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## Late Primary Unilateral Thalamic Hemorrhage in Infancy: Report of Two Cases

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### Abstract

We report on two infants with primary unilateral thalamic hemorrhage which occurred at two months of age. Both infants were normal prior to the onset of hemorrhage. Both children presented with seizures and subsequently developed epilepsy. These cases suggest that primary unilateral thalamic

hemorrhage can occur in seemingly well infants outside the neonatal period.

**Key words:** Thalamus – Hemorrhage – Infant – Seizures

### Introduction

Thalamic hemorrhage is usually observed in premature infants (3,9) or in term newborns (5) after a severe pathological neonatal event (8). Less commonly, thalamic hemorrhage has been reported in full-term infants who were born by normal delivery (7) and initially appeared well; these infants then develop abnormal neurological signs during the first or second week of life. This condition is usually unilateral (2) and is almost always associated with intraventricular hemorrhage (6).

We now report on two patients who manifested acute neurological symptoms at two months of age and who were found to have unilateral thalamic hemorrhage with intraventricular involvement. Both of these children later developed seizures.

### Case Reports

#### Case 1

The patient was born at term (38 weeks) to unrelated healthy parents. The mother had two previous miscarriages. Birth weight was 3.45 kg, height 50 cm and head circumference 35 cm, all parameters being near the 50th percentile for age. The child appeared well until the age of two months. While being breastfed, the child suddenly developed hypertonia followed by right head deviation and right gaze preference, then by stupor which progressed to coma within a few hours' time. Non-contrast head CT scan on admission showed massive left thalamic hemorrhage with intraventricular extension and modest hydrocephalus (Fig. 1A). MRI on admission indicated a thalamic origin of the bleed (Fig. 1B). MRI-angiography failed to disclose an underlying vascular malformation (Fig. 1D). Ophthalmological examination showed no evidence of retinal hemorrhage. Extensive evaluation of coagulation status, including prothrombin and partial thromboplastin times, fibrinogen, protein C, protein S and factor V Leiden, revealed no abnormalities. Blood cultures were sterile, white cell count and

erythrocyte sedimentation rate were normal, suggesting absence of a local or severe generalized infection. Echocardiography, electrocardiography and abdominal ultrasound were all normal.

The child was initially critically ill, and developed signs of increased intracranial pressure. Clinical status improved with ventricular drainage. He was discharged home after three weeks following ventriculoperitoneal shunt placement. Phenobarbital was started prophylactically and no seizures were initially observed.

