Turkish Journal of Pediatric Disease
Türkiye Çocuk Hastalıkları Dergisi

Infantile Chronic Subdural Hematoma Secondary to Brain Atrophy

Beyin Atrofisine Sekonder İnfantil Kronik Subdural Hematom

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ABSTRACT

Chronic subdural hematoma (CSH) may develop in infants as a result of some accompanying circumstances of brain atrophy. A six-month-old boy with mental and motor retardation and increased head circumference was admitted in our hospital. His head circumference was over 97 percentile. Hypotonic and hypoactive baby couldn't hold his head and wasn't interested in surrounding enviroment. He had a history of aspiration pneumonia with no history of head trauma. MRI showed acute elements over chronic subdural hemorrhage spread almost all over the supratentorial area with severe cerebral atrophy. The brain volume was 95.252 mm^3 and it was around 1/6-1/8 of normal volume. It is thought that, chronic subdural hematoma was developed due to cerebral atrophy as a cascade started with chronic hypoxia and resulted as an increase in the head circumference and panhypopitruitism.

After 10 days of subdural drainage, subduroperitoneal shunt was placed'. At the end of second month, head circumference stopped increasing, the patient could hold his head and started to be partially interested in the surrounding objects, however the change in the brain volume was not significant.

Cognitive and motor functions progress very rapidly in the first two years of life. Early evacuation of CSH has a positive effect on prognosis and most commonly used method is subduraperitoneal shunt insertion.

Key Words: Brain Atrophy, Infantile panhypopituitarism, Subdural hematoma

ÖZ

İnfantlarda kronik subdural hematom beyin atrofisi ile ilişkili bazı durumlara bağlı olarak gelişebilir. Altı aylık bebek hasta mental ve motor retardasyon ve baş çevresinde artış bulguları ile kliniğimize sevk edildi. Baş çevresi 52 cm (97 persentil üstü) olarak ölçüldü, fontanelinin açık, gergin olduğu ve pulse etmediği görüldü. Nörolojik muayenesinde çevre ile ilgisiz olduğu, başını serbest kaldıramadığı görüldü. Öyküsünden 2 aylıkken aspirasyon pnömonisi geçirdiği ve kafa travması öyküsü olmadığı öğrenildi. Manyetik Rezonans Görüntülemede kronik üstü akut kısımlar içeren subdural kanamanın tüm supratentorial alana yayıldığı, beyinin supratentorial kısmının çok ciddi şekilde global atrofiye uğradığı görüldü. Hesaplamada hastanın beyin hacmi 95.252 mm^3 olarak ölçülmüş ve normal hacim yaklaşık 1/6-1/8 oranında azalmıştır. Hastanın öyküsünden, bir kaskat halinde; pnomoniye bağlı kronik hipoksi ile başlayan sürecin, buna bağlı beyin atrofisi gelişimi ve sonrasında subdural hematom, panhipopitruitizm ve baş çevresinde artış ile sonuçlandığı düşünülmüştür.

Hastaya subdural drenaj takılmış, drenajının 10. gününde reopere edilerek subduroperitoneal şant yerleştirilmiştir. Ameliyattan sonraki ikinci ayda baş çevresi artışı durmuş, hastanın başını tutabildiği ve çevresiyle kısmi ilgili olmaya başladığı görülmüştür. Ancak beyin hacminde önemli değişiklik olmamıştır.

Kognitiv ve motor işlevler hayatın ilk iki yılında hızla gelişir. Bu nedenle hematomun erken boşaltılmasının prognoza olumlu etkisi vardır ve bu amaçla en sık kullanılan yöntem subduraperitoneal şant yerleştirilmesidir.

Anahtar Kelimeler: Beyin atrofisi, İnfantil panhipopituitarizm, Subdural hematom

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Conflict of Interest /*Çıkar Çatışması:* *On behalf of all authors, the corresponding author states that there is no conflict of interest.*

Financial Disclosure / *Finansal Destek*: The authors declared that this case has received no financial support.

***Confirmation / Onay*:** The written consent was received from the patient who was presented in this study.

How to cite / *Atıf Yazım Şekli* : Javadov T, Kuzan BN, Sakar and Dagcınar A. Infantile Chronic Subdural Hematoma Secondary to Brain Atrophy. Turkish J Pediatr Dis 2023;17:68-70.

