



# Study of Flow Volumes of Internal Jugular Veins in Patients with Cerebral Venous Sinus Thrombosis by Doppler Ultrasonography.

Dr. G. Yuvabalakumaran<sup>1</sup>, Dr. R. M. Sidhesh<sup>2</sup>, Dr. Birkanwar Hayer<sup>3\*</sup>, Dr. B. Pravitha<sup>4</sup>,  
Dr. R. Sathiyarayanan<sup>5</sup>, Dr. V. Prashanth<sup>5</sup>.

<sup>1,2,3,4,5</sup>Professor & Head, Associate Professor, Resident, Senior resident, Assistant Professor Department of Radio-Diagnosis, Vinayaka Mission's Kirupananda Variyar Medical College & Hospitals, Vinayaka Mission's Research Foundation (DU), Chinnasiragapadi, Sangagiri Main Road, NH-47, Salem, Tamil Nadu, India 636308.

\*Corresponding author: Dr. Birkanwar Hayer,

\*Hno 1210 Phase 9 Sector 63, Mohali, Punjab -160062 Email.id: Hayer.bir@gmail.com, Mobile no: 9252700007. Email.id: Hayer.bir@gmail.com,

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## ARTICLE INFO

## ABSTRACT

### Background

This descriptive observational study evaluation of internal jugular flow volume in 378 cerebral venous thrombosis patients which was conducted in Vinayaka Mission Kirupananda Variyar Medical College and Hospital.

**Aim** Assessment of flow volume in internal jugular vein by Doppler ultrasonography in cerebral venous sinus thrombosis patients and to compare it with cases of hypoplastic cerebral venous sinuses.

**Methodology** 378 cerebral venous thrombosis patients were evaluated with GE F8 Logiq ultrasound machine and Siemens magnetom symphony 1.5 tesla MRI for IJV volume and MRI brain with MRV respectively. The patients were grouped into four categories.

### Result

The average internal jugular vein flow volume in ml/min Mean± SD are as follows:

Category A: - Right side afflicted 53.47; Right side non-afflicted 400.1; Left side afflicted 64.83; Left side non-afflicted 438.2.

Category B: - Right side afflicted 101.8; Right side non-afflicted 229.6; Left side afflicted 104.3; Left side non-afflicted 190.3

Category C: - Right side afflicted 96.27; Right side non-afflicted 143.5; Left side afflicted 89.89; Left side non-afflicted 145.5

Category D: - Right side afflicted 223.6; Right side non-afflicted 471.8; Left side afflicted 228.6; Left side non-afflicted 430.2.

**Conclusion** Doppler examination of the affected patients revealed that there was a reduction in the internal jugular vein flow volume. Hence doppler can be used as an adjunct to MRI in the evaluation of CVT.

**Keywords:** Cerebral venous thrombosis, Internal jugular flow volume, Doppler study, MR venography.

## INTRODUCTION

Cerebral venous sinus thrombosis consists a manifold of etiology, clinical findings, radiological imaging features and prognosis. <sup>(1)</sup> Cerebral venous sinus thrombosis is a rare condition as compared to the occlusive arterial disease of the brain, which has a predilection towards young adults and children. The incidence of CVT is approximately 5 per 10 lakh population. Annually CVT contributes to 0.5% - 1% of the reported stroke cases. <sup>(2)</sup> It is the predominant cause for stroke in young patients in India, accounting for about 20% in people who are aged ≤ 40 years. <sup>(3,4)</sup> In the pediatric age, the incidence reported is 7 per 10 lakh population. Women remains the primary target for adult CVT. This study focuses on the evaluation of internal jugular flow volume in CVT patients by doppler and MR venography.

## OBJECTIVE

Assessment of flow volume in internal jugular vein by Doppler ultrasonography in cerebral venous sinus thrombosis patients and to compare it with cases of hypoplastic cerebral venous sinuses.