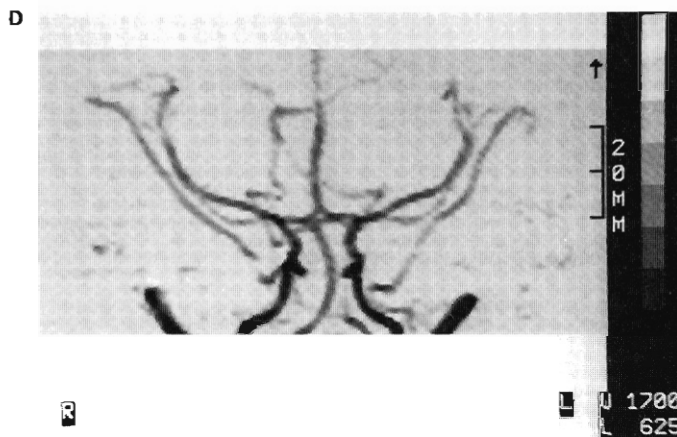
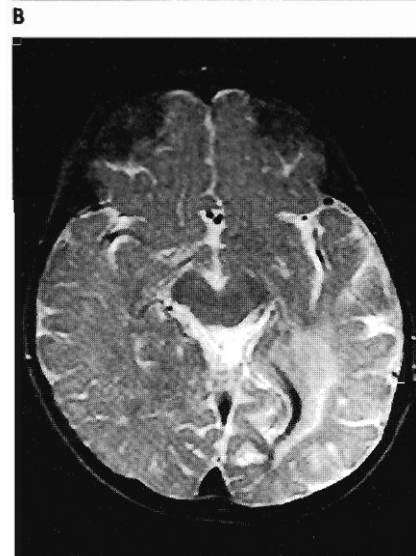
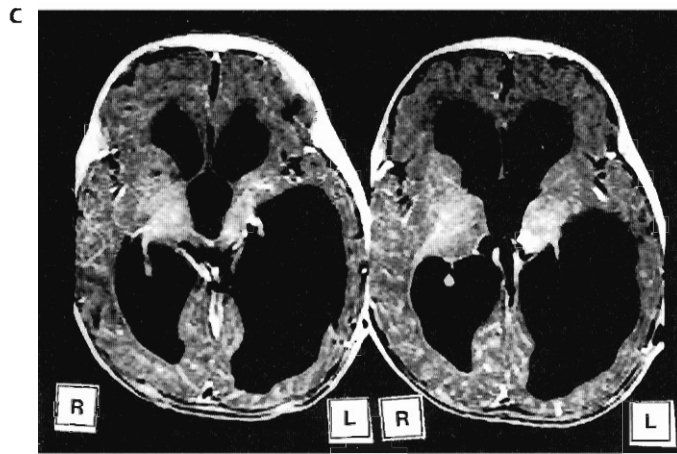
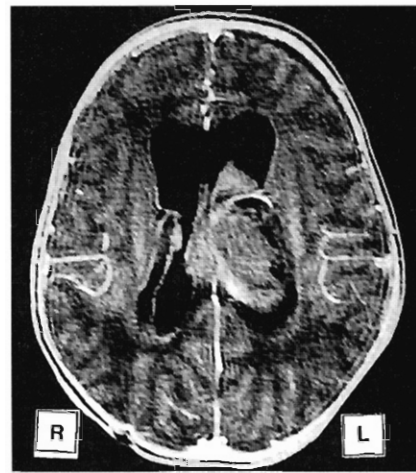
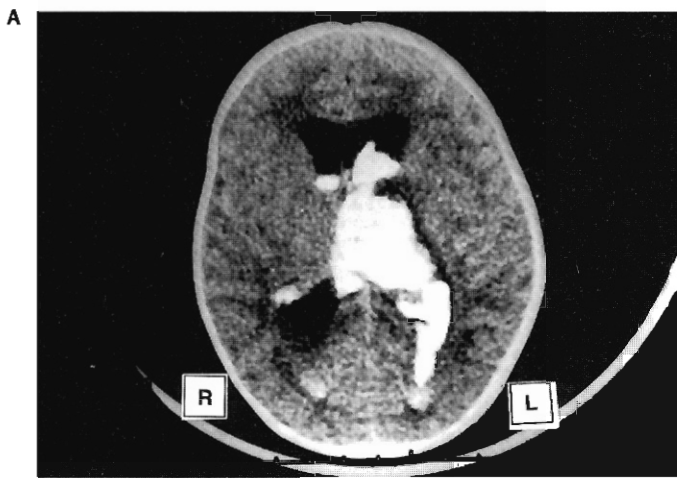
The patient was then seen at the Division of Pediatric Neurology at the University of Catania, Italy, at three months of age. Physical examination showed a weight and height at the 50th percentile, with head circumference 45.5 cm (75 percentile). The head was asymmetric being flattened along the right occiput. Lateral gaze palsy was present bilaterally and head control was poor. Deep tendon reflexes were symmetrically increased in all extremities. Startle reflex in response to either auditory or somatosensory stimuli was markedly increased. Episodes of opisthotonus were observed during periods of agitation. Routine electroencephalogram (EEG) was markedly asymmetric with spike waves on left side, while the right side showed near-normal activity. Ophthalmological examination again showed no evidence of retinal hemorrhage or other abnormalities. Brainstem and visual evoked responses were normal.

At the age of 5 months, a repeat MRI showed signs of previous hemorrhage in the left thalamic region and marked ventriculomegaly (Fig. 1C). At the age of 6.5 months, the patient was noted to have episodes of flexion and rotation of the head and flexion of arms many times a day followed by cry. EEG showed modified hypsarrhythmia with right side being slightly more affected than left, and a diagnosis of infantile spasms was made. Gamma-vinyl gamma-aminobutyric acid (Vigabatrin) was added and resulted in complete cessation of spasms in a few days.

