CASE REPORT

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Imaging Findings of Intracranial Hypotension Presented with Pseudo-Subarachnoidal Hemorrhage

Yalancı-Subaraknoid Kanama ile Prezente Olan İntrakraniyal Hipotansiyonun Görüntüleme Bulguları

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ABSTRACT

Spontaneous intracranial hypotension (SIH) is a condition in which the fluid pressure inside the skull is lower than normal. It is secondary to cerebrospinal fluid (CSF) leak at the level of the spine and the resulting loss of CSF volume. Pseudo-subarachnoidal hemorrhage is a rare condition that can occur in patients with spontaneous intracranial hypotension. The diagnosis is very important because it can be confused with true subarachnoidal hemorrhage. True subarachnoidal hemorrhage is one of the complications that may occur in SIH patients. The differentiation of these two conditions as well as computed tomography (CT) and magnetic resonance imaging (MRI) findings and the response of the blood-patch treatment applied by interventional radiology is also very valuable.

ÖZET

Spontan intrakraniyal hipotansiyon (SIH), kafatasının içindeki sıvı basıncının normalden düşük olduğu bir durumdur. Omurga seviyesinde beyin omurilik sıvısı (BOS) sızıntısına ve bunun sonucunda BOS hacim kaybına sekonder gelişir. Psödo-subaraknoid kanama, spontan intrakraniyal hipotansiyonu olan hastalarda görülebilen nadir bir durumdur. Tanı çok önemlidir çünkü gerçek subaraknoid kanama ile karıştırılabilir. Gerçek subaraknoid kanama SIH hastalarında ortaya çıkabilecek komplikasyonlardan biridir. Bu iki durum arasındaki farkın bilgisayarlı tomografi (BT) ve manyetik rezonans görüntüleme (MRG) bulguları ve girişimsel radyoloji tarafından uygulanan kan-yama tedavisinin yanıtı çok değerlidir.

Keywords:
Spontaneous intracranial hypotension
Pseudo-subarachnoidal hemorrhage
Magnetic resonance imaging

Anahtar Kelimeler:
Spontan intrakraniyal hipotansiyon
Yalancı-subaraknoidal kanama
Manyetik rezonans görüntüleme

INTRODUCTION

Spontaneous intracranial hypotension (SIH) is a condition that often occurs with chronic orthostatic headache, changes in mental status, and gradual increase of complaints due to hypovolemia of the cerebrospinal fluid (CSF) (1). Major complications associated with SIH are subdural hematoma (SDH), cerebral venous thrombosis (CVT), and subarachnoidal hemorrhage (SAH) which are often caused by compensatory mechanisms. Rarely, pseudo-SAH has been reported in patients with intracranial hypotension (2). Although there is no blood in the subarachnoidal space when pseudo-SAH occurs an increase in the attenuation is observed in the basilar cistern along the tentorium cerebelli and falx cerebri. Subarachnoidal hemorrhage is one of the expected complications in patients with intracranial hypotension, but its differentiation from the pseudo-SAH changes the approach and treatment (3).

Therefore in our case, we aimed to present the Computed Tomography (CT) and Magnetic Resonance Imaging (MRI) findings of intracranial hypotension presenting with pseudo subarachnoidal hemorrhage.

CASE

A 55-year-old male patient with a diagnosis of diabetes mellitus and hypertension, who had known no operation or trauma history was admitted to emergency service with complaints of severe headache and balance disorder for the last 15 days. Non-contrast enhanced computed tomography (NECT) was performed with a 128 detectors scanner CT (PHILIPS, Ingenuity, Nederland). Bilateral subdural effusion, obliteration of basal cisternae, and pseudo-subarachnoidal hemorrhage (SAH) due to vascular structures were observed in the NECT of the patient (Figure 1). Brain and whole spinal MRI (1.5T GE flex LG full, USA) showed bilateral subdural hemorrhage (Figure 2), sulcal effacement (Figure 3a), dural enhancement extending to the cervical spinal area (Figure 3b), obliteration of the pontomesencephalic angle and secondary tonsillar ectopia (Figure 3c). Dural defect was not observed. Areas considered to be pseudo-SAH in NECT were observed normally in the axial SWI (a) sequences (Figure 4a, b). Also, no diffusion restriction was found in the Diffusion-Weighted Imaging (DWI) (Figure 4b) and Apparent Diffusion Coefficient (ADC) (Figure 4c) images of these areas. MR Venography examination performed for sinus venous thrombosis was evaluated as normal. Because the patient's CSF pressure was weak and urgent, myelography was not performed as an additional imaging method. Before the interventional procedure, steroids and IV fluid were given to the patient

