

Evaluating the presence of abnormal venous vasculature in a non-MS population using CT angiography

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Introduction: There has been a major push in the last year to show that patients with multiple sclerosis (MS) have abnormal venous vasculature (1) and it has been shown directly by Interventional Radiologists (IRs) treating patients with angioplasty that many do in fact have problems with stenoses, bad valves or abnormal flow (2). The question remains, “How many normal individuals also have the same bad venous vasculature characteristics as those shown in MS?” To address this issue, we chose to retrospectively evaluate a set of 300 computed tomography angiographic (CTA) datasets to see how many people presenting with atherosclerosis or a variety of other symptoms exhibited venous abnormalities.

Methods: Institutional review board approval was obtained to evaluate retrospectively the CTA data. The patients were scanned in a 64 slice CT Scanner, utilizing about 100cc of Ultravist 370. Axial images were obtained with 1mm resolution. A total of 300 conventional CTA data were reviewed by two Radiologists and by a physicist or biomedical engineer on the local PACS system. The history of every case was reviewed to determine the cause of pathology if possible. Data were reviewed in the original axial plane and reformatted for both coronal and sagittal viewing. If there appeared to be any significant narrowing, the data were saved and then evaluated with SPIN to determine the cross sectional area of the purportedly narrowed or pinched region. Whenever patients had a prior scan both were reviewed and narrowing in both ensured that the data was used to quantify vessel cross section. Narrowing was called stenosis if the area of the jugular vein was less than 25mm^2 unless the narrowing appeared in the C1/C2

(cranio-vertebral junction) region where the cutoff was 12mm^2 . These two cutoffs were chosen to represent 70% stenosis of the jugular veins.

Results: Of the 300 cases reviewed, 36 were of non-diagnostic quality. Thirty-three (33) cases had significant venous narrowing in at least one vein (8 of 33 had bilateral stenoses). Of these 33, 13 had trauma and one had suspected MS. Therefore, excluding the trauma data, 19 cases out of 250 cases were found to have abnormal veins or 7.6% of non-MS patients had venous stenosis. Of these 250 cases, 121 were imaged for suspected atherosclerosis and the rest had a variety of potential diagnoses including: stroke, infections, thyroid masses, etc. Nine out of 19 showing stenosis were from the atherosclerotic group (7.2%) while 10 of 19 were from the miscellaneous category (8%). No truncular venous malformations were observed in this group of 33 abnormal venous vasculature cases. However, 1 of the 9 atherosclerosis stenoses was of a beaded nature (multiple stenoses). Figure 1 shows an example of a normal appearing coronal data set and its transverse view. Figure 2 shows an example of an abnormal appearing coronal data set and its transverse view.

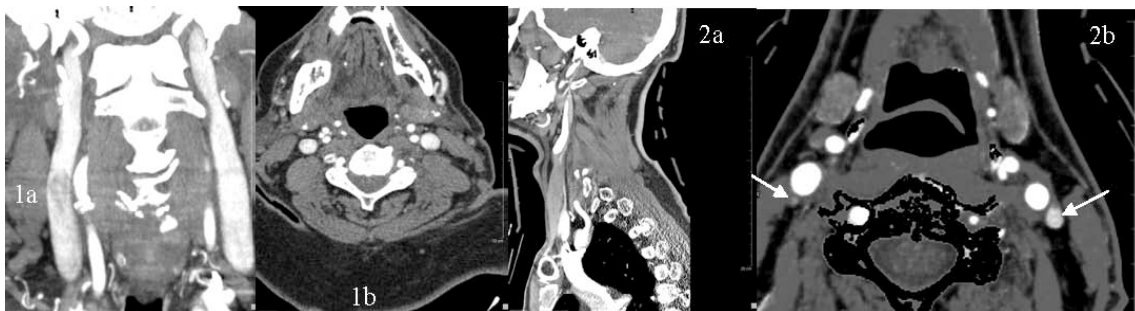


Fig. 1: Normal anatomy in coronal (a) and transverse views (b).

Fig. 2: Abnormal anatomy in sagittal view (c) and transverse view (d). In the normal cases jugular veins were of large caliber while in the abnormal cases we found narrowing (left white arrow in Fig. 2b) either unilateral or bilateral in 19 out of 250 cases.

Discussion and Conclusion: There are reports by interventional radiologists stating that the rate of abnormal vasculature as seen using angiography is between 80 and 97%. Reports from those using MR venography (MRV) are less supportive of this (but MRV is far from the gold standard of angiography) that only 56% of MS patients show venous abnormalities while 22% of normals do show problems (3). This larger fraction

of normals that met the five Zamboni criteria may be explained by the fact that in their study the normal population was often chosen from relatives of the MS patients. Our results indicate that even for people with other suspected diseases, the rate of abnormal venous stenosis is only 7.6%. What role these venous abnormalities may play in this cohort of 19 patients is unclear, but it demonstrates that the prevalence of stenoses in the non-MS population is low and certainly much smaller than that observed by others in the MS population.

References:

[1] Zamboni P et al. Chronic cerebrospinal venous insufficiency in patients with multiple sclerosis. *J Neurol Neurosurg Psychiatry*. 2009;80:392-399. [2] Ludyga T et al. Endovascular treatment for chronic cerebrospinal venous insufficiency: is the procedure safe? *Phleb In Press*. 2010. [3] Zivadinov R et al. Use of MR venography for characterization of the extracranial venous system in patients with MS and healthy control subjects. *Radiology*, 2010, in press.