

# Cerebral Venous Sinus Thrombosis

WHEN A HEMORRHAGE IS NOT A  
HEMORRHAGE

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# Educational Objectives

At the conclusion of this session, participants should be able to:

- Examine the risk factors associated with the development of cerebral venous sinus thrombosis.
  - Explore diagnostic assessments that aid in identifying a cerebral venous sinus thrombosis.
  - Distinguish CT scan findings that indicate cerebral venous sinus thrombosis from those typically indicative of an intracranial hemorrhage.
  - Discuss both pharmacologic and nonpharmacologic interventions available for managing cerebral venous sinus thrombosis.
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**For this patient, which of the following is the initial diagnostic study of choice?**

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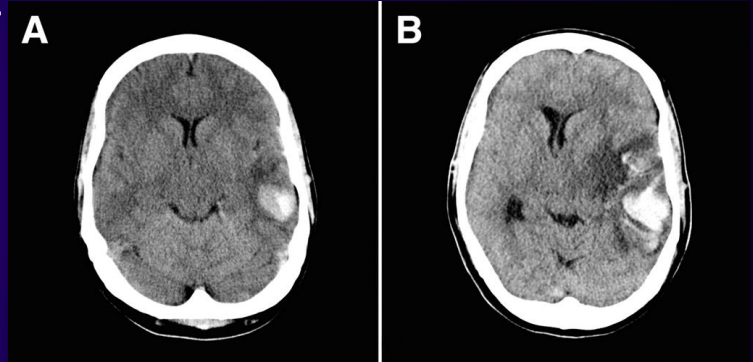
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## The Case:

She undergoes a non-contrast CT of the head.



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**Which of the following is seen on the CTH above?**

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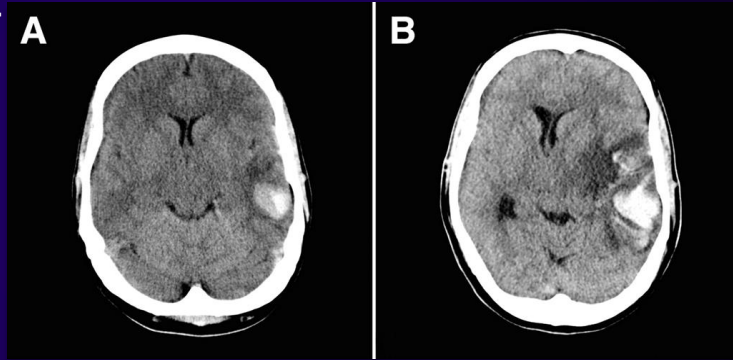
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## The Case:

She undergoes a non-contrast CT of the head.

Findings: Left temporoparietal intracerebral hemorrhage



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## Types of Intracranial Hemorrhage

- 1 Epidural Hemorrhage
- 2 Subdural Hemorrhage
- 3 Subarachnoid Hemorrhage
- 4 Intracerebral Hemorrhage



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## The Case:

### PMHx:

- HTN, DM and Breast Ca (Dx 2010- Treated with radiation and chemotherapy, remission since 2015)

### PSHx:

- Right radical mastectomy (2014)

### Medications:

- Amlodipine 10mg PO Daily
- Metformin 500 mg PO BID

### Allergies:

- NKDA

### SHx:

- Denies ETOH, Tobacco and illicit drugs

### FHx:

- Noncontributory

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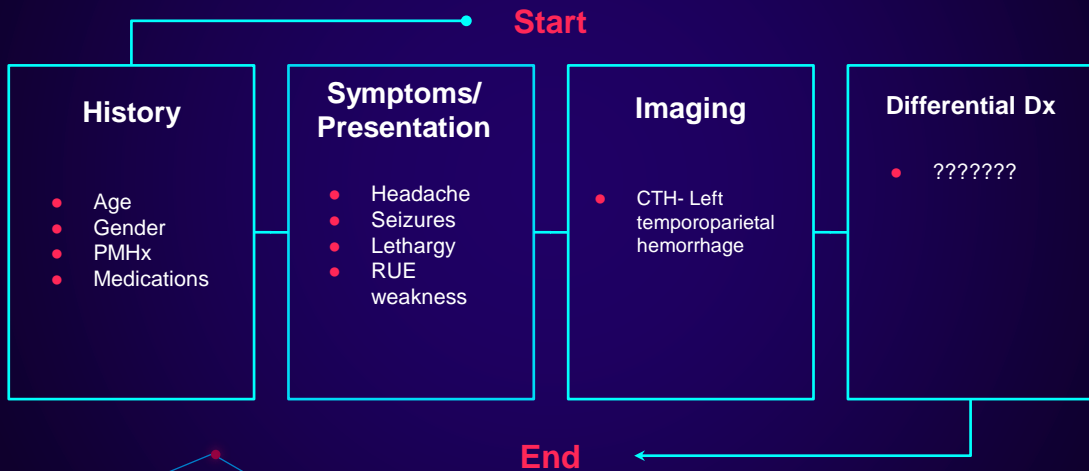
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# Narrowing the Differential Diagnosis