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Figure 1: Axial non-enhanced CT, obliteration of basal cisternae, and pseudo-SAH due to congestion of vascular structures are observed (white arrows).

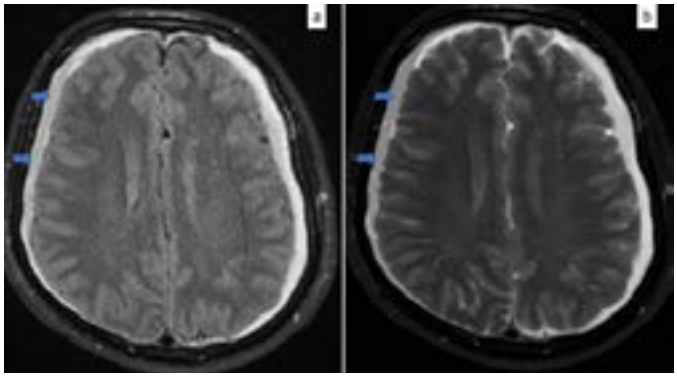

Figure 2: Axial FLAIR (a) and axial T2WI (b) bilateral subdural hemorrhage (arrows) are seen in the cerebral convexity.

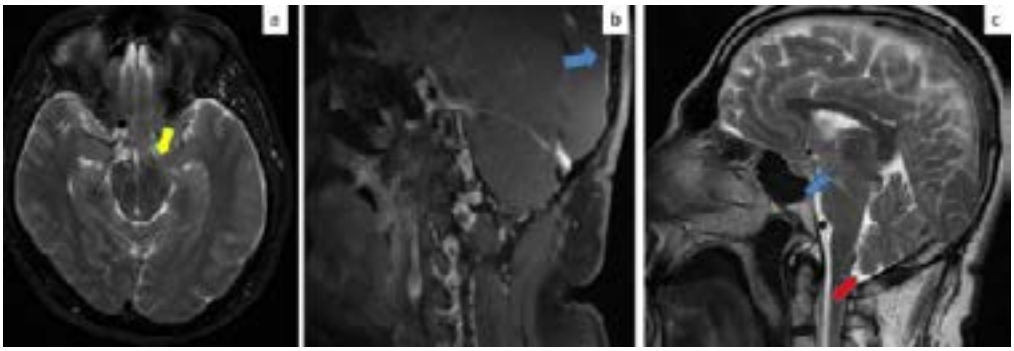

Figure 3: a) Axial T2WI sulcal effacement is seen (yellow arrow) **b)** Sagittal post-contrast T1WI dural enhancement is seen (blue arrow) **c)** Sagittal T2WI obliteration of the pontomesencephalic angle (blue arrow) and secondary tonsillar ectopia (red arrow) are seen.

