

Absorption or Circulation of the Subdural Hematoma? How Should We Name It? A Case Report and Literature Review

Subdural Hematomun Emilimi mi, Dolaşımı mı? Adını Nasıl Koymalıyız? Bir Olgu Sunumu ve Literatür Taraması

● Ahmet Günaydın¹, ● Cem Atabey², ● Ahmet Şanlı³

¹Ankara Etlik City Hospital, Clinic of Neurosurgery, Ankara, Türkiye

²University of Health Sciences Türkiye, İstanbul Sultan 2. Abdülhamid Han Training and Research Hospital, Clinic of Neurosurgery, İstanbul, Türkiye

³University of Health Sciences Türkiye, Ankara Dışkapı Yıldırım Beyazıt Training and Research Hospital, Clinic of Neurosurgery, Ankara, Türkiye

ABSTRACT

Traumatic acute subdural hematoma (TASH) is a life-threatening entity. 90% of cases undergo urgent surgery. Evacuation of the hematoma and decompression of the brain tissue are necessary. If the neurological status of the patient is good, conservative treatment for resolution of the hematoma is an option. In addition, spontaneous resolutions of TASHs have been reported, but their mechanism has not been investigated. An 85-year-old female was admitted to our emergency department with deterioration of mental status and vomiting after a traffic accident, diagnosed with bilateral frontoparietal TASH. Surprisingly, control computed tomography (CT) showed a remarkable reduction in the hematoma size and decrease in the midline shift preoperatively. There was an arachnoid injury at cranial CT and thoracolumbar magnetic resonance imaging (MRI) study was verified that blood in subarachnoid space at the lumbar region. Control CT revealed intraventricular hematoma 5 days after the initial cranial CT. The patient was discharged two weeks later without any neurological deficits. Rapid spontaneous evacuation of TASH into the intraventricular space via the thoracolumbar subarachnoid cerebrospinal fluid (CSF) circulation is presented and possible related mechanisms are discussed. TASH as an event of traumatic head injury or secondary to tearing of corticodural bridging vessels could occur incidentally. Arachnoid tears and the effect of CSF flow due to high pressure are responsible for redistribution and relocation of the TASH. Radiological investigation with thoracolumbar spine MRI and repeated cranial CT is necessary for rapid resolution.

Keywords: Subdural, hematoma, MRI, cerebrospinal fluid, trauma

ÖZ

Travmatik akut subdural hematom (TASH) yaşamı tehdit eden bir durumdur. Olguların %90'ı acil ameliyata alınıyor. Hematomun boşaltılması ve beyin dokusunun dekompresyonu gereklidir. Hastanın nörolojik durumu iyi ise hematomun çözülmesi için konservatif tedavi bir seçenektir. Ayrıca TASH'lerin kendiliğinden çözüldüğü de bildirilmiş ancak mekanizması araştırılmamıştır. Seksen beş yaşında kadın hasta trafik kazası sonrası bilinç durumunun bozulması ve kusma şikayetiyle acil servise başvurdu ve çift taraflı frontoparietal TASH tanısı aldı. Şaşırtıcı bir şekilde, ameliyat öncesi kontrol bilgisayarlı tomografi'si (BT) hematom boyutunda kayda değer bir azalma ve orta hat kaymasında azalma olduğunu gösterdi. Kranial BT'de araknoid yaralanma olduğu ve torakolomber manyetik rezonans görüntüleme (MRG) çalışmasıyla lomber bölgede subaraknoid boşlukta kan olduğu doğrulandı. Hastanın kontrol BT'sinde, ilk kranial BT'den 5 gün sonra intraventriküler hematom saptandı. Hasta iki hafta sonra herhangi bir nörolojik defisit olmaksızın taburcu edildi. TASH'ın torakolomber subaraknoid beyin omurilik sıvısı (BOS) dolaşımı yoluyla intraventriküler boşluğa hızlı spontan geçişi sunulmuş olup olası ilgili mekanizmalar tartışılmıştır. Travmatik kafa travması sonucu veya kortiko-dural köprü damarlarının yırtılmasına ikincil olarak TASH tesadüfen meydana gelebilir. Araknoid yırtıklar ve yüksek basınca bağlı BOS akışının etkisi, TASH'ın yeniden dağılımından ve yer değiştirmesinden sorumludur. Hızlı çözüm için torakolomber omurga MRG ve tekrarlanan kranial BT ile radyolojik inceleme gereklidir.