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## Why suspect Cerebral Venous Sinus Thrombosis?

Suspicious Radiographic Findings on CT Head:

1

Location

2

Shape

3

Edema

4

Venous Infarction

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**Which of the following would be the next diagnostic study of choice for the continued work-up of this patient?**

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# The Case:

Patient under goes:

CTA Head: Findings- No evidence of aneurysm or large vessel occlusion.

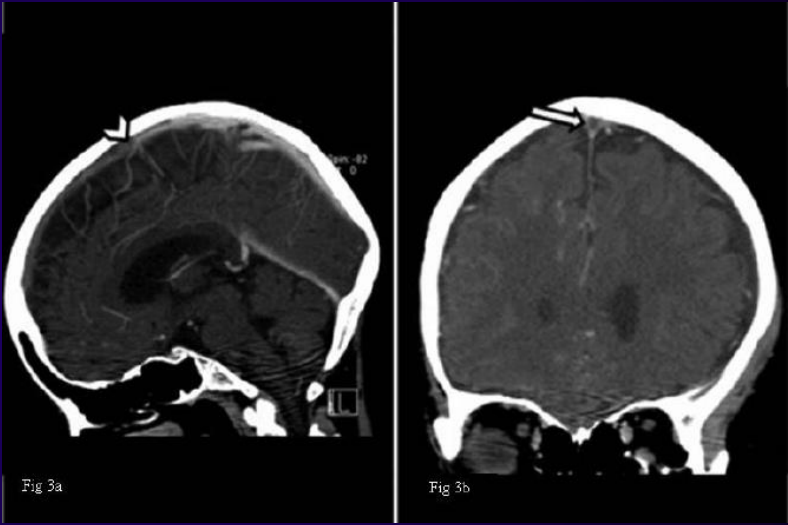


Photo: [https://www.researchgate.net/figure/Superior-sagittal-sinus-thrombosis-Figure-3a-CTV-in-reformatted-sagittal-plane-showing\\_fig3\\_236592574](https://www.researchgate.net/figure/Superior-sagittal-sinus-thrombosis-Figure-3a-CTV-in-reformatted-sagittal-plane-showing_fig3_236592574)

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Which of the following is seen on the CTV above?

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# Cerebral Venous Sinus Thrombosis

**3-4 per million**  
Estimated incidence<sup>(1)</sup>

**Epidemiology:**

More common in young adults (30's-40's)<sup>(1)</sup>

**0.5%**  
of all strokes <sup>(1)</sup>

**75%**  
of those affected are women <sup>(1)</sup>

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## Cerebral Venous Sinus Thrombosis: **Risk factors**

Risk factors	Causes	Description
Infectious	Meningitis, ear/sinuses infections, etc.	
Noninfectious	Postpartum	Highest risk of developing CVST is immediately postpartum
	Hypercoagulable states	Cancer, Sickle cell disease, antiphospholipid antibody syndrome, Behçet factor V Leiden, protein S or C deficiency, polycythemia, etc.
	Postoperative State	
	Drugs	Tamoxifen, Erythropoietin, Birth control pills, etc.
	SARS-CoV-2 vaccines	ChAdOx1 nCov-19 (Oxford-AstraZeneca) and Ad26.COVS.S (Janssen/Johnson & Johnson)
	Head Injury	

