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Abstract

Six pregnant women with convulsions between 25 to 40 weeks of gestation were experienced. Among them, 4 patients were diagnosed as having intracranial hemorrhage and two as simple eclampsia. With the aid of brain CT scan, one case of arteriovenous malformation was detected and treated surgically with good prognosis for both the mother and the fetus. Two patients were diagnosed to have cerebral hemorrhage with subsequent penetration into the lateral ventricles and were treated conservatively. Their fetuses were delivered alive by cesarean section, but the mothers expired. The other patient with cerebral hemorrhage was treated surgically, and both the mother and the fetus survived. One of the simple eclampsia patients was noted to have a growth retarded fetus at 32 weeks of pregnancy with subsequent intra-uterine death, but the mother recovered after conservative treatment. Another patient at 40 weeks of pregnancy was also treated conservatively and both the fetus and the mother survived. Brain CT scan findings differed between these two eclampsia patients; local brain edema for the second patient and generalized brain edema for the first patient. Thus more active application of brain CT scan is recommended in managing pregnant patients with convulsions.

KEYWORDS: eclampsia, cerebrovascular disorders(CVD), brain CT scan

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Differentiation between Eclampsia and Cerebrovascular Disorders by Brain CT Scan in Pregnant Patients with Convulsive Seizures

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Six pregnant women with convulsions between 25 to 40 weeks of gestation were experienced. Among them, 4 patients were diagnosed as having intracranial hemorrhage and two as simple eclampsia. With the aid of brain CT scan, one case of arteriovenous malformation was detected and treated surgically with good prognosis for both the mother and the fetus. Two patients were diagnosed to have cerebral hemorrhage with subsequent penetration into the lateral ventricles and were treated conservatively. Their fetuses were delivered alive by cesarean section, but the mothers expired. The other patient with cerebral hemorrhage was treated surgically, and both the mother and the fetus survived. One of the simple eclampsia patients was noted to have a growth retarded fetus at 32 weeks of pregnancy with subsequent intra-uterine death, but the mother recovered after conservative treatment. Another patient at 40 weeks of pregnancy was also treated conservatively and both the fetus and the mother survived. Brain CT scan findings differed between these two eclampsia patients; local brain edema for the second patient and generalized brain edema for the first patient. Thus more active application of brain CT scan is recommended in managing pregnant patients with convulsions.

Key words : eclampsia, cerebrovascular disorders (CVD), brain CT scan

Differentiation between cerebrovascular disorders (CVD) and eclampsia was not always easy. But recent improvements of diagnostic measures, especially computed tomography (CT), have permitted more precise investigation of the acute neurological state. An increasing number of cases studied with brain CT scan have been reported (1-4). The authors reported their experience with convulsive pregnant women who received brain CT scan and discussed the pathophysiological correlation of brain CT scan findings to clinical manifestations.

Case Reports

The six patients reported were initially diagnosed as having eclampsia or suspected of having eclampsia. Their past histories were not remarkable. For an accurate diagnosis of the underlying pathologies, brain CT scans in combination with other examinations were carried out during hospitalization. A brief summary of these cases is shown in Table 1.

Case 1. A 25-year-old, gravida 2 para 0 woman at 38 weeks of pregnancy was referred to our department because of a sud-

Table 1 Summary of the clinical courses of the patients

	Case					
	1	2	3	4	5	6
Age (years)	25	33	25	24	30	25
Parity ^a	pp	mp	pp	pp	mp	mp
Onset (weeks of pregnancy)	38	34	40	40	32	25
Initial symptoms	Convulsion Lethargy	Headache Vomiting	Headache Stiffness of neck	Nausea Blindness Headache Vomiting	Headache Vomiting Convulsion	Nausea Vomiting Headache Lethargy
Symptoms of toxemia ^b (before onset → after onset)	p → pH	h → H	ePH → ePH	ep → epH	ph → PH	None → none
CT findings	Cerebral hemorrhage with penetration into both lateral ventricles	Cerebral hemorrhage with penetration into both lateral ventricles	Cerebral hemorrhage with penetration into both lateral ventricles	Low density area bilaterally in occipital region	Diffuse brain edema	Right parietal hematoma
Treatment	Ventricular drainage	Conservatively	Conservatively	Conservatively	Conservatively	Resection of the AVM and removal of the hematoma
Mode of delivery	C/S	C/S	C/S	C/S	Vaginal	Vaginal
Outcome						
Mother	Completely recovered	Expired	Expired	Completely recovered	Completely recovered	Completely recovered
Fetus	Survived	Survived	Survived	Survived	Died intra-uterinely	Survived

a: pp: primipara; mp: multipara.

b: e represents tibial edema; p represents 30 mg ≤ proteinuria ≤ 200 mg/dl; P represents proteinuria > 200 mg/dl h represents 140 mmHg ≤ systolic pressure < 160 mmHg or 90 mmHg ≤ diastolic pressure < 110 mmHg. H represents systolic pressure ≥ 160 mmHg or diastolic pressure ≥ 110 mmHg (according to the criteria of the Committee on Toxemia of the Japan Society of Obstetrics and Gynecology).