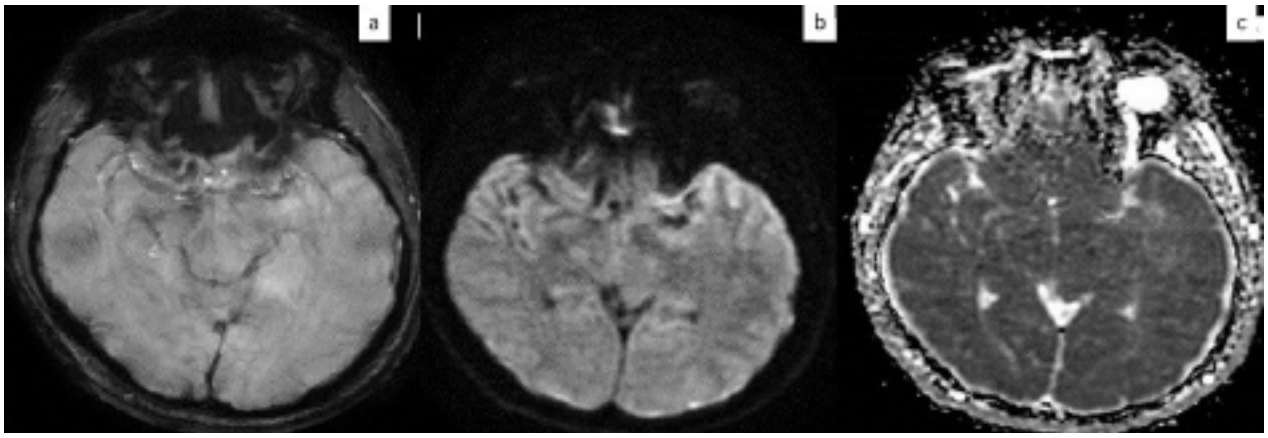

Figure 4: Axial **(a)** SWI image is normal. Axial DWI **(b)** and ADC **(c)** images, diffusion restriction was not found in the pseudo-SAH areas.

as conservative therapy. As CSF leakage could not be detected, an epidural blood patch was empirically performed by an interventional radiologist at level L2-3, L3-4. The patient's complaints decreased significantly after the epidural patch and clinical cure were provided. An informed consent was obtained from the patient for the publication of this manuscript.

DISCUSSION

According to the Monroe-Kelly hypothesis, volume loss in one compartment is compensated by an increase in another compartment to maintain intracranial pressure. When the CSF decreases rapidly, it is replaced by the brain parenchyma, and consequently the brain parenchyma damages (1). SIH is a condition that develops due to negative pressure in the cranial cavity and as in our case, the characteristic symptom is the orthostatic headache that decreases at rest. The incidence of SIH is 5/100 thousand patients and it is higher in women. The most common cause in etiology is spontaneous CSF leakage. Also, association with posttraumatic causes, coughing, sneezing, or some connective tissue diseases such as Marfan syndrome, Ehler-Danlos syndrome, and polycystic kidney disease has been reported. In 2013 the diagnostic criteria of the international headache classification committee were revised and accordingly, patients with a CSF pressure of $\leq$ 60 mm/Hg should be screened for CSF leakage is recommended (1,3).

Common findings of MRI in SIH are diffuse

pachymeningeal enhancement, tonsillar herniation, and subdural fluid collection are diffuse pachymeningeal enhancement, tonsillar herniation, and subdural fluid collection (4). Although the subdural fluid is observed at the level of cerebral convexity, it may sometimes continue throughout the tentorium but does not show a mass effect. Widening of the venous structures and pituitary gland, narrowing of the pontomesencephalic angle and the mamillopontine distance are other findings that can be observed (1). Cranial MRI may be normal in 20-30% of patients. Conditions that radiologically mimic SAH include hyponatremia, anoxic ischemia, metabolic encephalopathy, pyogenic leptomeningitis, intrathecal contrast administration, and SIH. Pseudo- subarachnoidal hemorrhage in SIH is thought to occur secondary to vascular enlargement in patients with extensive cerebral edema (4,5). Spinal MRI findings of spontaneous intracranial hypotension include; distension in the epidural veins, fluid accumulation in the epidural space, and meningeal diverticulum development at the level of the nerve root. Farb et al. were suggested that in most of the cases, CSF leakage related to the dural tears along the spinal canal develops SIH (6).

Bilateral subdural fluid or hematoma is highly diagnostic in imaging findings in patients who frequently admit to the emergency service due to mental deterioration. However, treatment of subdural hematoma before CSF leakage may be ineffective and harmful (7). Autologous epidural blood patches are frequently used in the treatment and can be repeated in cases that do not recover at one time, and surgical operation can be applied in resistant cases (3,6).

In conclusion; Spontaneous intracranial hypotension is a clinical diagnosis that can present with different imaging findings due to complications. It is important to recognize the pseudo-SAH and the distinction from real SAH because it will change the follow-up and treatment. As in our case, response after epidural blood patch application in the treatment of spinal CSF leakage in patients with severe orthostatic headache is diagnostic for SIH.

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

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