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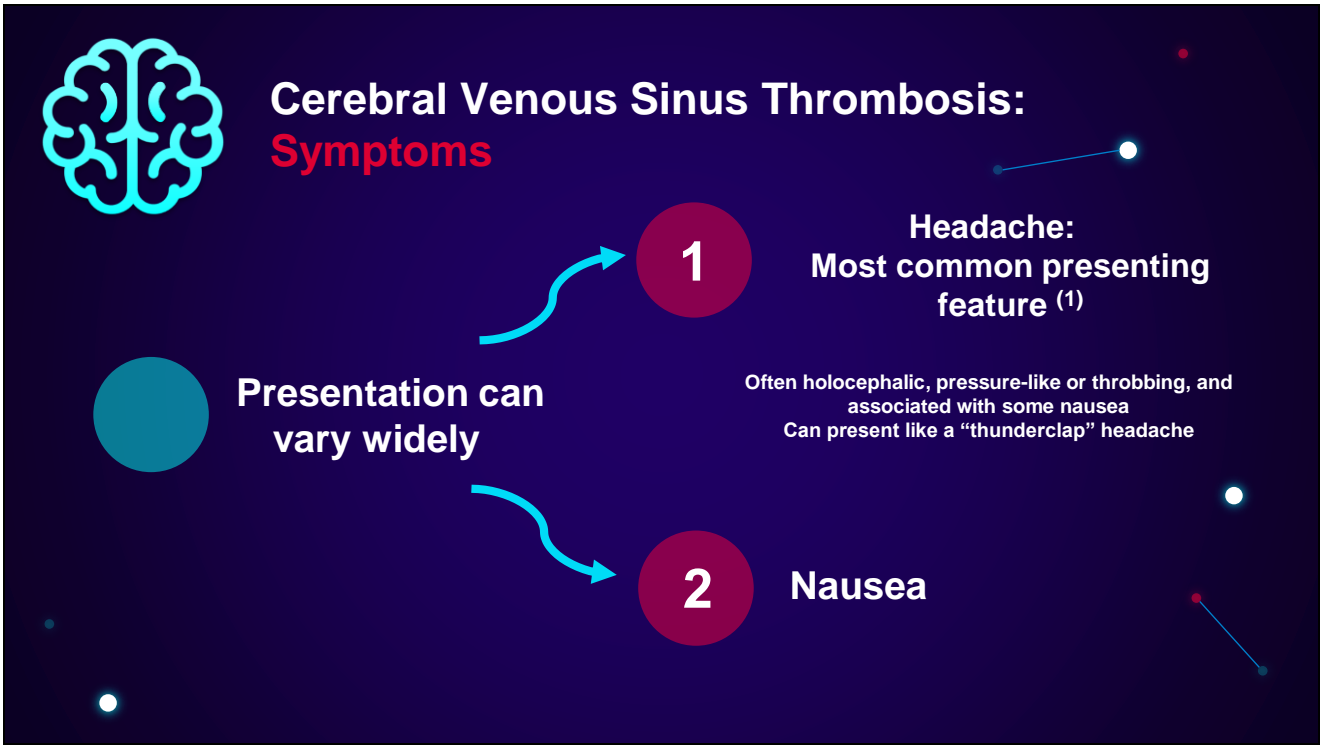
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**Cerebral Venous Sinus Thrombosis:  
Symptoms**



**1** **Headache:**  
Most common presenting feature <sup>(1)</sup>

Often holocephalic, pressure-like or throbbing, and associated with some nausea  
Can present like a “thunderclap” headache

**2** **Nausea**

**Presentation can vary widely**

The infographic features a dark blue background with white and red text. A teal brain icon is on the left. A teal circle with the number 1 is connected by an arrow to the 'Headache' text. A teal circle with the number 2 is connected by an arrow to the 'Nausea' text. The background is decorated with small white and red dots and thin teal lines.

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# Cerebral Venous Sinus Thrombosis

**Presentation:** can ranging from benign to severe

**Signs:**

- Vomiting
- Seizures
- Papilledema
- Stroke-Like Syndromes:
  - Usually slower in evolution
  - Hemiparesis, incomplete hemianopia, and aphasia
- Altered mental status: Can range from lethargy to coma