C/S: cesarean section.

AVM: arteriovenous malformation.

den onset of tonic convulsions followed by a clonic phase, loss of consciousness and hypertension (180/140 mmHg) during labor. After admission, several clonic convulsions were also observed. Under the suspicion of eclampsia, diazepam, magnesium sulfate and phenobarbital were administered. Shortly after admission, because of fetal distress and malrotation, an emergency cesarean section (C/S) was performed. Her consciousness did not recover within 24 h of the operation, and a brain CT scan was done (Fig. 1-a). Hemorrhage in the left caudate nucleus with penetration into the lateral ventricles was observed. Angiography did not disclose arteriovenous malformation or arterial aneurysm. Surgical intervention by ventricular drainage was done, and she regained consciousness on the 7th hospital day and was discharged on the 40th hospital day without any sequelae.

Case 2. A 33-year-old, gravida 2 para 1 woman complained of sudden onset of headache and vomiting at 34 weeks of pregnancy in spite of an uneventful prenatal course. She visited a local practitioner's clinic where no particular findings except mild hypertension (140/80 mmHg) were noted. She was transferred to our department for further investigation. Convulsive attacks occurred in the ambulance, and she arrived at our hospital in a semi-comatose state. Upon admission, a physical examination revealed hypertension (160/100 mmHg), anisocoria and absence of a light reflex. A laboratory examination disclosed mild proteinuria.

After endotracheal intubation, magnesium sulfate, diazepam and hydralazine were administered. Cerebral hemorrhage was strongly suspected because of the neurological manifestations and bloody lumbar tap. A brain CT scan disclosed cerebral hemorrhage adjacent to the central part of the right lateral ventricle with penetration into the lateral ventricles (Fig. 1-b). Since there was no

surgical indication, conservative management alone was given. Although no evidence of fetal distress was noticed thereafter, her consciousness disturbance persisted and her general condition deteriorated. Twenty days after the onset of the initial symptoms, C/S was performed to deliver a live fetus under the strong request of her family. The patient expired four days after the delivery.

Case 3. A 25-year-old, gravida 1 para 0, nulliparous woman was recognized to have severe hypertension, severe proteinuria and mild edema when she visited a prenatal clinic for her first prenatal examination at 39 weeks of pregnancy. Admission was advised, but the patient refused. She complained of headache, neck stiffness during the labor at 40 weeks of pregnancy and was transferred to our department for further management.

Upon admission, the patient's consciousness was impaired. Headache and vomiting were noted. Eclampsia was suspected initially, but on account of the presence of the marked neck stiffness, some organic lesion of the nervous system was also suspected. Fetal distress was indicated by fetal heart rate monitoring. According to the family's strong desire, C/S was performed to deliver the fetus. She never recovered consciousness after the operation. A brain CT scan was carried out 17 h after the appearance of neck stiffness and revealed hemorrhage in the right parietal lobe with penetration into both lateral ventricles (Fig. 1-c). The patient finally expired 14 days after the C/S.

Case 4. A 24-year-old, gravida 1 para 0 woman was admitted with the complaints of nausea, vomiting, headache and loss of vision at 40 weeks of pregnancy. Hypertension (164/110 mmHg) was noticed, but no neurological signs or papilloedema were recognized. Headache and vomiting persisted and tonic convulsions with disturbance of consciousness occurred.

