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Circulation. 2014;130:e68-e70

doi: 10.1161/CIRCULATIONAHA.113.008018

Circulation is published by the American Heart Association, 7272 Greenville Avenue, Dallas, TX 75231

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Print ISSN: 0009-7322. Online ISSN: 1524-4539

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Cerebral and Sinus Vein Thrombosis

Stephan Moll, MD; Beth Waldron, MA

A blood clot in the veins that drain the blood from the brain is called a sinus or cerebral vein thrombosis. It is an uncommon type of clot, affecting about 1500 people in the United States per year.

Normally, blood is transported through arteries into the brain, where it delivers oxygen and nutrients. Once the blood has done its job, it collects into small veins (known as cerebral veins) that drain into large veins, called sinus veins (Figure 1). The sinus veins lead to the jugular veins in the neck, which carry the blood back to the heart. The sinus veins have nothing in common (except for the name sinus) with the sinuses of the face on both sides of the nose and above the eyes, which can get infected, leading to sinusitis.

Symptoms

The obstruction of the blood flow from a clot in veins in the head leads to a back up of blood and increasing blood pressure in the blood vessels just before the obstruction. This is like water in front of a dam. The increased pressure leads to swelling of part of the brain, which results in headaches; the pressure can damage the brain tissue, leading to stroke-like symptoms. The

increased pressure can also lead to rupture of the blood vessel and bleeding into the brain (Figure 2).

In medical terms this is called cerebral hemorrhage. It is like water in a reservoir overflowing into the

surroundings or like a ruptured dam. This is referred to as venous hemorrhagic infarction, or venous hemorrhagic stroke. It can lead to further damage of brain tissue. About one-third of patients with sinus and

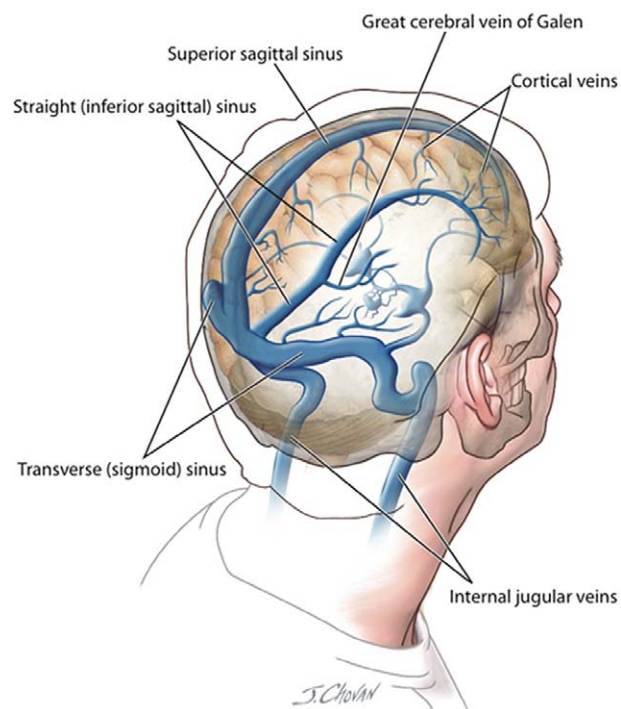


Figure 1. The anatomy and terminology of the cerebral and sinus veins. Reproduced with permission from Clot Connect.¹

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Circulation is available at <http://circ.ahajournals.org>

DOI: 10.1161/CIRCULATIONAHA.113.008018

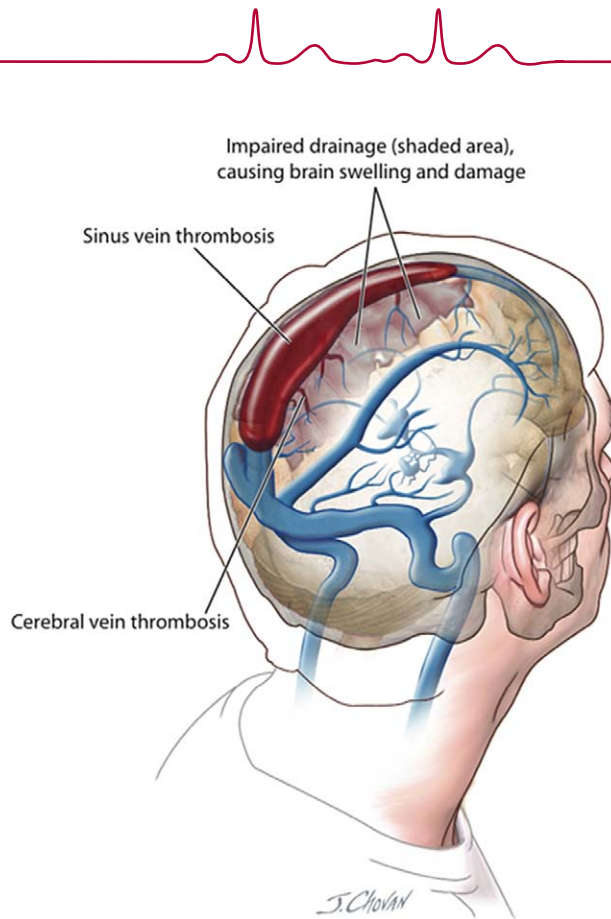


Figure 2: A blood clot in a sinus leads to brain swelling and can lead to bleeding into surrounding brain tissue. Reproduced with permission from Clot Connect.¹

cerebral vein thrombosis have such bleeding.

