

## Deep Cerebral Venous Thrombosis Associated with Oral Contraceptives : A Case Report<sup>1</sup>

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Deep cerebral venous thrombosis(DCVT) is a rare category of stroke that can be caused by various conditions. We report a case of spontaneous DCVT in a 34-year-old female using oral contraceptives ; clinical and radiologic manifestations were characteristic.

**Index words :** Brain, MR  
Brain, infarction  
Veins, thrombosis

Cerebral venous thrombosis (CVT) is an uncommon disorder and most frequently involves the lateral sinus and the superior sagittal sinus(1, 2). Isolated thrombosis of the deep cerebral venous system and straight sinus without involvement of the sagittal sinus is very rare and the prognosis is grave(1, 3, 4).

### Case Report

A 35-year-old previously healthy woman was admitted due to rapidly progressive confusion and inappropriate behavior, as well as headache. Her past medical history was unremarkable. She had been taking oral contraceptives for 11 months. Cranial nerve examination was normal, and sensory and motor responses were intact. Except for iron deficiency anemia, the results of laboratory tests were within normal range.

Lumbar puncture revealed mildly elevated cerebrospinal fluid pressure, and slightly increased white blood cell count. Prothrombin time, partial thromboplastin time, protein S, protein C, antithrombin III, and antiphospholipid antibodies were within the normal range. MR imaging(Fig. 1) was performed 1 week after the onset of symptoms.

In bilateral basal ganglia, thalami, midbrain, and adjacent white matter, MR images showed high signal intensity on T2-weighted images and low signal intensity on T1-weighted images with mild hydrocephalus and mass effect. Hemorrhage was not apparent. High signal intensity was seen in the vein of Galen and straight sinus on both T1-weighted and T2-weighted images, reflecting subacute thrombosis. Both internal cerebral veins revealed iso-intensity on T1-weighted images and hypointensity on T2-weighted images with loss of normal signal void, suggesting more acute thrombosis. Postcontrast T1-weighted image showed irregular linear enhancement of the lesion. On a right internal carotid angiogram, flow of the deep venous system was absent. Venous thrombosis was diagnosed and anticoagulant therapy with intravenous heparin was started ; the patient's symptoms improved remarkably.

Twenty days later, she underwent follow-up MR imaging(Fig. 2), and previously abnormal signal intensity showed marked improvement, reflecting edema. Small hemorrhagic infarctions in both caudate heads, the left globus pallidus, and the right thalamus remained, however. The high signal intensity seen in the vein of Galen and straight sinus decreased on both T1-weighted and T2-weighted images, representing partial recanalization. Follow-up angiography was not performed.

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### Discussion

CVT is a rare event which often has serious complica-

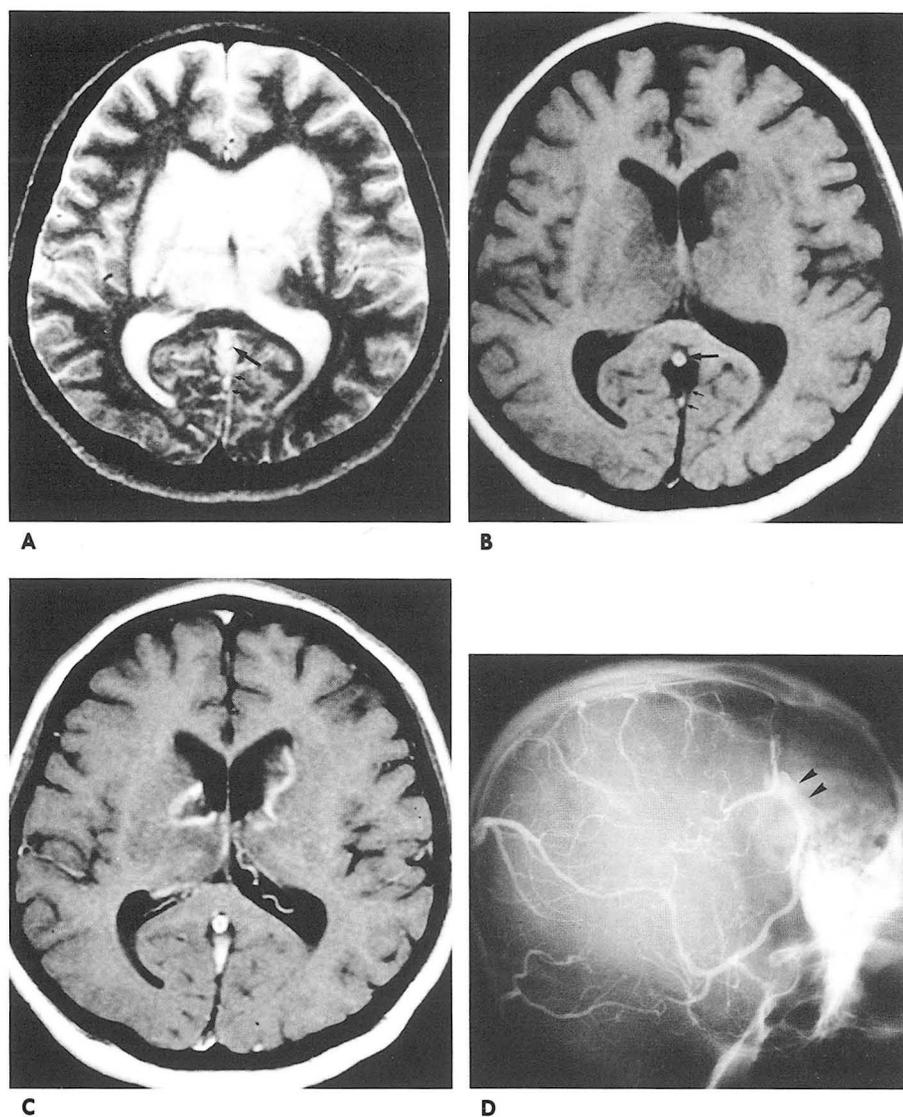
ations(2), and because of various and non-specific clinical presentations, diagnosis is difficult. In order to start anticoagulant treatment as soon as possible, this must, however, be quickly established(5).

