

# **The chronic cerebrospinal venous insufficiency syndrome, Angiographic findings and Doppler correlation**

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**Introduction:** Chronic cerebrospinal venous insufficiency (CCSVI) is a syndrome seen in multiple sclerosis (MS) patients characterized by abnormal venous haemodynamics due to venous obstacles in main extracranial and extra spinal routes (1). This results in poor venous drainage of the brain and spinal cord with opening of collaterals to overcome cerebrospinal venous hypertension. CCSVI can be assessed by non invasive Doppler ultrasound; (2) however this is highly operator dependent and needs special training (3).The gold standard for assessment of venous pathology is catheter angiography (4).

**Objectives:** To give detailed description of angiographic finding of CCSVI and abnormal venous haemodynamics in MS patients. To correlate some of these findings with the corresponding well established Doppler ultrasound criteria.

**Materials & Methods:** A retrospective analysis of the angiographic findings of 287 patients with clinically definite MS who underwent selective venography of the Internal Jugular veins (IJV) and Azygus vein (AV).

Mean age of the patients was 34 years (range 14-66 years). Mean duration of the disease was 6.4 years. (Range 6 months - 17 years) Left common femoral vein approach was used in the vast majority of cases. Injection rate in the IJV and AV were: 3 ml/second, Quantity: 10 ML.

**Results:** Angiographic evidence of abnormal venous haemodynamics was very common in MS patients. Significant venous stenosis in at least one of the three veins was seen in 93% of cases:

The most common angiographic finding was the stagnation of contrast and delayed emptying at the level of the valve.

Signs of abnormal venous Haemodynamics in the IJV were (Rt IJV , Lt IJV) :

(1) Reflux at the level of the valve: 57 , 64% (2)Reflux propagated into the cranium 29,41% (3) Stagnation of the contrast with poor drainage: 71 , 77% (4)Stenotic valve due to:-Annulus: 70 , 53% -Septum: 13 , 7% -Membrane like valve :5 , 4%, Intraluminal Flap: 1, 2% , Twisting: 0 , 0.5%.

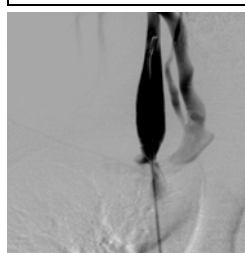
Sings of abnormal venous haemodynamics in the AV were:

(1) Obvious stenosis: 39%: Upper Stenosis 21%, lower stenosis 13%, -Multiple stenosis 5% (2) Intraspinal reflux: 35% (3) Reflux into left renal vein: 30% (4)-Delayed emptying at the valve: 46% (5) Significant collaterals: 28%

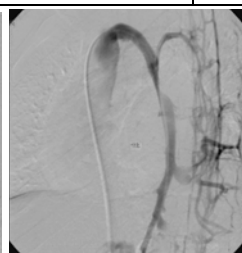
**Discussion:** CCSVI is usually diagnosed based on the known Doppler ultrasound criteria. These criteria with the corresponding angiographic finding in patient with CCSVI syndrome are summarized in table (1)

Table (1)

Doppler Ultrasound Criteria	Corresponding Angiographic finding
1-Reflux in the IJV or AV	Regurgitation of contrast in IJV or AV, Fig 1A,B
2-Reflux Propagated upward	Reversed flow,contralateral IJV opacification, Fig.2
3-Evidence of IJV.stenosis	Frank stenosis, Annulus, Septum, Flap Fig.3
4-No flow in IJV	Stagnation of Contrast in IJV Fig 4
5-Negative change in CSA in IJV	Can not be assist



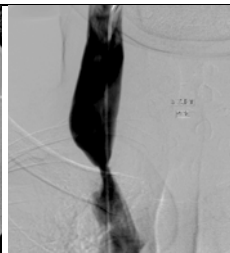
**Fig 1A**



**Fig1B**



**Fig 2**



**Fig 3**



**Fig 4**

**Conclusions:** Angiographic signs of abnormal venous haemodynamics are very common in MS patient. These findings are so variable, most of these findings can be correlated with the corresponding well established Doppler ultrasound criteria. However some of these findings are unique and can be only appreciated by the gold standard catheter venography.

**References:**

(1) Zamboni P, Galeotti R. *Phlebology*; 25:269-79, 2010. (2) Zamboni P et al *J Neurol Neurosurg Psychiatry*; 80:392-9, 2009. (3) Menegatti E et al. *Int Angiol*; 29:121-6, 2010. (4) Zamboni P et al. *J Vasc Surg*; 50:1348-58, 2009