## METHODOLOGY

This descriptive observational study involved 378 patients was conducted in Vinayaka Mission Kirupananda Variyar Medical College and Hospital. Patients were evaluated with GE F8 Logiq ultrasound machine and Siemens Magnetom Symphony 1.5 tesla MRI. Patients diagnosed with CVT and cerebral venous sinus hypoplasia by MRI were included in this study. Antenatal women and patients with arteriovenous malformations, caroticoavernous fistula and deranged thyroid metabolism are excluded from the study. Patients affected with cerebral venous sinus thrombosis were grouped into four categories depending on its extent as follows:

Category	Involvement
A	Complete unilateral thrombosis of sigmoid / transverse sinus.
B	Complete thrombosis of superior sagittal sinus with complete / partial thrombosis of the sigmoid / transverse sinus.
C	Partial unilateral thrombosis of sigmoid / transverse sinus.
D	Hypoplasia of any of the cerebral venous sinuses.

## RESULT

This study revealed that majority of the patients presented between 40 – 50 years, 58% percent. CVT had female predilection (n=123, 65.08%) as compared to the male population (n=66, 34.92%). In the study group 42, 40, 54 and 242 patients fall in the category A, B, C & D, respectively.

### Category I

S. No	Side of involvement	Internal Jugular Vein flow volume in ml/min Mean± SD
1.	Right side afflicted	53.47
2.	Right side non- afflicted	400.1
3.	Left side afflicted	64.83
4.	Left side non-afflicted	438.2

Substantial difference between the mean flow volume of the right / left sides of the IJVs in cases with sinus thrombosis is absent. (p>0.05).

### In Group II

S. No	Side of involvement	Internal Jugular Vein flow volume in ml/min Mean±SD
1.	Right side afflicted	229.6
2.	Right side non- afflicted	101.8
3.	Left side afflicted	104.3
4.	Left side non-afflicted	190.3

Substantial difference between the mean flow volume of the right / left sides of the IJVs in cases with sinus thrombosis is absent. (p>0.05).

### In Group III

S. No	Side of involvement	Internal Jugular Vein flow volume in ml/ min Mean±SD
1.	Right side afflicted	96.27
2.	Right side non- afflicted	143.5
3.	Left side afflicted	89.89
4.	Left side non-afflicted	145.5

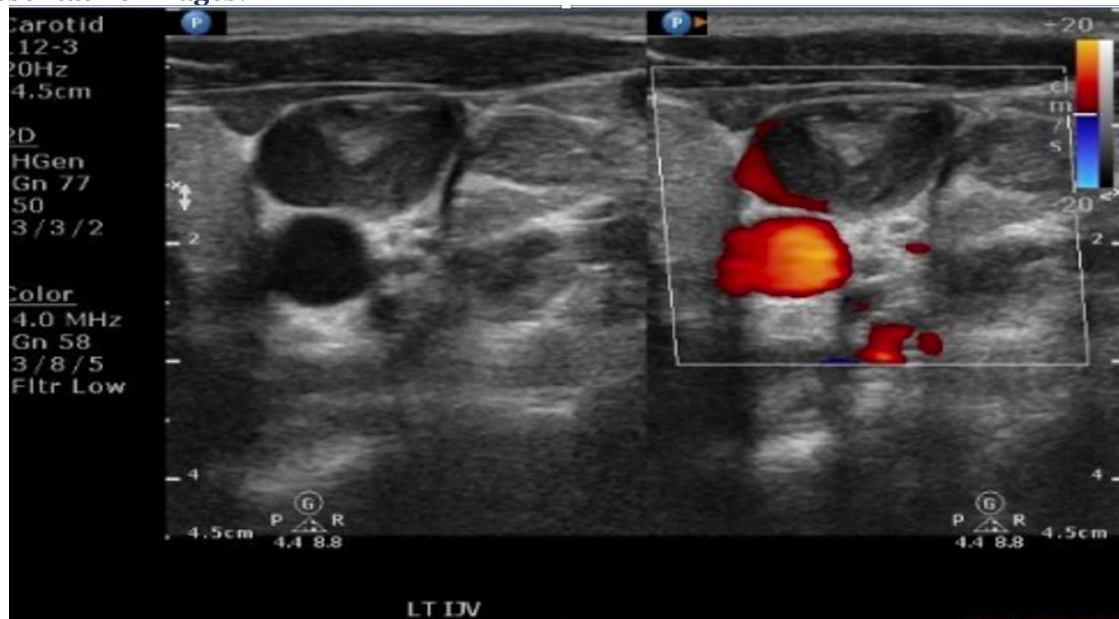
Substantial difference between the mean flow volume of the right / left sides of the IJVs in cases with sinus thrombosis was absent. (p>0.05).