Anahtar Kelimeler: Sudural, hematom, MRG, beyin omurilik sıvısı, travma



Address for Correspondence: Cem Atabey, University of Health Sciences Türkiye, İstanbul Sultan 2. Abdülhamid Han Training and Research Hospital, Clinic of Neurosurgery, İstanbul, Türkiye

Phone: +90 536 551 91 06 E-mail: cematabey@gmail.com **ORCID ID:** orcid.org/0000-0002-3292-5791

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Introduction

Traumatic acute subdural hematoma (TASH) is a life-threatening entity. TASH is associated with a mortality rate of 40-60%. 90% of cases undergo urgent surgery, and evacuation of the hematoma and decompression of the brain are necessary (1,2). Neurological deterioration of the patient and a hematoma greater than 10 mm or midline shift greater than 5 mm on a computed tomography (CT) scan have been used for the proper indication and timing of surgical evacuation of hematoma (3). If neurological status of the patient is good, conservative treatment is an option (4). In addition, spontaneous resolutions of TASHs have been reported, but the mechanism has not been investigated (5).

We presented a case of rapid spontaneous evacuation of TASH into the subarachnoid space of the thoracolumbar spine and discussed possible related mechanisms.

Case Report

An 85-year-old female was admitted to our emergency department with deterioration of mental status and vomiting after a traffic accident. On admission, the patient was confused with a score of 13 on the Glasgow Coma score (GCS) in the emergency room. Cranial CT was performed initially and demonstrated bilateral frontoparietal TASH with a midline shift (Figure 1a). She had an acetylsalicylic acid use story. After preoperative preparation for decompressive surgery, control CT was planned to reveal considerable and accompanying pathologies with the hematoma. Surprisingly, control CT showed a remarkable reduction of the hematoma size and decrease of the midline shift (Figure 1b). Based on CT findings, we started medical treatment and decided to follow up the patient with CT scan. There was an arachnoid injury at cranial CT (Figure 1c), and thoracolumbar magnetic resonance imaging (MRI) study was planned to identify the hematoma location. Thoracolumbar MRI verified blood in the subarachnoid space at the lumbar region due to cerebrospinal fluid (CSF) circulation with microgravity (Figure 2a,b,c,d). After 5 days, the patient's control CT revealed an intraventricular hematoma. As mentioned in our hypothesis, the hematoma in the lumbar region was again in the ventricular space in the cranial region due to the effect of CSF circulation (Figure 3).

The patient's course was uneventful, and the last control CT scan revealed a reduction in the hematoma size (Figure 4a,b). The patient was discharged two weeks after admission with 15 GCS.

Discussion

TASH is a severe head injury with a high mortality rate. Surgery is usually the first treatment option in patients with poor neurological condition, severe midline shift, or great hematoma. Despite the surgical management guidelines of TASH, conservative treatment is a plausible option for patients in good condition. The true incidence of rapid resolution of TASH is underestimated because of urgent neurosurgical intervention with removal of subdural hematoma. Rapid and spontaneous resolution of TASH has been reported in the literature and expressed differently (5).

Two possible mechanisms have been proposed for rapid resolution of TASH: a) The dilution and redistribution of hematoma by the flow of CSF through the arachnoid tear, followed by retrograde flow into the subarachnoid space (3,6,7). b) The compression and redistribution of the hematoma can be induced by increased intracranial pressure (8). This hypothesis is supported by the finding of dispersal of blood in the cerebellar tentorium, interhemispheric subdural space, or spinal subdural space on follow-up MRI (3,8,9). Vital et al. (5) believed that the resolution of the hematomas is due to the effect of these two mechanisms. However, there is the rule of Lavoisier law "There is nothing to exist, and none can exist". According to Lavoisier fluid dynamics, relocation of the hematoma with CSF flow is the main reason for redistribution due to the adjacent arachnoid injury and the effect of arachnoid tear, as in our case. Legros et al. (10) emphasized fluid dynamics, microgravity, and body forces. There are driving forces for flow on fluids. We believe that there are forces on CSF flow due to microgravity. In the present case, the subdural hematoma relocalize through the thoracolumbar subarachnoid space due to microgravity and CSF flow.