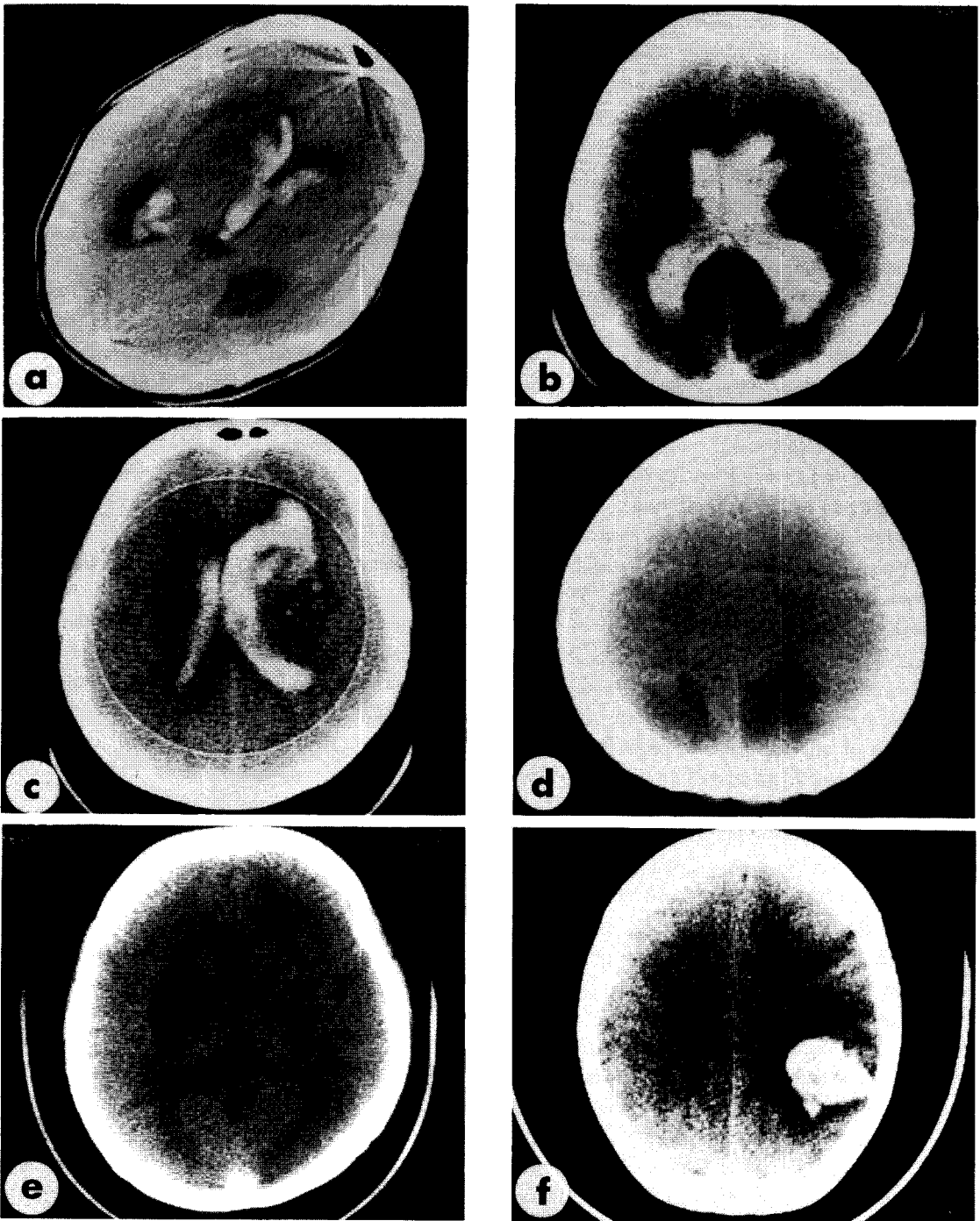


Fig. 1 Brain CT scans. a: case 1; hemorrhage inside the left caudate nucleus with penetration into the anterior horn of both lateral ventricles and the posterior horn of the left lateral ventricle. b: case 2; hemorrhage in the area adjacent to the central part of the right lateral ventricle with penetration into the lateral ventricles. c: case 3; Hemorrhage in the right parietal lobe with penetration into both lateral ventricles. d: case 4; low density area with ill-defined margin in both occipital lobes. e: case 5; diffuse brain edema without characteristic change. f: case 6; high density area suggesting hemorrhage in the right parietal lobe.

Under the diagnosis of eclampsia, endotracheal intubation was performed and magnesium sulfate was given. A brain CT scan performed 6 h after the onset of the above symptoms (Fig. 1-d) revealed a low density area suggestive of local brain edema or brain infarction bilaterally over the occipital lobes. A C/S was done at once and a healthy fetus was delivered. The patient was able to respond 6 h after the operation and regained consciousness the following day. Angiography performed thereafter did not disclose any abnormality.