Photo: <https://en.wikipedia.org/wiki/Papilledema>

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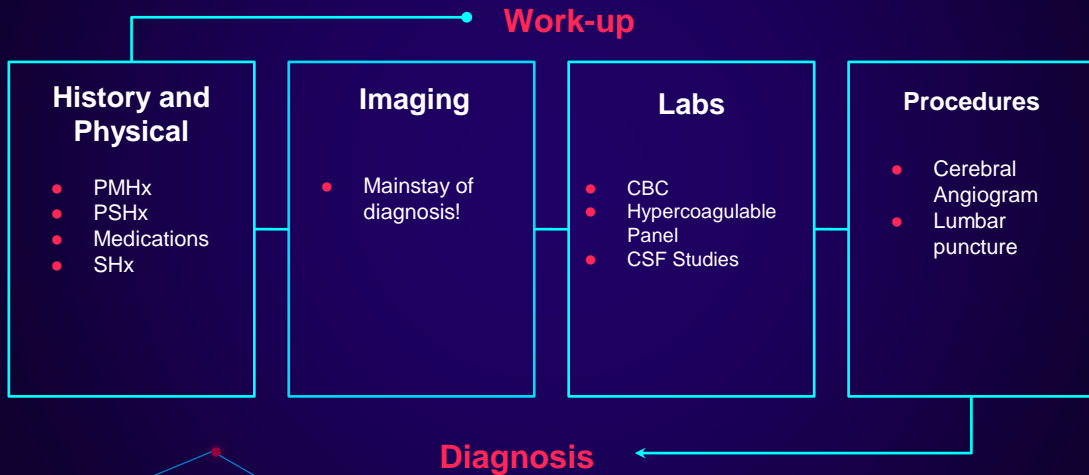
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# Cerebral Venous Sinus Thrombosis:



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## Cerebral Venous Sinus Thrombosis: **Imaging**

- Over 50% of patients are found to have brain parenchymal lesions<sup>(1)</sup>
- Findings include: <sup>(1)</sup>
  - Hemorrhagic venous infarcts (most common)
  - Intraparenchymal hemorrhage
  - Subarachnoid Hemorrhage




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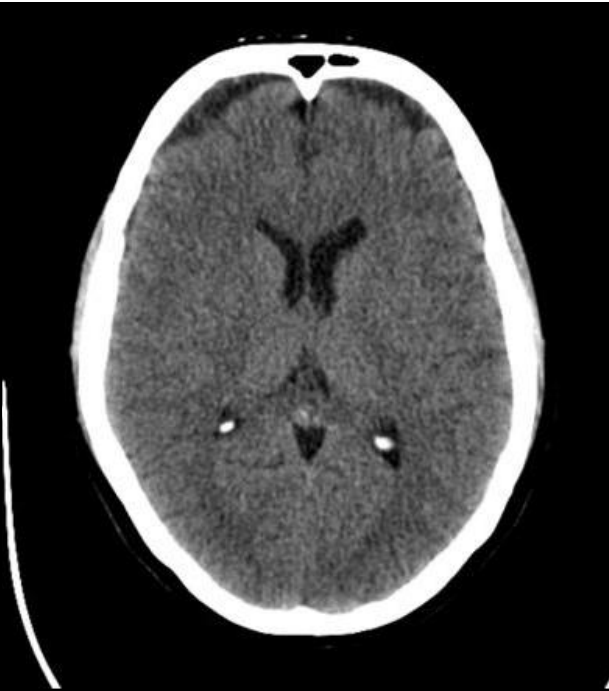
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## Cerebral Venous Sinus Thrombosis: Imaging

**CT Head:** Most commonly the initial exam

**Findings:**

- Multiple cerebral lesions not in arterial territories
- May see Hemorrhagic infarctions (Usually cortical) or/with edematous venous congestion
- +/- "Dense Clot Sign"

Photo: <https://www.emra.org/emresident/article/cvst>

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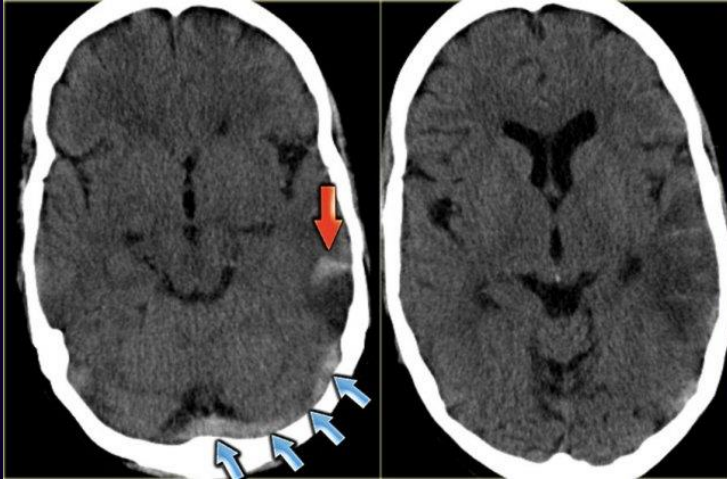
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## Cerebral Venous Sinus Thrombosis: Imaging



### CT Head:

- Hemorrhagic infarction in the temporal lobe (red arrow).
- **Dense Clot Sign:** Dense transverse sinus due to thrombosis (blue arrows).