The majority of reported cases of rapid spontaneous resolution of TASH occurred in elderly patients or infants. Vital et al. (5) reviewed the literature and listed the patients. The mean age was 36 years (range; 8 months-92 years). Our patient was an 85-year-old female with TASH. In our opinion, there is not any significant relation between the age and spontaneous resolution.

Patients with spontaneous resolution of TASH were admitted to the hospital with low back pain after three days or more. All patients underwent lumbar MRI due to low back pain. Spinal subdural hematoma identified incidentally (5,8,11,12). In spite of the literature, 2 h after initial CT, there was thoracolumbar subdural hematoma without low

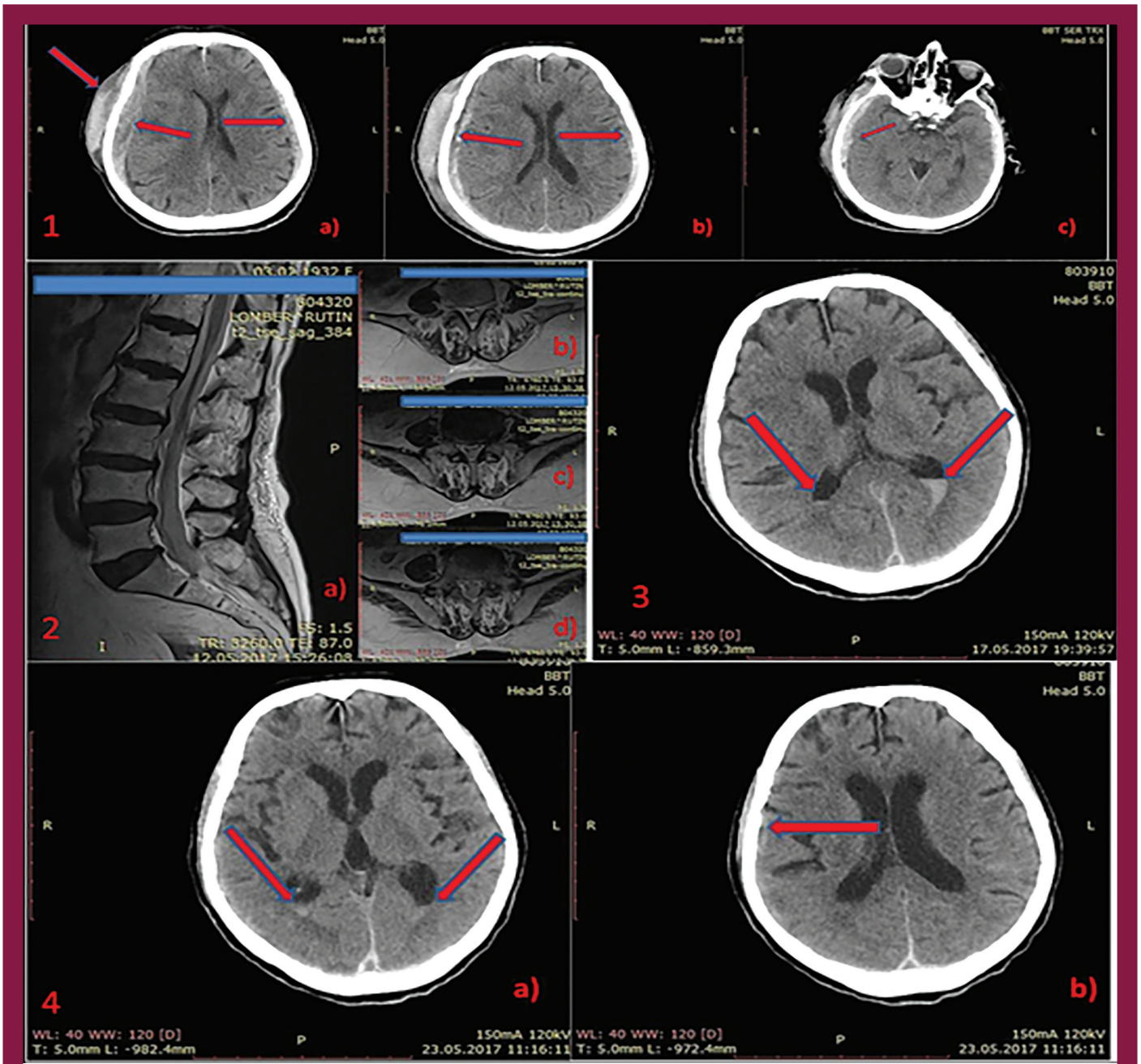


Figure 1a. Cranial CT was initially performed and demonstrated bilateral frontoparietal TASH with a midline shift and cephal hematoma. (red arrows)

CT: Computed tomography, TASH: Traumatic acute subdural hematoma

Figure 1b. Control CT showed a remarkable reduction in the hematoma size and decrease in the midline shift (red arrow)

CT: Computed tomography

Figure 1c. An arachnoid injury on cranial CT is shown with a red arrow

CT: Computed tomography

Figure 2. Thoracolumbar MRI verified blood in the subarachnoid space at the lumbar region (a) sagittal and (b-d) axial views

MRI: Magnetic resonance imaging

Figure 3. Bilateral intraventricular hemorrhage was seen in the control CT at the 5th days in the intensive care unit (red arrows)

CT: Computed tomography

Figure 4. The last control CT scan revealed a reduction in the hematoma size. a) Intraventricular b) subdural

CT: Computed tomography

back pain and neurological improvement with subdural hematoma resolution in the presented case. In our opinion, timing and back pain are not mandatory for showing the redistribution and relocation of subdural hematoma.