The low density area disappeared in the follow-up brain CT scan taken 5 days later when consciousness and vision had returned. Because it usually takes several months for

a brain infarction to disappear, the low density area observed on the initial brain CT scan was considered to be the result of transient local edema. A transient spasm of a brain vessel due to toxemia was thought to have caused the ischemic change and the subsequent local brain edema. The local edema was located in the vicinity of the visual cortex of the occipital lobe and resulted in the visual disturbance. Restoration of the brain blood flow after the delivery reversed the pathological change and the visual disturbance disappeared completely.

Case 5. A 32-year-old, gravida 3 para 2 woman at 32 weeks of pregnancy was transferred to our department because of headache, nausea and clonic convulsions. A

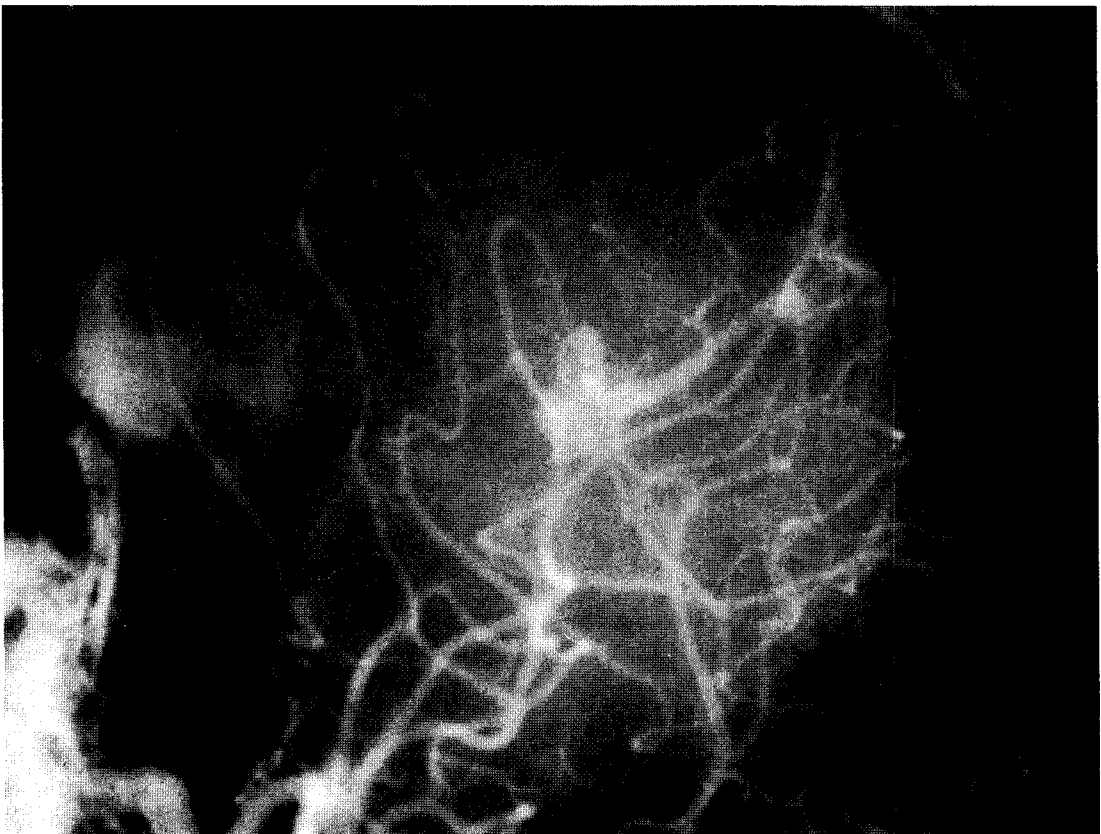


Fig. 2 Cerebral angiography of case 6. Arteriovenous malformation of the right middle cerebral artery was present.

prenatal visit on the day just prior to the onset of convulsions disclosed severe proteinuria and mild hypertension. The patient arrived at the hospital with full consciousness, hypertension (150/120 mmHg), right hemiplegia and right contralateral hemianopsia. The fetal weight was estimated to be 1,271 g by ultrasonic examination, which showed intrauterine growth retardation. Under the administration of magnesium sulfate, a brain CT scan was performed (Fig. 1-e). Generalized brain edema was recognized. Convulsions occurred twice thereafter, the patient fell into lethargy, but the general condition remained rather stable. Only conservative management including anti-convulsants and dialysis were given. On the 4th hospital day, intrauterine fetal death occurred and delivery was induced. Sixteen h after the pregnancy was terminated, her consciousness recovered. On the 29th hospital day, she was discharged from the hospital with a mild degree of right hemiplegia, from which she recovered completely later. Angiography did not reveal any abnormality, and the onset of the neurological manifestations was thought to be the result of generalized brain edema.