Photo: Simons, B., Smithuis, R, and Lycklama a Nijeholt, G. (no date) Cerebral venous sinus thrombosis, *The Radiology Assistant*: Cerebral Venous Sinus Thrombosis. Available at: <https://radiologyassistant.nl/neuroradiology/sinus-thrombosis/cerebral-venous-thrombosis> (Accessed: 11 September 2023).

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# Cerebral venous Sinus Thrombosis and Intracranial Hemorrhage

Up to 40% of patients with cerebral venous sinus thrombosis present with an intracranial hemorrhage (2)

Risk factors include (2):



**Female** (1,2)



**Older Age**



**Pregnancy and Peripartum Period**



**Chronic HTN**

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# Cerebral venous Sinus Thrombosis and Intracranial Hemorrhage



Presenting Signs and Symptoms <sup>(2)</sup>:

1

Higher rate of seizures and focal neurologic deficits

2

Higher rates of venous infarcts

3

Lower rates of Headaches

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More commonly affects the superior sagittal sinus <sup>(2,1)</sup>

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## Cerebral Venous Sinus Thrombosis: Treatment

### Anticoagulation Therapy:

- Heparin (unfractionated or low-molecular-weight) is the first-line treatment<sup>(3)</sup>
- Followed by oral anticoagulation for 3 months (Usually warfarin)

Antibiotics if the venous occlusion is caused by an infection

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# The Case:

The patient was started on a heparin gtt. A CTH, hospital day 2, showed stable intracranial hemorrhage. Patient's exam remained stable, but patient continued to suffer from frequent seizures despite escalation of antiepileptic medications. On hospital day 5, repeat CTH showed worsening left parietal ICH with mass effect. She underwent a CTV head, which showed unchanged superior sagittal sinus thrombosis.

**What do we do now?**



Photo <https://academic-accelerator.com/encyclopedia/intracerebral-hemorrhage>

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# Cerebral Venous Sinus Thrombosis: Treatment

**Refractory Cases/Severe Cases:** stupor or coma with significantly elevated intracranial pressure, etc.

- ### 1 Local infusion of tPA
- Has been used, but has not been subjected to the same randomized testing
  - No consensus on the type of thrombolytic drugs, doses or admission rate due to lack of adequate number of studies <sup>(3)</sup>

- ### 2 Mechanical thrombectomy
- Rare cases refractory to anticoagulation
  - Can be considered as a salvage treatment in severe CVST patients refractory to heparin <sup>(3)</sup>

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# Cerebral Venous Sinus Thrombosis: Treatment

**Risk factors** for Severe Clinical Course <sup>(3)</sup>:



Lower GCS on presentation <sup>(3)</sup>

Average of 13.5



Seizures on Presentation <sup>(3)</sup>



Thrombosis of the Superior Sagittal Sinus <sup>(3)</sup>

Usually with complete occlusion

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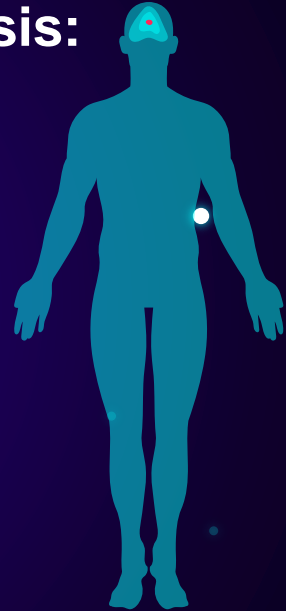
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# Cerebral Venous Sinus Thrombosis:

## Prognosis

Overall inpatient mortality ranges from **3.9-8.3%** <sup>(8)</sup>

- Older age, seizures and intracranial bleeding were associated with increased risk of inpatient mortality. <sup>(8)</sup>
- If a patient survives the acute phase, long-term prognosis is generally satisfactory <sup>(3)</sup>
- Good prognosis was associated with <sup>(3)</sup>:
  - Shorter length of Clot
  - Higher GCS on presentation



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## Cerebral Venous Sinus Thrombosis: Prognosis



