

Seeing double: A case of cerebral venous sinus thrombosis

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CASE

A woman, aged 19 years, was referred by her general practitioner (GP) for an urgent ophthalmology review because of a four-week history of worsening horizontal diplopia and band-like occipital and frontal headaches, worse in the morning. There were no other neurological symptoms and her ocular history was unremarkable, though she had a history of migraines. Six weeks prior, she had a planned surgical termination of pregnancy at seven weeks' gestation, and was not on contraception. Her regular medications included quetiapine for depression and iron tablets for anaemia. She was a non-smoker. A non-contrast MRI of the brain performed prior to this presentation did not reveal any pathology. On examination, visual acuity was 6/6 in each eye. She had mild abduction deficits in both eyes. There were no visual field deficits. Pupillary reactions to light and accommodation were intact and there was no ptosis. Fundoscopy showed mild swelling of both optic nerve heads. Of note, her body mass index (BMI) was 34 kg/m².

QUESTION 1

What are the differential diagnoses?

ANSWER 1

The combination of new headaches, bilateral sixth nerve palsy and optic nerve head swelling raised suspicion for increased

intracranial pressure (ICP). Possible causes included space-occupying lesion, cerebral venous sinus thrombosis (CVST) and idiopathic intracranial hypertension (IIH), especially with risk factors like high BMI and iron deficiency anaemia.

Normal MRI brain does not rule out CVST and IIH, as the optimal neuroimaging for these conditions involve contrast studies and a venogram, with MRI being the gold standard.¹

CASE CONTINUED

The patient was sent to the emergency department (ED) for computed tomography (CT) head with venogram, revealing right transverse sinus thrombosis, along with partial thrombosis of the right sigmoid sinus and proximal internal jugular vein. She was admitted and commenced on heparin infusion, followed by dabigatran for six months. A thrombophilia screen was negative. Her diplopia was managed with Fresnel prism, a thin plastic sheet adhered to glasses lenses temporarily, for symptomatic relief. Two weeks later, her headaches had improved and diplopia resolved. A follow-up MRI and magnetic resonance venography (MRV) showed a reduction in clot burden.

QUESTION 2

What are the risk factors that can cause CVST in women?

QUESTION 3

How would you counsel her on contraceptive options?

ANSWER 2

In Australia, CVST is diagnosed in 1.30 to 1.57 per 100,000 persons annually.² Women are three-fold more likely to be affected, with an average age of 37 years, compared to age 46 years for males.³ Additional risk factors for women include pregnancy and postpartum state, and medications like the combined oral contraceptive pill (OCP) and oral menopausal hormone therapy. Combined OCP users have six- to seven-fold higher risk of developing CVST.^{1,4} In our case, the patient also had risk factors of obesity and iron deficiency anaemia (hypercoagulable state).

ANSWER 3

The patient should avoid estrogen-containing oral contraceptives, and her history of migraines already presents a relative contraindication. Progesterone-only contraceptive pills are a safer option if oral medications are preferred. Although data on CVST and contraception are limited, non-hormonal or levonorgestrel intrauterine devices are considered safe.⁵ The risk of CVST in the use of other hormonal preparations, such as transdermal patches and contraceptive rings, have not been assessed by major studies.⁴ Fortunately, subsequent pregnancies after CVST are generally safe, with a recurrence rate of 12 events per 1000 pregnancies.⁶

CASE CONTINUED

CVST is a rare venous thromboembolism involving the brain's dural venous sinuses, accounting for up to 3% of strokes.⁷

Table 1. Risk factors for cerebral venous sinus thrombosis based on Virchow's thrombogenic triad

| Endothelial damage | Hypercoagulability | | Venous stasis |
|---|---|--|---|
| | Hereditary | Acquired | |
| <ul style="list-style-type: none"> • Smoking • Hypertension | <ul style="list-style-type: none"> • Factor V Leiden mutation • Protein C and S deficiency • Prothrombin gene mutation | <ul style="list-style-type: none"> • Pregnancy • Oestrogen-containing contraception/oral MHT • Obesity • Cancer (active) • Chemotherapy | <ul style="list-style-type: none"> • Immobility • Polycythaemia |

MHT, menopausal hormone therapy.

Risk factors align with Virchow's thrombogenic triad: endothelial injury, hypercoagulability and venous stasis (Table 1).⁸ Over 80% of patients present with sudden, severe headaches, often

worsening with Valsalva manoeuvres, straining and lying down.¹ Red flags in our case included the patient's headache pattern change, papilloedema, cranial sixth nerve palsy and post-pregnancy status.⁹

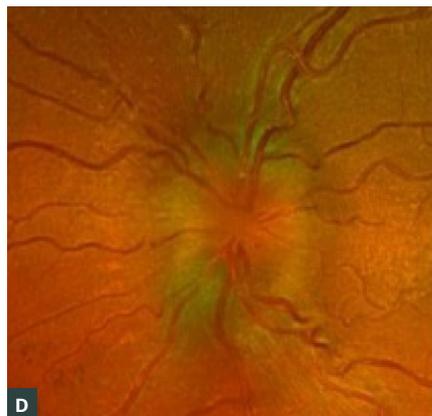


Figure 1. False-colour images showing normal (A) right and (B) left optic nerve heads; and swollen (C) right and (D) left optic nerve heads.

