Differential Diagnosis and Treatment of Small Subdural Effusion in Children

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Summary

Twenty infants with peripheral low density areas over the frontal lobes in CT scans that resembled cortical atrophy or early communicating hydrocephalus are reported. Most cases presented minimal developmental retardation and a slightly bulging fontanelle. In many cases, peripheral hypodensity over the frontal lobes disappeared and the infants' development eventually reached normal levels without operations. The lesion might be called "infantile benign subdural effusion" and should be treated conservatively. Two illustrative cases are presented and the differential diagnosis is discussed.

Key words: Subdural fluid collection, cortical atrophy, communicating hydrocephalus, infants, computed tomography

Introduction

Thin low density zones are often found over the surface of the brain in infants who show slight developmental retardation and a slightly bulging fontanelle. This peripheral low density may represent subdural fluid collection, and it is indistinguishable from cortical atrophy in CT scans. We have seen and followed twenty cases in 2 to 8-month-old infants with these CT findings. Special attention has been paid to these findings since the introduction of computed tomography because small subdural fluid collections were not always detected by cerebral angiography. In this paper two illustrative cases are presented and differential diagnosis of these CT findings is discussed.

Illustrative Cases

Case 1: Six-month-old male infant with developmental retardation

He was born after 36 weeks of gestation by normal delivery. His head was not fixed and both lower extremities were rigid at the age of 3 months. It was noticed that he had motor weakness in the right lower extremity and positive transillumination of the head at the age of 4 months. On admission, the head circumference was at about the 80th percentile and the anterior fontanelle was slightly tense. Rigidity in the right upper and lower extremities and hyperactive deep tendon reflexes were present. CT scans showed minimal ventricular dilatation and a low density area over the frontal lobes associated with dilatation of the interhemispheric and Sylvian fissures and cortical sulci (Fig. 1). A burr hole was made in the left frontal region and irrigation of the subdural space was performed under the diagnosis of subdural effusion. Clear yellow fluid containing a large amount of protein was present in the subdural space, but no obvious membrane was found. Follow-up CT one year and four months later showed disappearance of the peripheral low density area over the frontal lobes and slight separation of the interhemispheric fissure (Fig. 1). He had almost reached normal developmental levels over the past 16 months.

Case 2: Four-month-old male infant with a seizure disorder

He was born by normal delivery. He started to
have convulsive seizures in the mandible 2 to 3 times a day and occasionally arched his back from around 2 months after birth. The seizures were controlled by anticonvulsants. No head control was observed and enlargement of the head (47.5 cm > +2SD) with slightly tense anterior fontanelle was noticed at the age of 4 months. CT scans showed a low density zone over the frontal lobes (Fig. 2). No operation was performed. Follow-up CT scans performed 11 months later showed disappearance of the low density zone over the frontal lobes (Fig. 2).

**Discussion**

I. Differentiation of subdural effusion from cerebral atrophy

Peripheral hypodensity over the frontal lobes in CT may represent subdural fluid collection and is indistinguishable from cortical atrophy. Differentiation of subdural effusion from cerebral atrophy is often difficult not only in CT, but also pathophysiologically. Subdural effusion often causes secondary cerebral atrophy. In cerebral atrophy the widened subarchnoid spaces may resemble subdural fluid collection. In some cases both clinical entities may be present simultaneously. Most of the cases in the present series showed pressure signs of a slight degree such as head enlargement and a tense fontanelle. Almost all patients eventually reached normal developmental levels and the peripheral low density over the frontal lobes disappeared in follow-up CT. Consequently, we considered these cases as subdural effusion rather than cerebral atrophy. In addition to delayed levels, watery
clear or xanthochromic fluid of high protein content collected by subdural taps or burr hole opening, and occasional membrane formation are not compatible with craniocerebral disproportion seen in normal developmental changes. Peripheral low density or interhemispheric fissure seen in CT in normal infants is minimal and usually less than 0.5 mm in width. In cerebral atrophy or the normal brain in craniocerebral disproportion cases, the brain moves more freely in a widened subarachnoid space due to the force of gravity when the head is rotated. Conversely, subdural effusion persists despite changes in head position. This appears to be of diagnostic value in some but not all cases.
II. Differentiation of subdural effusion from hydrocephalus

Communicating hydrocephalus due to distal (high convexity or parasagittal) blocks may cause dilatation of the subarachnoid spaces. This may be an early finding in congenital communicating hydrocephalus. However, the ventricular system dilates at the same time in distal space obstructive hydrocephalus of the common type. In the present series, slight ventricular dilatation was noted in many cases. This may be due to disturbances of the cerebrospinal fluid dynamics caused by subdural fluid collection. Radionuclide cisternography showed no ventricular reflux, but prolonged stasis of radionuclide over the surface of the brain was observed in the scans taken 24 hours later.
later (Fig. 3). These findings suggested the disturbance of cerebrospinal fluid circulation in the subarachnoid spaces over the convexity.

III. Pathogenesis of small subdural effusion
The pathogenesis of small subdural effusion over the frontal convexities is not clear. Perinatal trauma might be responsible in some cases. Cases reported by Robertson et al.6) and Sahar7) are similar to our cases. The lesions in these cases might be produced by the same mechanism.

IV. Treatment of small subdural effusion
In three out of 20 cases, operations were performed. The remaining cases were followed without operations for one to two years. A single subdural tap was performed in nine cases for diagnostic purposes. Repeated subdural taps were not performed in any case. Aspiration of subdural fluid even by a single tap may shorten the period needed for the disappearance of the peripheral low density in CT. In any event, the patients did well and subdural fluid disappeared along with clinical improvement with or without operations. Consequently, the lesion might be called “infantile benign subdural effusion” and should be treated conservatively.

Conclusion
Twenty cases of infants with low density areas over the frontal lobes in CT scans resembling cortical atrophy or early congenital communicating hydrocephalus were reported. Almost all cases showed increased intracranial pressure of a slight degree associated with delayed developmental levels. Peripheral low density over the frontal lobes may indicate subdural fluid collection. Such low density disappeared in follow-up CT and the infants developed almost normally without operations in many cases. The lesion might be called “infantile benign subdural effusion” and should be treated conservatively.

References