Case 6. A 25-year-old, gravida 1 para 0 woman at 25 weeks of pregnancy was admitted to a local hospital on account of a sudden onset of headache and nausea followed by loss of consciousness. She was transferred to our department three days later.

Upon admission to our department, her consciousness was clear, and no symptom nor sign suggestive of toxemia was recognized. A brain CT scan (Fig. 1-f) and angiography (Fig. 2) revealed a right parietal hematoma and the presence of arteriovenous malformation respectively. Surgical management including resection of the arteriovenous malformation and removal of the hematoma was performed and she recovered and was

discharged from the hospital 30 days after the operation. At 40 weeks of pregnancy, a healthy fetus was delivered vaginally with an uneventful course.

Discussion

As noted from the clinical course of the patients described above, when convulsions and disturbance of consciousness occur in pregnant women, eclampsia is usually suspected initially. However, there are other disorders, such as epilepsy, hysteria, hypoparathyroidism, diabetic coma and meningitis which should be ruled out. In addition, cerebral vascular disorders such as intracerebral, subarachnoid or intraventricular hemorrhages, also require cautious differentiation because the prognosis of both the mother and the fetus is involved. It has been recommended that the differential diagnosis of such disorders should always be born in mind when managing convulsive disorders in pregnant women (7-12).

Differential diagnosis between cerebrovascular disorders (CVD) and simple eclampsia is of particular importance because accurate diagnosis can lead to proper treatment and thus influence the prognosis of both the mother and fetus.

Usually a differential diagnosis can be made when neurological manifestations or symptoms and signs of toxemia are present. Patients with a CVD attack usually show symptoms and signs suggestive of the existence of some underlying lesion. On the other hand, patients with eclampsia usually manifest toxemia — hypertension, proteinuria and edema — and are usually devoid of neurological signs such as hemiplegia, meningeal irritation and visual disturbance. A preliminary tentative diagnosis can be attained in cases of eclampsia by following the clinical course and performing a physi-

cal examination.

However, toxemic patients are also known to have fragile blood vessels which may be predisposed to an attack of CVD. It was reported that in one series of autopsied patients died of eclampsia, 58% had findings of cerebral hemorrhage (13). CVD may sometimes be complicated with some degree of toxemia which leads to a misdiagnosis of simple eclampsia.

Etiologically, cerebrovascular disorders are assumed to be triggered somehow either by the pregnancy itself or by the vascular changes present in toxemic patients. As described above, three of our cerebrovascular disorder patients manifested to some extent symptoms of toxemia before the onset of convulsions. Among these three patients, hypertension was present in two. It may be postulated that hypertension is a predisposing factor of intracranial hemorrhage. On the other hand, cerebrovascular disorders may also occur in patients without hypertension as in those with subarachnoid hemorrhage.

An accurate and prompt diagnosis relies upon brain CT scan which can be performed non-invasively and gives valuable information about the presence of a lesion, particularly intracranial hemorrhage. Among the six patients reported above, intracranial hemorrhage was diagnosed in four patients. The remaining two patients, cases No. 4 and 5, were considered to have reversible changes in light of the brain CT scan, lumbar puncture and angiography. However, cerebral edema did exist in both patients: localized edema in case No. 4 and generalized edema in case No. 5.

Although no pronounced brain CT scan changes of eclampsia have been reported in the literature, the authors' experience suggests that transient brain changes of varied degree may be present in eclampsia patients. At least two kinds of pathophysiological

changes were recognized in eclamptic patients, namely generalized and localized edema.

The authors already suggested that the absolute blood pressure alone should not be taken as the only warning sign of hypertension (14). Asymptomatic latent hypertension with relatively normal blood pressure instead of overtly high blood pressure early in the pregnancy might elevate gradually as the pregnancy progresses.

A pregnant woman with convulsions and disturbance of consciousness should be examined by brain CT scan as soon as possible to make a differential diagnosis between CVD and eclampsia. Other examinations such as lumbar puncture, angiography and ocular funduscopy are also useful in reaching a diagnosis and should be awarded more appraisal.

Managing the patients in an ICU is preferable because eclampsia involves multiple organs (4, 14, 15). If a definite diagnosis of CVD is attained, a neurosurgical opinion should be obtained. The obstetrician is concerned with the viability and well-being of the fetus. Appropriate decision-making is essential for both the mother and the fetus. Further experience and application of the brain CT scan may be necessary for setting up criteria for appropriate management of patients with convulsions and disturbance of consciousness.

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