### In Group IV

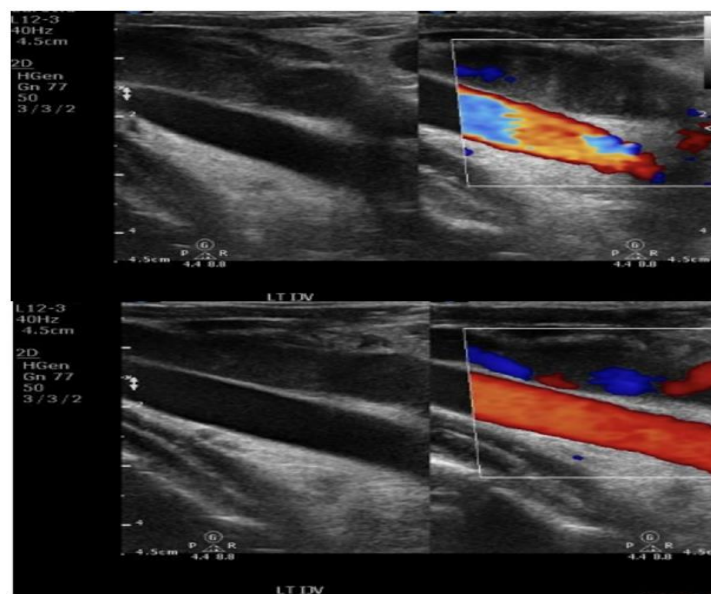
S. No	Side of involvement	Internal Jugular Vein flow volume in ml/ min Mean± SD
1.	Right side afflicted	223.6
2.	Right side non- afflicted	471.8
3.	Left side afflicted	228.6
4.	Left side non-afflicted	430.1

Substantial difference between the mean flow volume of the right / left sides of the IJVs in cases with sinus thrombosis was absent. ( $p>0.05$ ).

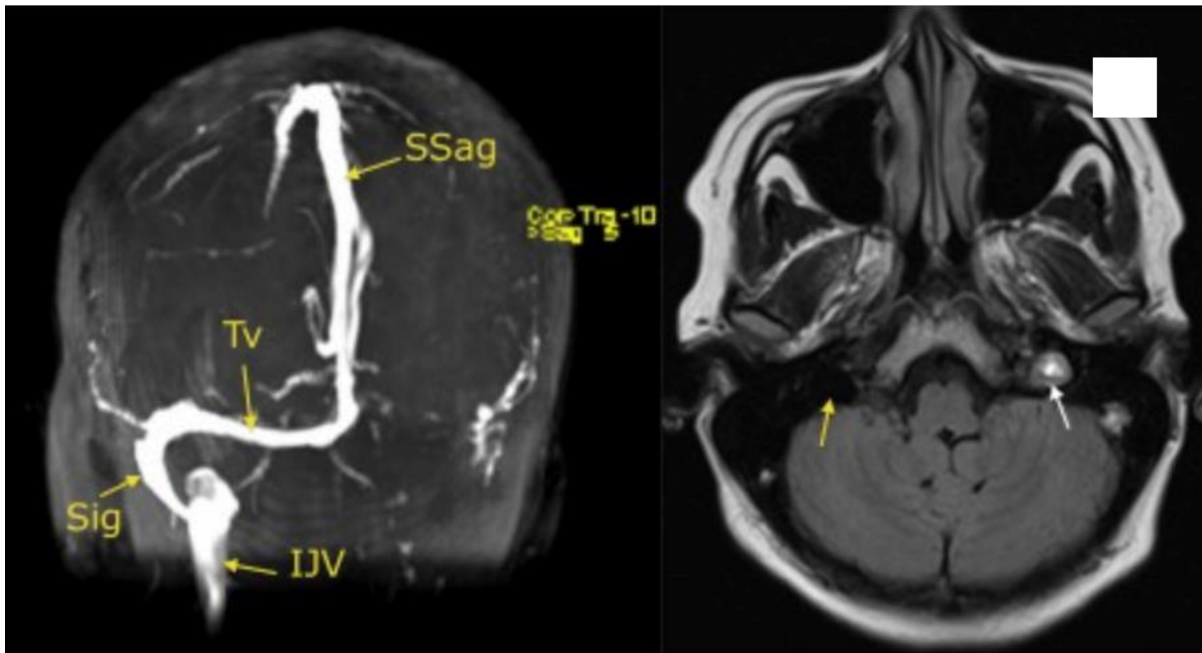
#### Representative Images:



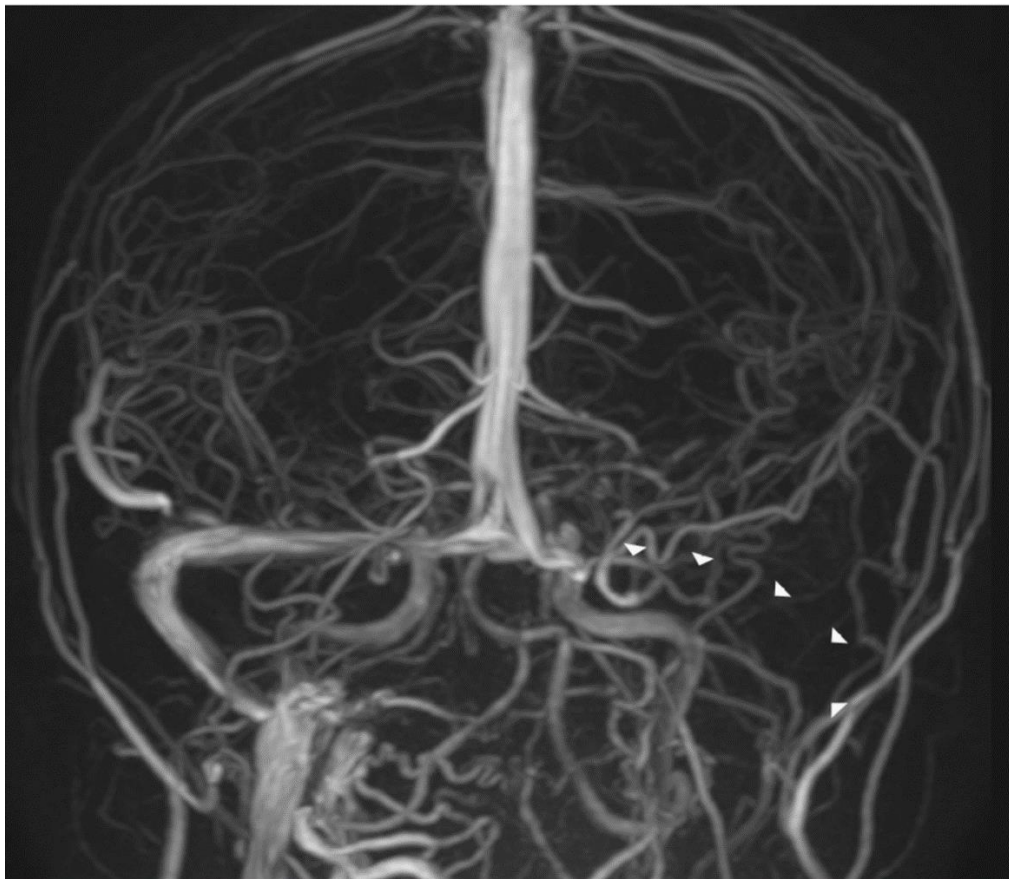
**FIGURE 1** - Axial Doppler ultrasonography image in the same patient as in the previous image shows an echogenic thrombus extending into the mid segment of left IJV with significantly reduced flow.



**FIGURE 2** - Longitudinal B-mode and Doppler ultrasonography images obtained in a case of extensive left-sided CVST show venous thrombosis involving left IJ with significant luminal compromise thereby leading to a significantly decreased flow volume.



**Figure 3** – There flow through the left transverse, sigmoid sinuses and in the left internal jugular were absent. FLAIR image shows normal 'flow void' (due to moving blood) in the right internal jugular vein (yellow arrow), but abnormal high signal in the left IJV, due to thrombus (white arrow).