- ▶ **Poor Prognosis** associated with:
  - ▶ Presence of ICH <sup>(2,5)</sup>
    - ▶ Lower rates of excellent outcome measured by a 90-day mRS 0
    - ▶ Higher rates of 90-day mortality
  - ▶ Thrombosis of Superior Sagittal Sinus <sup>(3)</sup>
  - ▶ Lower GCS/Coma on presentation <sup>(3)</sup>
  - ▶ Seizure Activity <sup>(3)</sup>
- ▶ **Coma and multiple cerebral hemorrhages are usually fatal**

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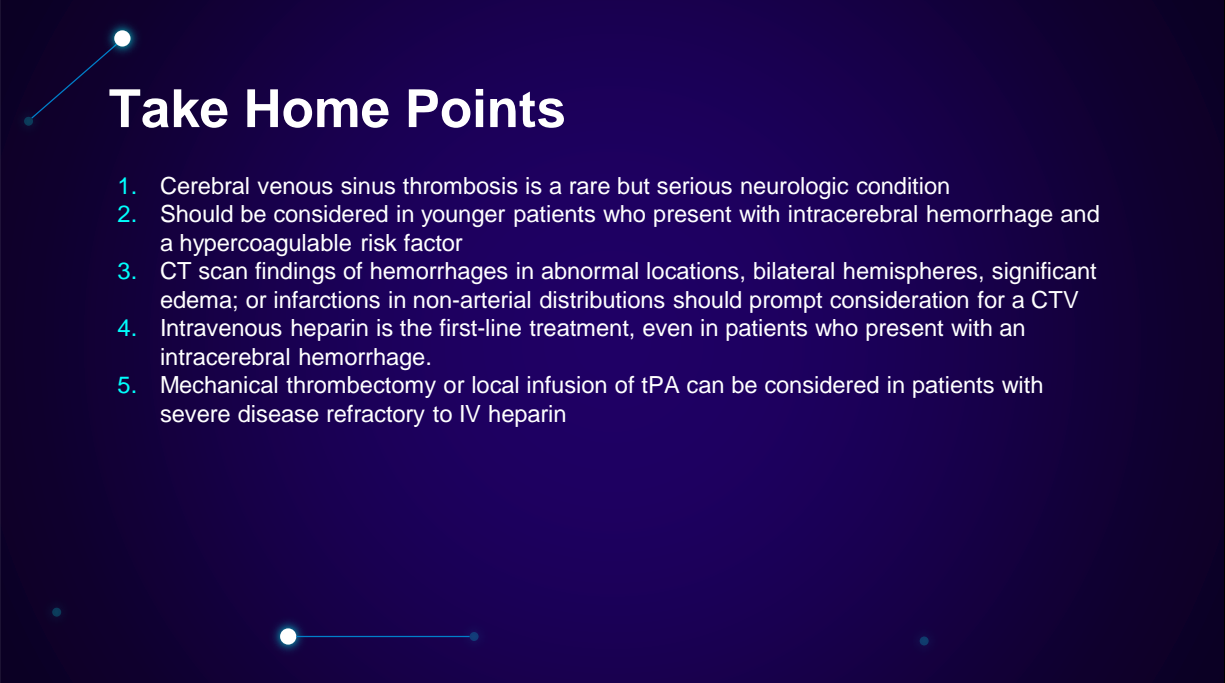
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## Take Home Points

- 1. Cerebral venous sinus thrombosis is a rare but serious neurologic condition
- 2. Should be considered in younger patients who present with intracerebral hemorrhage and a hypercoagulable risk factor
- 3. CT scan findings of hemorrhages in abnormal locations, bilateral hemispheres, significant edema; or infarctions in non-arterial distributions should prompt consideration for a CTV
- 4. Intravenous heparin is the first-line treatment, even in patients who present with an intracerebral hemorrhage.
- 5. Mechanical thrombectomy or local infusion of tPA can be considered in patients with severe disease refractory to IV heparin



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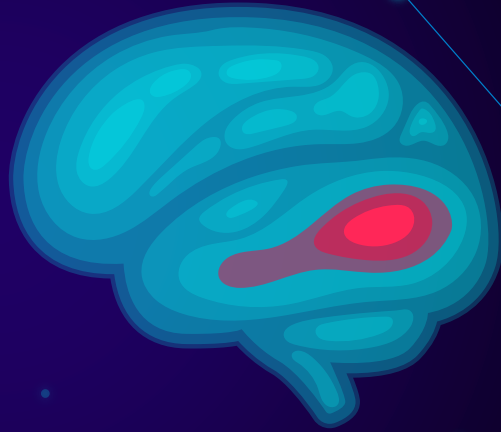


# Thanks

Do you have any questions?

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