dec:29(12):1867-78. Epub 2009 Sep 2. Review.

Zamboni P, Galeotti R, Menegatti E, Malagoni AM, Tacconi G, Dall'Ara S, Bartolomei I, Salvi F. Chronic cerebrospinal venous insufficiency in patients with multiple sclerosis. J Neurol Neurosurg Psychiatry. 2009 Apr:80(4):392-9. Epub 2008 Dec 5.

Jeanjean L et al. Retinal atrophy using optical coherence tomography (OCT) in 15 patients with multiple sclerosis and comparison with healthy subjects. Rev Neurol Paris 2008;164:927.

Simka M, Janas P, Ludyga T, Kazibudzki M, Latacz P. Optical coherence tomography findings in patients with chronic cerebrospinal venous insufficiency. Abstract for ISNVD. 2010.

ISNVD International Society for Neurovascular Disease