When last examined, the patient was 12 months old. Weight and height continued on the 50th percentile, and head circumference on the 75th percentile. The child showed progressive acquisition of motor and language milestones, but was still delayed in all fields of development. The clinical course showed

Received: January 11, 1999; revised, accepted: May 12, 1999

Neuropediatrics 30 (1999) 264–267  
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**Fig. 1 A–E** Case 1.  
**A** Non-contrast head CT scan on admission (patient's age 2 months): showing massive hemorrhage on left side.  
**B** Brain MRI on admission (patient's age 2 months) showing thalamic origin of hemorrhage.  
**C** Brain MRI three months later (patient's age 5 months): signs of previous hemorrhage in left thalamic region and marked ventriculomegaly.  
**D** MRI angiography performed on admission (patient's age 2 months): no signs of underlying vascular malformation.  
**E** Brain MRI ten months later (patient's age 12 months): marked resolution of ventricular dilatation and signs of old left thalamic hemorrhage.

**E**

ference 34 cm. The first two months of life were uneventful. At two months, the patient suddenly developed generalized hypotonia, pallor and tonic clonic seizures upon awakening from sleep. A CT scan, performed on admission, showed left thalamic hemorrhage (Fig. 2A). Extensive evaluation of coagulation status, including prothrombin and partial thromboplastin times, fibrinogen, protein C and protein S, revealed no abnormalities. Blood cultures were sterile, white cell count and erythrocyte sedimentation rate were normal, suggesting absence of a local or severe generalized infection. Echocardiography and electrocardiography were normal.

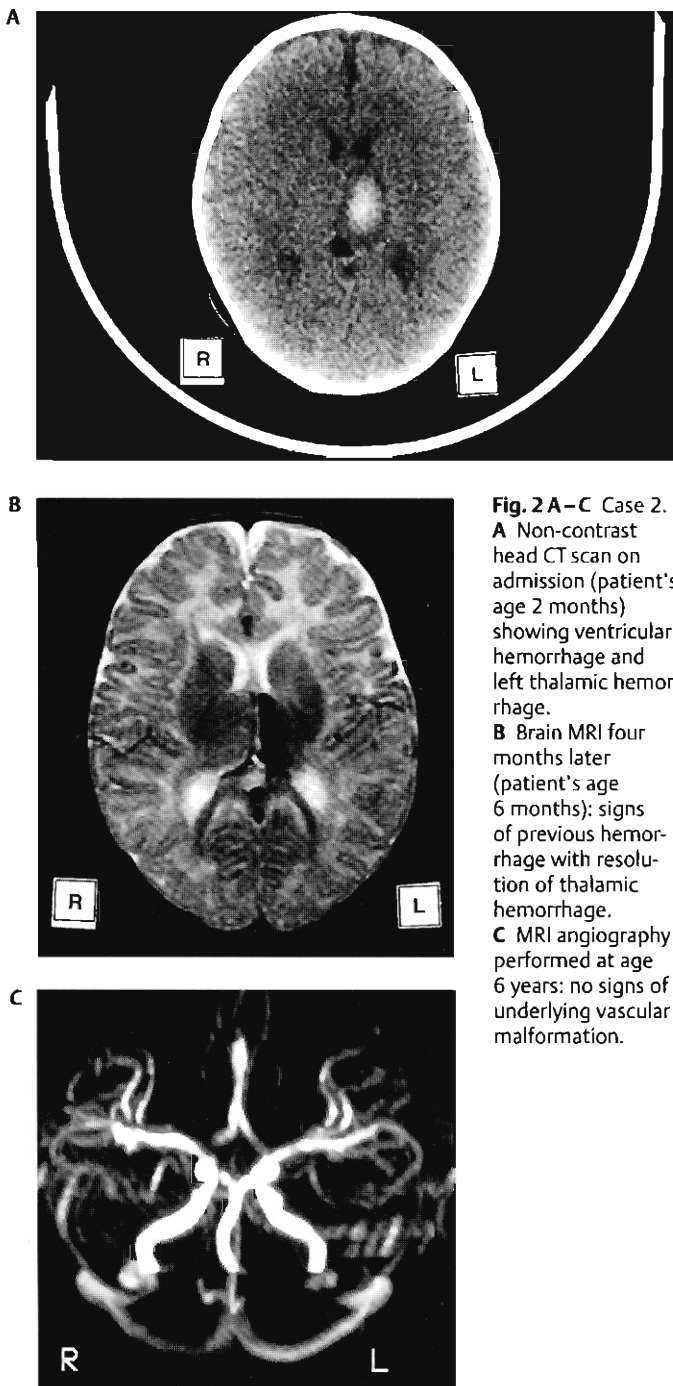
Initial EEG showed generalized high-voltage slow waves. After a few days, a gradual improvement was noticed, and one month after the patient was discharged on phenobarbital. Unlike Case 1, progressive hydrocephalus did not develop. Head MRI four months later (patient's age 6 months) displayed significant resolution of the thalamic hemorrhage (Fig. 2B).

