

# **The Role of Three Dimensional Magnetic Resonance Venography in Confirming of Color Doppler Ultrasound Findings and its Usefulness in Selecting Proper Angioplasty Procedure**

*Authors & Affiliation: Nikolaos Liasis<sup>1</sup>, Nikolaos Papanikolaou<sup>2</sup>, Elias Brountzos<sup>3</sup>*

*<sup>1</sup>Vascular and General Ultrasound Diagnostic Center/Euromedic Athens*

*<sup>2</sup>MRI Dept, Iatriki Diastasi, Euromedic Vari*

*<sup>3</sup>University of Athens/ Attiko Hospital*

**Introduction:** 3D reconstruction of MR Venography imaging data provides a unique portrayal of the anatomic structures such as the extra and intra cranial veins. Additionally, Magnetic Resonance Venography (MRV) may assess the azygous vein, an area that cannot be visualized with other imaging modalities. As opposed to the slice-by-slice cross-sectional presentation, this new technique, utilizing sophisticated volume rendering algorithms, can generate photorealistic 3d representations of vascular anatomy. At the same time, the relation to anatomic structures located outside the 3d models is continuously maintained and displayed in reference to the position of the viewed segment. The aim of this study is to check whether 3D Magnetic Resonance Venography (3D MRV) may aid in determining which patients are opt to undergo venous angioplasty, in imaging the azygous vein and most importantly in selecting proper method of repair.

**Materials & Methods:** In our study which includes 60 patients as an addition to the Zamboni Protocol for CCSVI evaluation, our clinic sends patients who depict anomalies in venous flow, specifically stenosis or regurgitation in the internal jugular veins and vertebral veins, or when there is assumption of stenosis of the azygous vein for 3D MRV. Primarily our patients undergo a complete Color Doppler Ultrasound Exam of the Extra cranial as well as Intracranial Veins Transcranial Doppler Ultrasound of the as described by Prof. Zamboni using In our study 45 out of 60 patients met 2-3 criteria of the 5 proposed by Prof. Zamboni. 20 of these patients underwent 3D MRV where findings of Color Doppler Ultrasound were confirmed in 17 patients and azygous vein stenosis was detected in 7 patients. By keeping Venography as a gold standard,

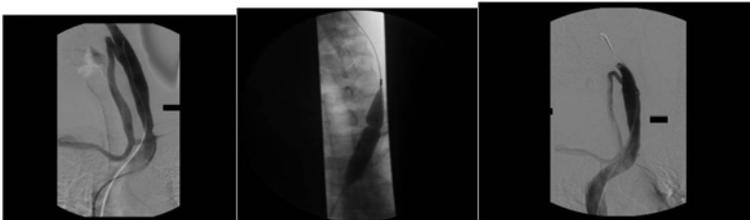
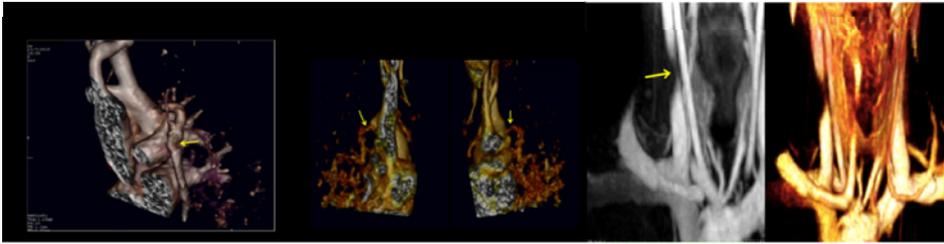
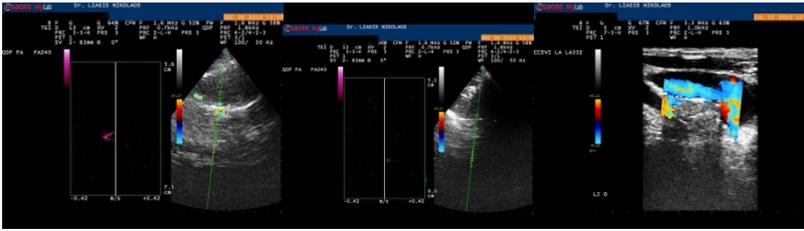
sensitivity, specificity, positive and negative predictive value of 3D MR Venography were calculated.

**Results:** Our clinical trial experience shows that 3D MRV has proven to be an essential tool when evaluating patients with CCSVI and can provide determining criteria in selecting patients for venous angioplasty. 3D MR Venography resulted in 93.5% sensitivity, 95% specificity, 93.5% positive predictive value and 95% negative predictive value. 15 of these patients underwent venous angioplasty. 13 of them showed improvement of quality of life and reduction of symptoms such as fatigue, mental fatigue, brain foginess, poor mental clarity, joint pain, and in the more severe cases disability of upper and lower extremity. In fact the two patients, who were handicapped for many years, have left their wheelchairs home.

**Discussion & Conclusion:** 3D MRV in 85% of the patients was a significantly useful modality in confirming color Doppler ultrasound findings and determining which patients should undergo angioplasty and type of angioplasty. 3D MRV is a valuable tool for endovascular planning of patients with CCSVI disease at various stages of treatment and can be conclusive in deciding which patients should undergo angioplasty. Lesion identification, therapeutic and patient selection for endovascular procedures and intraoperative localization are all factors enhanced with these techniques

#### **References:**

- (1) Haacke et al. JMRI, 32:663, 2010
- (2) Propescu et al. Phys Med Biol 54: 651, 2009
- (3) Derex et al. Cerebrovasc Dis, 17:238, 2004



**Image1-2:** QDP depicting reflux of the deep veins of the brain during expiration.

**Image 3:** Stenosis of the IJV right before its junction with the subclavian vein.

**Image 4-5:** 3d reconstruction of the azygos vein in a patient with CCSVI. A stenotic lesion is identified (arrow) with rich collaterals

**Image 6:** Maxim intensity projection coronal view (left) and 3d volume rendering reconstruction (right) showing a significant stenotic lesion (arrow) on the right internal jugular vein.

**Image: 7,8,9:** Stenosis of the IJV pre and post balloon angioplasty.