



Clinical Note

Cerebral venous thrombosis. A real issue for the emergency department

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ABSTRACT

Cerebral venous sinus thrombosis is a seldom-diagnosed entity, which was initially considered to bear a fatal prognosis. The introduction of modern neuroimaging techniques, mainly magnetic nuclear resonance (MNR) imaging and/or CT scan and/or MNR imaging angiography, have demonstrated that this condition is quite more frequent than previously thought and also that it bears a favourable prognosis in most cases in adequate management is provided. We here report the case of one female patient under oral contraceptive therapy who consulted at the Emergency Out-patient Clinic because of cephalea and was diagnosed of superior longitudinal and straight sinus venous thrombosis through emergency CT scan and angio-CT scan. Anticoagulation therapy was thereupon initiated with intravenous heparin sodium, with a favourable evolution and outcome. Based on this case, a bibliographic review of cerebral venous thrombosis, its diagnosis and its controverted therapy is carried out.

Key Words: *Cerebral venous thrombosis. Anticoagulation therapy. Oral contraceptives.*

RESUMEN

Trombosis venosa cerebral. Una realidad en Urgencias

La trombosis de los senos venosos cerebrales es una entidad de diagnóstico poco frecuente e inicialmente se pensaba que de pronóstico fatal. La implantación de modernas técnicas de neuroimagen, en especial, Resonancia Nuclear Magnética (RNM) y la angiografía por TAC o por RNM ha permitido comprobar que es más frecuente de lo que se pensaba y su pronóstico es favorable en la mayoría de los pacientes con un manejo adecuado. Se describe el caso de una paciente, en tratamiento con anticonceptivos orales, que consultó en el servicio de urgencias por cefalea y se diagnosticó de trombosis de seno venoso cerebral longitudinal superior y seno recto mediante TC y Angio - TC urgente. Ante estos hallazgos, se inició tratamiento anticoagulante con heparina sódica intravenosa y su evolución fue favorable. A propósito de este caso, se hace una revisión de la trombosis venosa cerebral, de su diagnóstico y de las controversias terapéuticas.

Palabras clave: *Trombosis venosa cerebral. Anticoagulación. Anticonceptivos orales.*

INTRODUCTION

Cerebral venous thrombosis (CVT) was first described in the 19th century and was considered a rare condition with a fatal prognosis¹. The introduction of new neuroimaging techniques, notably nuclear magnetic resonance (NMR), CT and NMR angiography have demonstrated that this condition is much more common than previously thought and that its prognosis is far from fatal. Indeed, good progress is made in most cases if managed correctly.

Symptoms are produced by two different mechanisms²: cerebral venous thrombosis which affects the surrounding area (venous infarction and brain oedema) and cerebral venous sinus thrombosis in which Pacchioni granulations are found (mainly in the superior sagittal and lateral sinus) and are responsible for the reabsorption of cerebrospinal fluid. Therefore the patient presents intracranial hypertension even though the ventricles are not dilated and there is no hydrocephalus.

This condition and its controversial treatment methods have been evaluated using this case as a basis.

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CLINICAL CASE

This is the case of a 31-year-old woman with a relevant family history given that her mother died at a young age of a pulmonary thromboembolism. The patient's personal medical history showed that she had been taking oral contraceptives for 7 years. She came to the emergency department complaining that she had headaches for approximately one week. These were oppressive, intense and began as bitemporal in nature and were followed by pain radiating into the occipital and cervical region. The cervical x-ray showed lordosis correction. She was discharged from hospital and prescribed treatment with analgesics and a myorelaxant. A follow-up visit was scheduled for five days later in the emergency department. During her second visit to the emergency department she reported persistent pain in the occipital and cervical region, which was oppressive in nature and accompanied by nausea and sporadic vomiting which increased when the patient bent over and moved her head. The patient also described excessive sleepiness and a short episode of pins and needles in her right hand the previous day.

During both visits to the hospital, the physical and neurological examinations were normal. During the second visit an emergency brain CT scan was requested, showing a hyperdense image in the area corresponding to the longitudinal sinus and the straight sinus (Figure 1). In light of these findings an emergency angio-CT scan was carried out demonstrating that the superior longitudinal, straight and transverse sinuses do not stand out (Figure 2). These findings coincide with venous sinus thrombosis.