Predisposing factors include ear and mastoid infection, pregnancy and puerperium, the use of oral contraceptives, hypercoagulable states, disseminated intravascular coagulation, polycythemia, acquired and congenital heart disease, sickle cell anemia, severe dehydration, trauma, Behcet's syndrome, and neoplasms(2, 3, 5). The lateral and superior sagittal sinuses are most commonly involved(2). Isolated DCVT is very rare and is associated with a poor prognosis(3, 6).

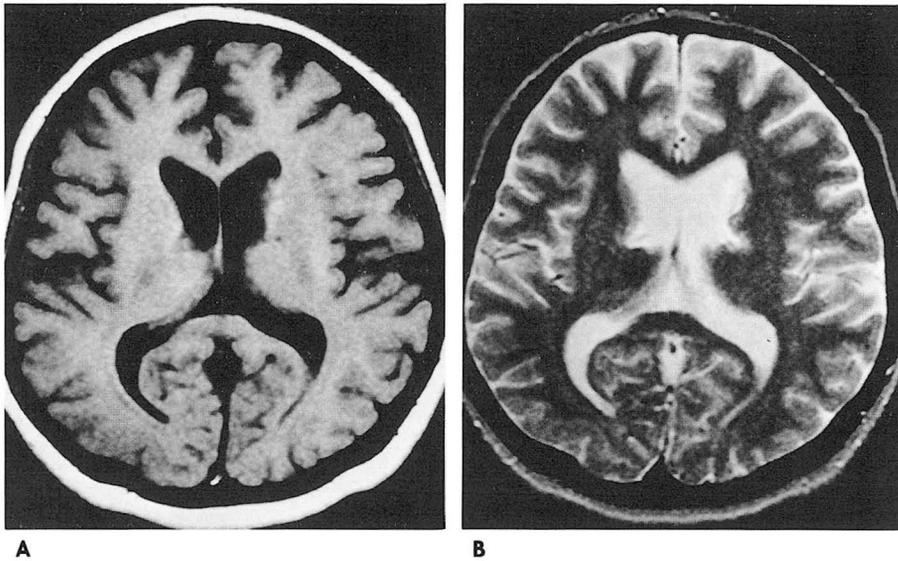
DCVT occurs more frequently in women; the most common presenting complaints are alteration in mental status, headache, vomiting, and hemiparesis(4, 7). Venous drainage of periventricular white matter, the caudate head, globus pallidus, putamen, thalamus and

midbrain is provided by the deep cerebral venous system(Fig. 3) (7, 8). The internal cerebral veins receive medullary, thalamic, and thalamostriate veins, then communicate with the vein of Galen, and basal veins of Rosenthal. The vein of Galen joins the inferior sagittal sinus to form the straight sinus, communicating posteroinferiorly with the dural sinuses at the torcular herophili. Thrombosis of all or a portion of this drainage can explain the abnormalities in these regions seen on imaging studies(7).