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Received / Geliş tarihi : 08.07.2021
Accepted / Kabul Tarihi : 01.12.2021
Online published : 19.04.2022
Elektronik yayın tarihi
DOI:10.12956/tchd.965567

INTRODUCTION

Chronic subdural hemorrhage can occur due to several causes (trauma, hemorrhagic diathesis, cerebrovascular events, vascular anomalies, arachnoid cysts, infections, tumor, and surgery) (1,2). During development of a chronic subdural hematoma; after enough blood is accumulated in the subdural space, it can make a pressure especially on the cortex, impair brain blood supply, especially the cortical part of it due to inflammation caused by hemorrhage material. Activated inflammatory cascade on the brain tissue can create a toxic-inflammatory effect (3). The fibroblasts located in the mechanically thin layer between dura and the arachnoid layers play the most important role in this process.

Growth factors released from fibroblasts increase neoangiogenesis and tissue plasminogen activator fibrinolysis. Developing immature vessels and increasing fibrinolysis may cause new bleeding and enlargement of the size of hematoma (4).

As hemorrhage becomes chronic, released VEGF and IL 6 may activate pathways like JAK-STAT and MAPK causing the formation of new membranes. Membranes formed between arachnoid and dura may cause new hemorrhage, thus the size of hematoma increases and vicious cycle may start (5). While the size of hematoma is small, the patient is usually asymptomatic; hence the size of hematoma increases as other space occupying lesions it may cause increased intracranial pressure. Since unilateral hemorrhage has a risk of uncal, subfalcine herniation, while bilateral hemorrhage has central transtentorial one (6,7). If uncal and central herniations cause brain stem compression and dislocation, it may affect respiratory function, loss of consciousness and paresis (8).

Chronic subdural hematoma is mostly seen in elder age group but seldom cases in infants are also reported (9,10). Infantile chronic subdural hematomas cause neurological symptoms and affect motor and mental development in most cases but some asymptomatic cases with no progression may be observed.

CASE REPORT

A six-month-old baby boy with mental and motor retardation and increased head circumference was admitted in our hospital. He referred to our hospital with chronic subdural hematoma and severe cerebral atrophy after taken CT scan due to these symptoms.

His medical history showed that he had no prenatal or early postnatal problem, had normal development for up to two months, was treated in the ICU of another hospital due to aspiration pneumonia when he was second months old and received respiratory support due to asphyxia and long-term antibiotic therapy. After age of two months, he

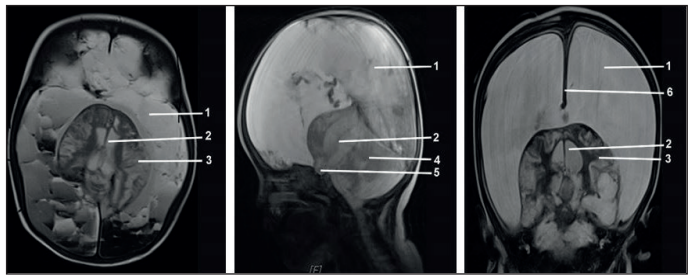

Figure 1: Patient's MRI done at the arrival to our clinic (1-subdural hematoma 2-shrunken ventricle, 3-atrophic cortex, 4-cerebellum 5-atrophic diencephalon 6-falx).

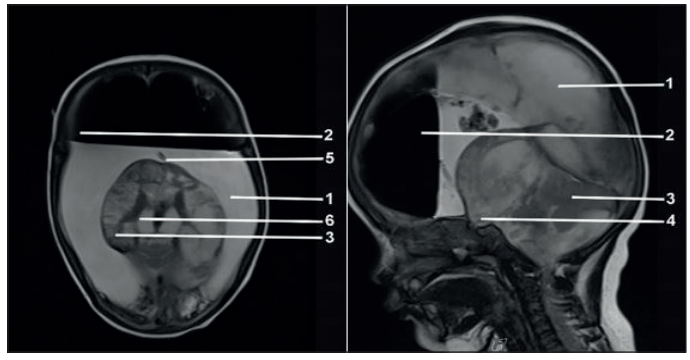

Figure 2: Post-operative MRI after inserted subdural peritoneal shunt (1- subdural hematoma 2-remaining space after hematoma drainage 3-cortex 4-diencephalon 5- proximal catheter of subdural peritoneal shunt 6-ventricle).

showed progressive worsening of neurological status and regression of development. It was reported that he was on hormone replacement therapy due to panhipopituitarism and phenobarbital treatment was started for seizures.