Symptoms from sinus and cerebral vein clots depend on the location and extent of the clot and vary from patient to patient.

- The most common symptom is a severe headache, often described as the worst headache that a patient has ever had. It can be of sudden onset, develop over a few hours, or a few days.
- Nausea and vomiting.
- Blurred vision.
- Neurological (ie, stroke-like) symptoms, such as seizures, speech impairment, 1-sided numbness or weakness of an arm, a leg, or both, confusion, a decreased level of alertness.
- A very extensive blood clot may lead to loss of consciousness and death.

Sinus and cerebral vein thrombosis may occur in newborns or adults. It can

be attributable to (1) temporary risk factors and (2) permanent (inherited) ones. In newborns, the most common cause for the clot is an infection, typically an infection of the inner ear (otitis), the bone behind the ear (mastoiditis), the mouth, face, or neck, as well as sinusitis. In adults, risk factors for developing clots include clotting disorders (known as thrombophilia), birth control pills, patches and rings, estrogen replacement therapy, pregnancy and postpartum state, active cancer, and certain medications (such as tamoxifen and cancer chemotherapy). Sometimes, no obvious cause is identified, in spite of an extensive laboratory work-up.

Diagnosis

Sinus and cerebral vein thrombosis is easily missed if the correct imaging X-ray study is not done. The appropriate test for diagnosis is an MRI venogram (or MRV) or CT venogram (CTV). If available, the MRV is slightly preferred over CTV. The usual

plain routine CT or MRI, as are often done for evaluation of stroke or bleeds into the head, are often normal. A plain X-ray of the head is not helpful.

Treatment

Patients with an acute clot are admitted to the hospital. If symptoms are severe, patients will be admitted to a stroke or intensive care unit. The immediate treatment consists of giving blood thinners (known as anticoagulants). In the first few days, these are either heparin into the veins (intravenously), or injections of low-molecular-weight heparin (enoxaparin [Lovenox], dalteparin [Fragmin], tinzaparin [Innohep]) under the skin (subcutaneously). The purpose of giving blood thinners is to prevent the existing clot(s) from getting bigger and new clots from forming. The body's own clot-dissolving system then slowly, over weeks and months, works on dissolving the existing clots.

Clot busting drugs (known as fibrinolytic drugs) are typically not given, because they may increase the risk of bleeding into the brain. Radiological or surgical procedures with catheters to break up and extract the clot (called thrombectomy and endovascular therapy) are done only in severe cases and in patients who get worse despite adequate blood thinning therapy.

Once the patient has been stable for a few days, an oral blood thinner (warfarin [Coumadin, Jantoven]) is started. The injectable drug and warfarin need to overlap for at least 5 days and until the International Normalized Ratio (INR; this is the measure of how thin the blood is and how much warfarin the patient needs to take) is >2.0 . The typical target INR is 2.0 to 3.0. One of the newer oral blood thinners (rivaroxaban [Xarelto], dabigatran [Pradaxa], apixaban [Eliquis]) may be considered in place of warfarin.

A key question is how long a patient needs to be on blood thinners. This depends on how high the risk of another clot is if the patient is not on blood thinners.² A treatment guideline has been published.³

- If the clot was associated with a transient risk factor, such as an infection or trauma, a period of 3 to 6 months is typically sufficient.
- If strong risk factors suggesting a high risk of recurrent clot are present, long-term warfarin is often chosen. Strong clotting disorders are antiphospholipid antibody syndrome, deficiency of protein C, S, or antithrombin, 2 abnormal genes for factor V Leiden (=homozygous), 2 abnormal genes for the prothrombin mutation (=homozygous); one abnormal gene for each of these mutations (double heterozygous).
- In all other patients with unprovoked clot, a treatment period of 6 to 12 months is often chosen. This includes patients who only have 1 abnormal gene for factor V Leiden (ie, who are heterozygous) or have 1 abnormal gene for the prothrombin 20210 mutation (ie, are heterozygous).

Recovery and Complications

Almost 80% of patients with sinus or cerebral vein thrombosis fully recover, but it may take several weeks or months to get back to normal. Headaches and seizures may persist for some time. Minor disability (concentration or memory problems) occurs in 6% of patients (1 of 17 people). Occasionally, patients will develop chronic headaches, blurred vision, ringing in the ears, or other neurological deficits after the clot from increased pressure inside the skull after a clot. In medical terms, this is called increased intracranial pressure, or pseudotumor cerebri. Poor outcome, with major neurological deficits, occurs in 14% percent of patients (1 of 7 people).

Further Resources

Further information on blood clots and blood thinners can be found at *Clot Connect* (www.clotconnect.org)

Acknowledgments

The illustrations were drawn by Joe Covan for Clot Connect blog.

Disclosures

None.

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