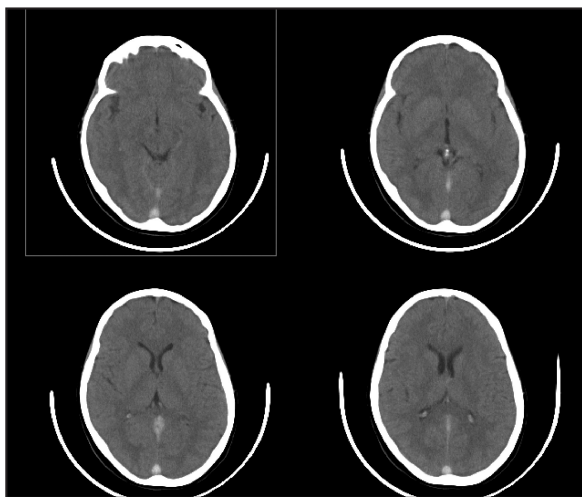


Figure 1. Cranial CT scan: a hyperdense image in the area of the superior longitudinal, straight and transverse sinuses.

After performing a hypercoagulability study in the emergency department, which was normal, anticoagulant treatment was begun with intravenous heparin sodium and the patient was admitted to hospital. Ten days later a brain NMR scan was carried out (Figure 3) as was as an angio-NMR (Figure 4), which confirmed the diagnosis of superior longitudinal sinus thrombosis and permeability of the straight and transverse

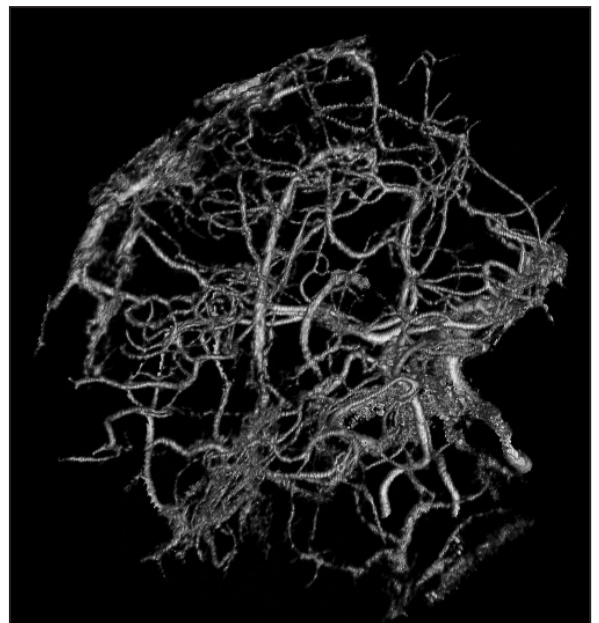


Figure 2. Angio-CT: the superior longitudinal, straight and transverse sinuses do not stand out.

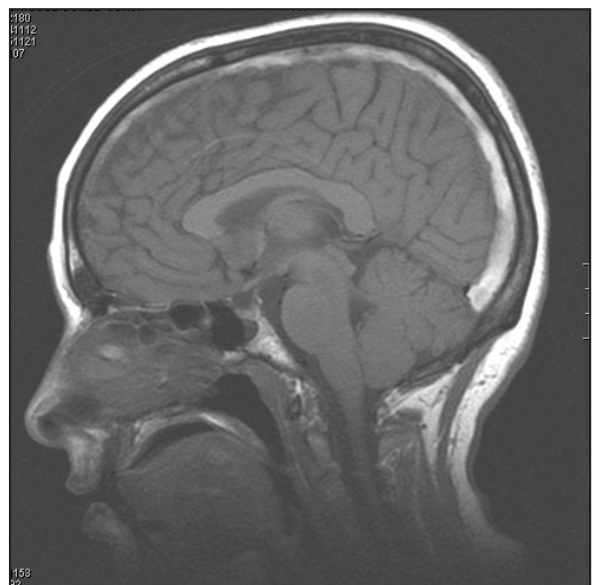


Figure 3. NMR: higher density in the superior longitudinal sinus.

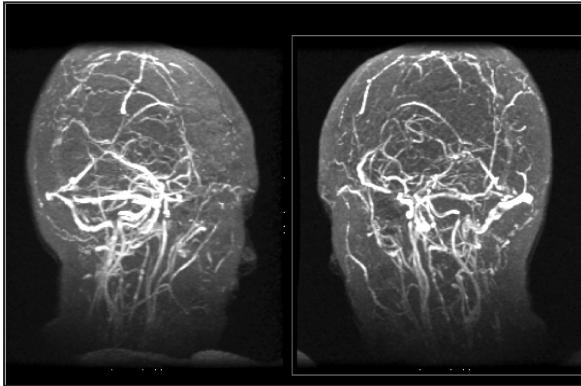


Figure 4. Angio-NMR: the superior longitudinal sinus does not stand out. There is permeability in the straight and transverse sinuses.

sinuses. Consequently, the patient developed intracranial hypertension and bilateral papillary oedema with intermittent diplopia and blurred vision in both eyes, which improved following treatment with oral steroids. Finally, the patient underwent an x-ray of the paranasal sinuses, a thoracoabdominal CT scan, routine tests, blood and urine tests.