On neurological examination, the head circumference was 52 cm (over 97 percentile) and the fontanel was open, bulging and non-pulsatile. Hypotonic and hypoactive baby could not sit and bilateral pupillary light reflexes could not be obtained. He couldn't hold his head, had sucking and searching reflexes. He responded to the painful stimulus by pulling four limbs. Extensor plantar responses were positive.

We performed cranial magnetic resonance imaging (MRI) which confirmed diagnosis. The result showed subdural hemorrhage containing chronic, subacute and acute phase blood elements spread almost all over the supratentorial area that created severe atrophy of the brain. The cortical and subcortical areas were severely thinned and the diencephalic structures decreased in volume due to global atrophy in the brain. Infratentorial areas was not affected (Figure 1).

MRI examination of the patient was performed under sedation with a 3T MRI device (Verio; Siemens Medical System). The obtained images were processed on the workstation and measurements were made on axial T2 weighted images (Syngo. via, Siemens Work Sitation) (Section thickness: 5 mm Gap: 6.5 mm). In the axial images, the total volume was calculated from the internal tabula level of the calvarium with the free

hand drawing technique. ((Slice thickness + amount of gap) X number of slice). Total brain volume was likewise calculated in the cortical area using free hand drawing technique with the relevant formula: ((Slice thickness + amount of gap) x number of slice). Brainstem and cerebellum were not included into total brain volume calculation.

The patient's brain volume was measured as 95.252 mm^3 and normal volume decreased by approximately 1/6-1/8 in calculation.

Subdural drainage was placed in order to prevent growth of head circumference and to reduce pressure on the brain as much as possible. During the surgery, dark brown blood in the chronic subdural hematoma setting with occasionally contained acute bleeding foci is evacuated from burr hole. On the 10^{th} day of the drainage when the colour of the drainage was more serous, the patient was re-operated and a subduroperitoneal shunt was placed. At the end of the second month, patient's head circumference stopped increasing, it was seen that the patient could hold his head and started to be partially interested in the surrounding objects, however the change in the brain volume was not significant (Figure 2).

DISCUSSION

Chronic subdural hematoma is a lesion that can lead to serious neurological complications in infants. Neurological follow-up becomes difficult in patients with asphyxia as they should be intubated and sedated in intensive care hospitalization period. Reducing sedation as much as possible and performing frequent neurological examinations, controling the head circumference and fontanel tension may be useful for early diagnosis especially in intubated and sedated cases.

Brain development reaches 80-90% volume of adult brain in the first 2 years of life (11). Especially myelinization starts at birth and is completed mostly at the age of 2 (12). Cognitive and motor functions progress very rapidly in the first two years of life hence atrophy and other organic disorders that occur during this period affect both functions seriously (13,14). Therefore, for the prevention of cognitive and motor retardation early evacuation of chronic subdural hematoma has a positive effect on prognosis at first two years of age (12).

In our case, the possible trigger for the happened sequential events was brain atrophy due to asphyxia and secondary subdural hemorrhages that the patient had at the age of 2 months. Hemorrhages secondary to atrophy caused an increase in cortical and subcortical atrophy, shrinking of the brain caused growth of subdural hematoma and consequently formation of a rare and uncommon form of cerebral atrophy. While normal human brain volume should be 425.000-855.000 mm^3 in the first 0-12 months of life in our patient it was 95.252 mm^3 (12). Apart from the cortical and subcortical layer, atrophy of the diencephalon suggests that the initial asphyxia attack played a role in the event.

On time and appropriately done surgical treatment should be used in order to preserve motor and mental development. Immediate surgical treatment is essential in patients with subdural hemorrhage that cause shift and neurological losses. Although approaches such as Burr Hole drainage, hematoma evacuation with craniotomy are feasible in surgical treatment, the most commonly used recent method is subduraperitoneal shunt insertion (15).

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