**Figure 4** – MR Venogram of the brain revealed occlusion of left transverse/sigmoid sinus and left internal jugular vein (arrowheads).

### Discussion

Cerebral venous thrombosis is not a frequent condition unlike arterial stroke. It presents with a wide spectrum clinical sign. CVT can present as seizure, subarachnoid haemorrhage, unexplained loss of consciousness, space-occupying lesion, benign intracranial hypertension or meningoencephalitis depending up on the location, size, time, and progression of development of thrombus.<sup>(5)</sup> Superior sagittal sinus and lateral sinus



are most commonly involved in CVT, with multiple cerebral venous sinus involvement in 30-40% of cases.<sup>(6)</sup> The physician needs opt for an appropriate neuroimaging investigation from the following: computed tomography and angiography; magnetic resonance imaging (MRI) with magnetic resonance angiography and venography. MRV is a fast, non-invasive and sensitive technique for early diagnosis and for follow-up. Further evaluation could be done with digital subtraction angiography.

In this observational study of CVT, the affected patients were in the age group of 40 -50. This condition however mainly occurs in young individuals between the ages of 30 and 41 years old.<sup>(8-11)</sup> Young people and women of childbearing age are the frequently affected and it can present in newborn to 8<sup>th</sup> decade of life. CVT had a female predilection in our study like that of a study conducted in 2014, which revealed the female to male ratio was 3:1<sup>(7)</sup>

### Conclusion

Cerebral venous thrombosis had a female predilection with the most common presentation between 40 – 50 years of age. The varied clinical presentation of CVT leads to difficulty in diagnosis by CT venography. MRI being a non-invasive and non-radiation modality, with TOF venography remains the modality of choice for diagnosis of CVT. Doppler examination of the affected patients revealed that there was a reduction in the internal jugular vein flow volume. Hence Doppler can be used as an adjunct to MRI in the evaluation of CVT.

### References:

1. Ameri A, Bousser M-G. Cerebral venous thrombosis. *Neurologic clinics*. 1992;10(1):87-111.
2. Bousser MG, Ferro JM. Cerebral venous thrombosis: an update. *The Lancet Neurology*. 2007;6(2):162-70.
3. Srinivasan K. Ischemic cerebrovascular disease in the young. Two common causes in India. *Stroke*. 1984;15(4):733-5.
4. Banerjee AK, Varma M, Vasista RK, Chopra JS. Cerebrovascular disease in north-west India: a study of necropsy material. *Journal of neurology, neurosurgery, and psychiatry*. 1989;52(4):512-5.
5. Bousser MG, Chiras J, Borjes J, Castaigne P. Cerebral venous thrombosis--a review of 38 cases. *Stroke*. 1985;16(2):199-213.
6. Bousser MG. Cerebral venous thrombosis: diagnosis and management. *Journal of neurology*. 2000;247(4):252-8.
7. Ozen O, Unal O, Avcu S. Flow volumes of internal jugular veins are significantly reduced in patients with cerebral venous sinus thrombosis. *Current neurovascular research*. 2014;11(1):75-82.
8. deVeber G, Andrew M, Adams C, Bjornson B, Booth F, Buckley DJ, et al. Cerebral Sino venous thrombosis in children. *The New England journal of medicine*. 2001;345(6):417-23.
9. Wasay M, Bakshi R, Bobustuc G, Kojan S, Sheikh Z, Dai A, et al. Cerebral venous thrombosis: analysis of a multicenter cohort from the United States. *Journal of stroke and cerebrovascular diseases : the official journal of National Stroke Association*. 2008;17(2):49-54.
10. Sidhom Y, Mansour M, Messelmani M, Derbali H, Fekih-Mrissa N, Zaouali J, et al. Cerebral venous thrombosis: clinical features, risk factors, and long-term outcome in a Tunisian cohort. *Journal of stroke and cerebrovascular diseases : the official journal of National Stroke Association*. 2014;23(6):1291-5.
11. Kalita J, Chandra S, Kumar B, Bansal V, Misra UK. Cerebral Venous Sinus Thrombosis From a Tertiary Care Teaching Hospital in India. *The neurologist*. 2016;21(3):35-8.