When the patient was discharged (14 days after admission) she had no headaches and was slowly recovering from the visual alterations. She was discharged with the following treatment: oral anticoagulation, oral corticoids, antibiotics and aerosols.

DISCUSSION

The causes of CVT are shown in Table 1 but we would like to emphasise that in Spain the most common cause is hypercoagulability linked to hormonal factors: pregnancy, puerperium and, most importantly, the use of oral contraceptives^{3,6}. In developing countries the most common causes are infections along with puerperium and pregnancy⁴. With regard to our patient, contraceptives were found to be the most likely risk factor.

CVT symptoms vary widely (Table 2) but in all studies^{1,2,6} the most common symptom is headaches which do not tend to have any specific characteristics. The remaining symptoms tend to be linked to the headaches. In the case of our patient, the headache was the earliest and most crucial symptom which prompted her to come to the emergency department. The other symptoms (blurred vision, sporadic vomiting etc.) were less relevant and appeared later on.

Diagnosis of this condition is difficult given that it can present itself in different ways and, therefore, the use

TABLE 1. Causes of cerebral venous thrombosis and sinus thrombosis

- Idiopathic
- Infections
 - Local infections
 - Systemic infections
- Structural damage to the venous sinuses
 - Traumatism
 - Tumours
 - Neurosurgery
- Causes of thrombophilia of hormonal origin
 - Pregnancy and puerperium
 - Oral contraceptives
- Hereditary thrombophilia
 - Factor V Leiden
 - Protein C deficiency
 - Protein S deficiency
 - Antithrombin III deficiency
 - Prothrombin gene mutation
- Acquired thrombophilia
 - Disseminated intravascular coagulation
 - Heparin-induced thrombocytopenia
 - Paroxysmal nocturnal haemoglobinuria
 - Polycythemia vera
- Antiphospholipid antibody syndrome
- Solid and haematological neoplasms
- Inflammatory autoimmune diseases
 - Behçet's disease
 - Systemic lupus erythematosus
 - Wegener's granulomatosis
- Inflammatory intestinal disease
 - Crohn's disease
- Other medical causes
 - Heart failure
 - Cirrhosis of the liver
 - Serious dehydration
 - Nephrotic syndrome

Source: Sánchez Juan P, Espina Riera B, Valle San Román N, Gutiérrez Gutiérrez A. Cerebral venous thrombosis. *Medicine* 2003;8:4987-94.

of neuroimaging is vital¹. Furthermore, patients often come to the emergency department complaining of headaches when in fact, most are primary headaches and benign in nature. However emergency physicians must detect the signs and symptoms which may indicate a secondary headache which could have serious consequences for the patient. Therefore, more extensive emergency studies (most importantly neuroimaging tests) are required in these cases. Cerebral venous thrombosis should be considered in the differential diagnosis for young or middle-aged patients who complain of recent and unusual headaches, symptoms which are similar to those of a stroke in

TABLE 2. Most common symptoms of cerebral venous thrombosis and sinus thrombosis

Headaches	70%-91%
Focal signs	27%-79%
Altered level of consciousness	10%-63%
Crisis	10%-63%
Papilloedema	7%-80%
Other: bilateral pyramidal signs, neck stiffness, isolated ICHT	5%-28%

Source: Sánchez Juan P, Espina Riera B, Valle San Román N, Gutiérrez Gutiérrez A. Cerebral venous thrombosis. *Medicine* 2003;8:4987-94.

the absence of any risk factors, especially if the patients are female and are taking contraceptives, as was the case of our patient^{2,7,8}.

The CT scan done with and without contrast should be carried out first in the emergency department in order to rule out any other causes.

For most of patients CT scans show vague abnormalities and prompt further neuroimaging tests⁸. In this particular case, the hyperdense images in the area of the superior longitudinal venous sinus and the straight sinus led to an emergency angio-CT scan which practically confirmed the diagnosis. The quality of the venous reconstructions of the modern angio-CT scans taken of our patient (Figures 2 and 3) is comparable to that of venographic imaging using NMR. The brain NMR scan and venographic imaging using NMR are the techniques of choice in suspected CVT and they are also ideal for following up this condition. In the case of our patient, both techniques were used to confirm the diagnosis and confirm the findings of the CT scan. Conventional angiography is currently very limited in use and is only employed when the NMR cannot obtain an exact diagnosis⁸.

Besides the neuroimaging tests, patients should undergo other examinations to ascertain the causes of the condition. Hypercoagulability studies are the most important given that the results have serious implications with regard to the length of treatment and preventative procedures^{6,9,10}.