Papilloedema results from a clot blocking blood flow, raising intracranial pressure, and is seen in about one-third of patients.¹⁰ Direct fundoscopy should be performed, assessing for blurred disc margins, haemorrhages and obscuration of major blood vessels at the disc (Figure 1). Raised ICP can also cause cranial sixth nerve palsy, leading to diplopia, which improves by turning the head towards the affected side.

Non-contrast MRI brain scan does not exclude CVST. Management for suspected CVST involves referral to the ED for urgent imaging with contrast and venogram, in addition to an urgent ophthalmology assessment if required. Acute treatment for CVST involves anticoagulation with therapeutic dosage of low-molecular-weight heparin⁷ followed by novel oral anticoagulation (NOAC) or warfarin. Treatment duration varies, with up to 12 months for unprovoked cases and possibly lifelong anticoagulation in high-risk patients.

Diagnosing CVST can be challenging because of its non-specific symptoms. A non-dedicated CT scan or MRI might miss key findings, making contrast imaging with venography essential when CVST is suspected. It is important to consider CVST in the differential diagnosis for patients presenting with red flag headaches, diplopia, other neurological symptoms and relevant risk factors.

Key points

- Dedicated neuroimaging with venogram is recommended to exclude CVST.
- Direct fundoscopy and ocular motility testing should be performed as part of the neurological assessment.
- Same-day emergency presentation and referral to ophthalmology and neurology is recommended for further assessment and management in high-risk cases

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References

1. Idiculla PS, Gurala D, Palanisamy M, Vijayakumar R, Dhandapani S, Nagarajan E. Cerebral venous thrombosis: A comprehensive review. *Eur Neurol* 2020;83(4):369-79. doi: 10.1159/000509802.
2. Payne AB, Adamski A, Abe K, et al. Epidemiology of cerebral venous sinus thrombosis and cerebral venous sinus thrombosis with thrombocytopenia in the United States, 2018 and 2019. *Res Pract Thromb Haemost* 2022;6(2):e12682. doi: 10.1002/rth2.12682.
3. Ranjan R, Ken-Dror G, Martinelli J, et al. Age of onset of cerebral venous thrombosis: The BEAST study. *Eur Stroke J* 2023;8(1):344-50. doi: 10.1177/23969873221148267.
4. Amoozegar F, Ronksley PE, Sauve R, Menon BK. Hormonal contraceptives and cerebral venous thrombosis risk: A systematic review and meta-analysis. *Front Neurol* 2015;6:7. doi: 10.3389/fneur.2015.00007.
5. LaVasseur C, Neukam S, Kartika T, Samuelson Bannow B, Shatzel J, DeLoughery TG. Hormonal therapies and venous thrombosis: Considerations for prevention and management. *Res Pract Thromb Haemost* 2022;6(6):e12763. doi: 10.1002/rth2.12763.
6. Aguiar de Sousa D, Canhão P, Crassard I, et al; ISCVT-2-PREGNANCY Investigators. Safety of pregnancy after cerebral venous thrombosis: Results of the ISCVT (International Study on Cerebral Vein and Dural Sinus Thrombosis)-2 PREGNANCY Study. *Stroke* 2017;48(11):3130-33. doi: 10.1161/STROKEAHA.117.018829.
7. Saposnik G, Bushnell C, Coutinho JM, et al; American Heart Association Stroke Council; Council on Cardiopulmonary, Critical Care, Perioperative and Resuscitation; Council on Cardiovascular and Stroke Nursing; Council on Hypertension. Diagnosis and management of cerebral venous thrombosis: A scientific statement from the American Heart Association. *Stroke* 2024;55(3):e77-90. doi: 10.1161/STR.0000000000000456.
8. Ferro JM, Aguiar de Sousa D. Cerebral venous thrombosis: An update. *Curr Neurol Neurosci Rep* 2019;19(10):74. doi: 10.1007/s11910-019-0988-x.
9. Do TP, Remmers A, Schytz HW, et al. Red and orange flags for secondary headaches in clinical practice: SNNOOP10 list. *Neurology* 2019;92(3):134-44. doi: 10.1212/WNL.0000000000006697.
10. Ferro JMCP, Canhão P, Stam J, Bousser MG, Barinagarrementeria F; ISCVT Investigators. Prognosis of cerebral vein and dural sinus thrombosis: Results of the International Study on Cerebral Vein and Dural Sinus Thrombosis (ISCVT). *Stroke* 2004;35(3):664-70. doi: 10.1161/01.STR.0000117571.76197.26.

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