The patient remained seizure-free on phenobarbital until age 4 years when, during a febrile episode, she had a long generalized convulsion. When last examined at age 6 years, she was attending regular school. She had no convulsions, no mental retardation or language disturbances. Formal IQ testing was

progressive improvement. He was able to sit unsupported and showed good head control. He could grasp the objects and could perform bimanual transfer. Mild paralytic strabismus was present on right side. He had just begun to say his first words. Follow-up MRI showed marked resolution of ventricular dilatation and signs of old left thalamic hemorrhage (Fig. 1E).

### Case 2

The child was the second born at term from unrelated parents. Her birth weight was 3.65 kg, height 49 cm and head circum-



**Fig. 2 A–C** Case 2. **A** Non-contrast head CT scan on admission (patient's age 2 months) showing ventricular hemorrhage and left thalamic hemorrhage. **B** Brain MRI four months later (patient's age 6 months): signs of previous hemorrhage with resolution of thalamic hemorrhage. **C** MRI angiography performed at age 6 years: no signs of underlying vascular malformation.

in the normal range. The awake EEG showed occasional spike wave of 2–2.5 Hz; EEG during sleep showed a pattern of continuous spike waves during slow sleep. MRI-angiography excluded an underlying vascular malformation (Fig. 2C).

## Discussion

Within the pediatric population, thalamic hemorrhage has been most frequently reported in the neonatal period, with most reported cases occurring in infants under two weeks of age (2, 7, 8). In several cases, thalamic hemorrhage has been re-

ported in the context of significant hypoxic-ischemic injury, where it may be unilateral (2) or bilateral (8).

There have also been reports of apparently healthy children presenting with thalamic hemorrhage under the age of two weeks (7). The two patients reported here were apparently well until two months of age, and were not ill up until the day of presentation. Extensive evaluation failed to reveal evidence of coagulopathy and/or local or severe generalized infections. MRI-angiography in both patients (Figs. 1D and 2C) failed to provide evidence of an underlying vascular malformation. Thus, we believe that these patients have had spontaneous late-onset primary thalamic hemorrhage.

There have been prior reports of infants as old as 3 months with intraventricular hemorrhage developing spontaneously or in the context of pre-existing brain injury (5), although it is unclear if there was a thalamic source of hemorrhage in these cases. We view these cases as a late-onset variant of the "new clinical entity" of primary thalamic hemorrhage proposed by Trounce et al. (7), and we suggest that primary thalamic hemorrhage may have a wider age spectrum than previously believed. As Trounce et al. also observed (7), ventriculomegaly is common, but not invariable in this condition. As our Case 1 illustrates, short-term morbidity and mortality may be closely related to increased intracranial pressure, and prompt ventricular drainage may result in a reasonably good neurodevelopmental outcome, as others have found (2, 7).

The long-term outcome of children with primary thalamic hemorrhage is unknown. Both of our patients eventually developed seizures. In our Case 1, infantile spasms were diagnosed at 6.5 months of age. Intraventricular hemorrhage is one of the many forms of brain injury that have been previously reported to be associated with infantile spasms (1). Infantile spasms were easily controlled with Vigabatrin, but it is unclear if epileptic encephalopathy plays some role in the moderate developmental delay evident in this patient. In contrast, in our Case 2, signs of increased intracranial pressure did not dominate the early clinical picture and seizures, once controlled, did not recur until age four. This patient now has an EEG with interictal spike and slow-wave abnormalities during slow wave sleep (4): neither pattern has previously reported in patients with primary thalamic hemorrhage.

In summary, our cases illustrate that primary unilateral thalamic hemorrhage can occur in apparently well infants outside the neonatal period, and may be associated with seizures several months to years after the bleed.

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