In terms of treatment, three different aspects need to be taken into consideration: symptomatic treatment, treatment of the underlying cause and antithrombotic treatment^{1,2}.

Antithrombotic treatment is one of the most controversial issues related to the management of CVT. Two comparative studies have been performed. Heparin sodium and a placebo were compared in one in 20 patients¹¹. This study was cut short for ethical reasons because of the positive results obtained in the patients on heparin. In another study involving 60 patients¹², low molecular weight heparin was compared to a placebo. However, there were no significant advantages to heparin use in terms of patient progress in either study even though both studies showed positive results linked to a reduction in mortality and the possibility of recovery with no after effects in the heparin group (regardless of which heparin was used). Both studies indicate the reliability of treatment using heparin even in cases of brain haemorrhages. It also questions the use of placebo groups given the positive results and the low risk associated with heparin treatment. There are no studies on the length of how anticoagulation treatment.

Intravenous fibrinolytic treatment and local intrathrombus treatment have been tested alone and combined with heparin¹³ in a few cases. No comparative studies involving local fibrinolytics and heparin have been undertaken.

In the absence of any scientific evidence relating to antithrombotic treatment, most doctors opt for treatment with heparin as soon as the diagnosis is confirmed, even if the patient has a haemorrhaging stroke. Experts like Bousser⁸ recommend that even though we cannot predict which patients will recover straight away, heparin should be the treatment of choice regardless of the findings of the neuroimaging tests.

Lifelong anticoagulation treatment is recommended^{9,10} for patients with CVT who have thrombophilia as well as for those who with a recurring thrombotic condition, whether it be CVT or a condition affecting another area (deep vein thrombosis, pulmonary thromboembolism...).

In the case of pregnancy with a history of CVT, antithrombotic treatment is not advised, although it may be considered necessary during puerperium, at least two weeks after the birth¹⁰.

REFERENCES

- 1- Sánchez Juan P, Espina Riera B, Valle San Román N, Gutiérrez Gutiérrez A. Trombosis de los senos venosos cerebrales. *Medicine* 2003;08:4987-4.
- 2- Stam J. Trombosis of the cerebral veins and sinuses. *N Engl J Med* 2005;352:1791-8.
- 3- Martinelli I, Sachii E, Landi G, Taioli E, Duca F, Mannuccio P. High Risk of Cerebral-Vein Thrombosis in Carriers of a Prthrombin-Gene Mutation and in Users of Oral Contraceptives. *N Engl J Med* 1998;338:1793-7.
- 4- Cantú C, Barinagarrementería F. Cerebral Venous Thrombosis Associated with Pregnancy and Puerperium. Review of 67 Cases. *Stroke* 1993;24:1880-4.



- 5- De Bruijn SF, Stam J, Vandenbroucke JP. Increased risk of cerebral venous sinus thrombosis with third-generation oral contraceptives. *Lancet* 1998;351:1404.
- 6- Ferro JM, Canhao P, Stam J, Bousser MG, Barinagarrementeria F, and for the 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;35:664-70.
- 7- Bajwa ZH, Sabahat A. Approach to the patient with headache syndromes other than migraine. (monografía en internet). Waltham: UpToDate; 2005 (acceso 3-3-06). Disponible en: <http://www.uptodate.com/>
- 8- Bousser MG. Cerebral Venous Thrombosis. Nothing, Heparin, or local Thrombolysis? *Stroke* 1999;30:481-3.
- 9- Van Nuenen BFL, Munneke M, Bloem BR. Cerebral Venous Sinus Thrombosis: Prevention of Recurrent Thromboembolism. *Stroke* 2005;36:1822-3.
- 10- Preter M, Tzourio C, Ameri A, Bousser MG. Long-term Prognosis in Cerebral Venous Thrombosis. Follow-up of 77 patients. *Stroke* 1996;27:243-6.
- 11- Einhupl KM, Villringer A, Meister W, Mehraein S, Garner C, Pellkofer M, et al. Heparin treatment in sinus venous thrombosis. *Lancet* 1991;338:597-600.
- 12- De Bruijn SFTM, Stam J. for the Cerebral Sinus Thrombosis Study Group. Randomized, Placebo-Controlled Trial of Anticoagulant Treatment With Low-Molecular-Weight Heparin for Cerebral Sinus Thrombosis. *Stroke* 1999;30:484-8.
- 13- Frey JL, Muro GJ, McDougall CG, Dean BL, Jahnke HK. Cerebral Venous Thrombosis. Combined Intrathrombous rtPA and Intravenous Heparin. *Stroke* 1999;30:489-94.