Radiological studies were limited to cranial CT or MRI. There was not any investigated anatomic localization after spontaneous resolution of the hematoma radiologically in the relevant literature. In the presented case, the subdural hematoma was shown as resolute on cranial CT; however, there was hematoma in the subarachnoid space of the thoracolumbar spine due to the CSF flow and microgravity. In the literature, all cases underwent thoracolumbar MRI due to low back pain and there was a time interval. In our opinion, all patients with rapid subdural hematoma resolution without neurological deterioration should undergo radiological evaluation for hematoma relocation.

Surprisingly, we experienced an unusual case whose neurological condition improved because of rapid spontaneous resolution of TASH under conservative treatment. In this article, we wanted to emphasize for the first time that, unlike the cases published in the more recent literature, CSF circulation carries bleeding from the spinal region into the ventricles. In general, subdural hemorrhages are always evaluated using brain CT. Spinal MRI was not performed. Brain CT is not performed when bleeding in the spinal area is also absorbed or disappears.

However, it is very difficult to distinguish which patient should be treated surgically or conservatively. The neurosurgeon should make this critical decision according to the neurological examination and premorbid state of the patients.

Conclusion

TASH as an event of traumatic head injury or secondary to tearing of corticodural bridging vessels could have occurred incidentally. We wanted to remind the readers of the forgotten importance of post-traumatic arachnoid tears in this case. Arachnoid tears and the effect of CSF flow due to high pressure are responsible for redistribution and relocation of the TASH. Radiological investigation with thoracolumbar spine MRI and repeated cranial CT is necessary for rapid resolution.

Ethics

Informed Consent: Before treatment, consent was obtained from the patient.

Authorship Contributions

Surgical and Medical Practices: A.G., A.Ş., Design: A.Ş., Analysis or Interpretation: A.Ş., Literature Search: A.G., C.A., Writing: C.A.

Conflict of Interest: No conflict of interest was declared by the authors.

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