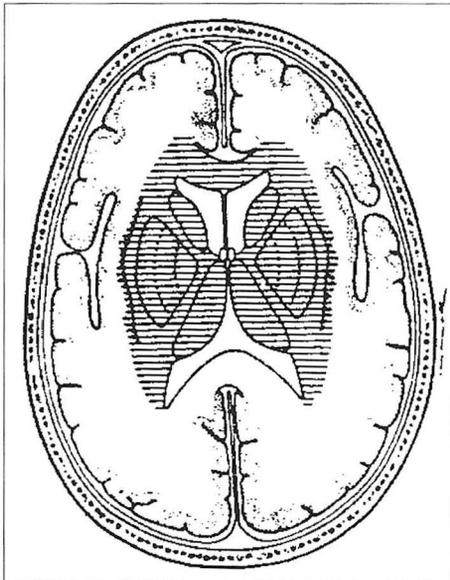
In DCVT, MR findings can be divided into direct and indirect signs. An example of the former is intraluminal venous thrombosis visualized in the vein of Galen, straight sinus, internal cerebral or thalamostriate veins. Indirect signs include unilateral or bilateral abnormal signal intensity in the thalamic or basal ganglionic region with or without hemorrhage, reflecting edema or infarction; ring or homogeneous contrast en-



**Fig. 1.** Initial MR imaging  
 On T2-weighted image(A), extensive high signal intensity in both basal ganglia, thalami, and adjacent white matter, representing edema or developing infarction is seen with mild hydrocephalus and mass effect. Unenhanced T1-weighted image (B) reveals ill-defined low signal intensity in the same distribution. Vein of Galen (large arrow) and straight sinus (small arrows) show hyperintensity on both T1-and T2-weighted images, reflecting subacute staged thrombus. Postcontrast T1-weighted image (C) shows irregular linear enhancement in the lesion. Right internal carotid angiogram (D) demonstrates absence of flow in deep cerebral venous system. Right transverse sinus is opacified(arrowheads).



**Fig. 2.** Follow-up MR imaging after 20 days T1(A)-and T2(B)-weighted images show a decrease of mass effect and edema in the basal ganglia and thalamus. Small areas of hemorrhagic infarction are apparent in both caudate nucleus heads, left globus pallidus, and right thalamus. Vein of Galen and straight sinus are partially recanalized.



**Fig. 3.** Territory served by the deep venous system of the brain(7).

hancement in venous infarction; ipsilateral or bilateral lateral ventricular dilatation reflecting local mass effect from edema producing obstruction of the foramen of Monro; hemorrhage in the cistern of the velum interpositum; and dilated collaterals, including transcortical medullary veins.

MR imaging alone appears to be a very sensitive and fairly specific method for the diagnosis of CVT. In the acute phase, thrombus, consisting of deoxyhemoglobin, appears as iso-intensity on T1-weighted images and hypointensity on T2-weighted images. In the subacute phase of several days following ictus, the thrombus

becomes progressively hyperintense on both T1- and T2-weighted spin echo images because of methemoglobin. This feature is highly specific for thrombus, but there are certain pitfalls, including the slice entry phenomenon, pseudo-diastolic gating or slow flow. During late stages of greater than two weeks duration, vascular recanalization occurs, and there is a resumption of flow-void in previously thrombosed vessels(1, 2).

Differential diagnosis includes asphyxia, bithalamic glioma, bilateral germ cell tumors, carbon monoxide poisoning, Wernicke encephalopathy, and vascular events such as "top of the basilar syndrome"(9). Although standard transfemoral angiography may still be required to establish the diagnosis of DCVT, MR angiography is a quick and non-invasive method providing further evaluation of cerebral vessels(1). Anticoagulant therapy showed improved outcome not only in dural sinus thrombosis, but also in DCVT(7).

In our case, a marked amount of edema in both basal ganglia, thalami, adjacent deep white matter, and the midbrain was demonstrated. Isolated DCVT involving both internal cerebral veins, the vein of Galen and straight sinus was present. These two last-named showed subacute stage thrombus, and both internal cerebral veins, more acute stage thrombus. On initial MR imaging there was no evidence of hemorrhage; on follow-up MR imaging after intravenous heparinotherapy, edema showed remarkable improvement, with only a small area of hemorrhagic infarction.

In conclusion, DCVT should be considered in any patient who has used oral contraceptives and in whom bilateral thalamic and basal ganglionic lesions are seen on MR imaging in association with headache and chan-

ge of consciousness. Conventional angiography or MR angiography should be subsequently performed(7).

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## 경구피임제 복용후 발생한 심부 뇌정맥 혈전증 : 1예 보고<sup>1</sup>

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심부 뇌정맥 혈전증은 다양한 원인에 기인하여 발생하는 뇌졸중의 드문 형태이다. 저자들은 경구피임약을 복용하고 있던 34세 여성에서 발생한 심부 뇌정맥 혈전증의 특징적인 임상적 및 방사선학적 소견을 보고하고자 한다.