



# Headache-like Subarachnoid Hemorrhage After Digital Subtraction Angiography: A Case Report

## *Dijital Substraksiyon Anjiyografi Sonrası Subaraknoid Kanamayı Taklit Eden Baş Ağrısı: Bir Olgu Sunumu*

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### Abstract

Subarachnoid hemorrhage (SAH) is a clinical condition with acute-onset, sudden, and severe headache. In addition to headache, severe nausea, vomiting, dizziness, confusion, agitation, focal neurologic deficits, and hypertension can be detected. Findings of meningeal irritation may accompany to these clinical features, 6-24 hours after the hemorrhage. Digital subtraction angiography (DSA) is used for surgical or endovascular treatment planning in order to identify vascular abnormalities, in addition to other imaging studies. After DSA, the frequency of all neurologic complications is between 0.2% and 4.5%. Headache may occur after DSA in an average 50% of patients. This rate is especially higher in female patients. Headache types are usually classified as migraine, tension or postoperative atypical headaches. The incidence of severe headache after DSA is low. Vascular wall rupture should be considered first in severe headache after the procedure. It should also be kept in mind that after all other secondary causes are excluded; SAH-like headaches after DSA can be detected.

**Keywords:** Headache, subarachnoid hemorrhage, digital subtraction angiography

### Öz

Subaraknoid kanama (SAK) akut başlangıçlı, ani ve şiddetli baş ağrısı ile ortaya çıkan klinik bir durumdur. Baş ağrısına ek olarak ciddi bulantı, kusma, baş dönmesi, konfüzyon, ajitasyon, fokal nörolojik defisitler ve kan basıncı yüksekliği görülebilir. Kanamadan 6-24 saat sonra meningeal irritasyon bulguları bu klinik duruma eklenebilir. Dijital substraksiyon anjiyografi (DSA) diğer görüntüleme tetkiklerine ek olarak, vasküler anormalliklerin tanısı amacıyla, cerrahi veya endovasküler tedavi planlaması için kullanılmaktadır. İşlem sonrası nörolojik komplikasyon sıklığı %0,2 ile %4,5 arasındadır. Ortalama %50 hastada ise DSA işlemi sonrası baş ağrısı olabilmektedir. Özellikle kadın hastalarda bu oran daha fazladır. Ağrılar sıklıkla migren, gerilim veya postoperatif atipik baş ağrıları sınıfına dahil edilebilir. DSA sonrası şiddetli baş ağrısı görülme sıklığı azdır. Bu nedenle işlem sonrası şiddetli baş ağrılarında öncelikle damar duvarı rüptürü düşünülmelidir. Diğer tüm sekonder nedenler dışlandıktan sonra, DSA sonrası SAK benzeri baş ağrılarının görülebileceği de akılda tutulmalıdır.

**Anahtar Kelimeler:** Baş ağrısı, subaraknoid kanama, dijital substraksiyon anjiyografi

### Introduction

Subarachnoid hemorrhage (SAH) is referred to as hemorrhage in the subarachnoid space of the brain, usually due to arterial and rarely due to venous causes. These hemorrhages can occur as a result of trauma, aneurysm, vascular malformations, bleeding disorders, brain tumors and anticoagulant treatment complications, and 20% of cases have no cause (1,2).

SAH usually have acute-onset and most patients present with sudden and severe headache. The main symptoms are headache, vomiting, dizziness, confusion, focal neurologic deficits, and

memory impairment. Findings of meningeal irritation, 'Kernig's and Brudzinski's sign', may develop 6-24 hours after hemorrhage (3). Objective verification and localization of hemorrhage in patients with clinically suspected SAH are important for the prevention and early treatment of complications such as parenchymal hemorrhage, ischemia, and hydrocephalus, which can develop after SAH (4).

Digital subtraction angiography (DSA) is used for the diagnosis of vascular abnormalities, surgical or endovascular treatment planning in addition to other imaging studies, and is the gold standard for imaging aneurysms. The presence, number,

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width, and direction of aneurysm, shape of the aneurysm wall, and its relationship with other vascular structures can be evaluated with angiography (5,6,7). Even under safe conditions, the rate of neurologic complications is still 2-3%. Headache can be seen in 50% of patients after DSA and migraine-type headache is detected in 43% (8). Although secondary headaches can also be seen in patients, SAH-like headache is rarely reported in the literature.

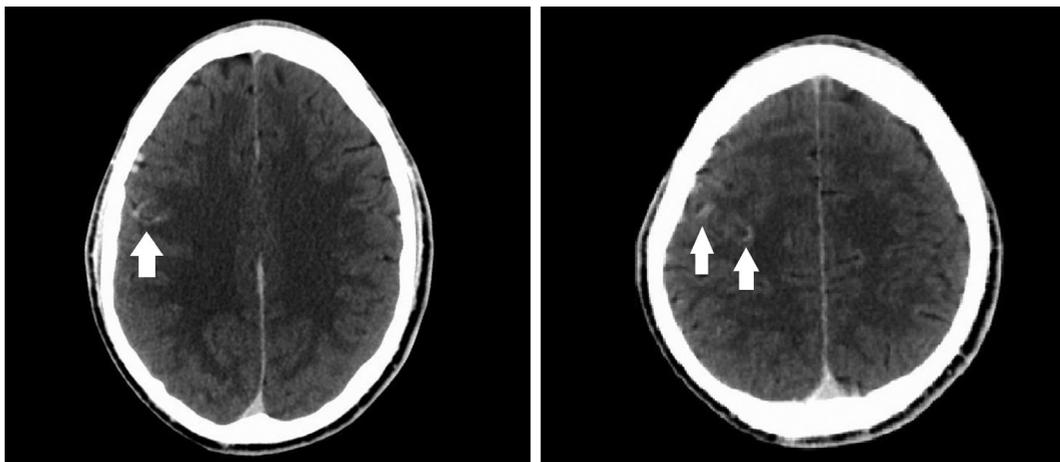
### Case Report

A 30-year-old man presented with temporary confusion lasting 48-72 hours, which he had had twice per week for a month. There was no history of trauma, infection, stress factor, drug and alcohol use, and systemic disease. On neurologic examination, direct and indirect pupillary light reflexes were normal, eye movements were normal in all directions, and facial asymmetry was not observed. The uvula was in the midline position and the gag reflex was present bilaterally. There was no atrophy of the tongue and the tongue movements were normal both inside and outside the mouth. Deep tendon reflexes were normoactive, muscle strength test was normal, and no pathologic reflex was detected. An electroencephalogram

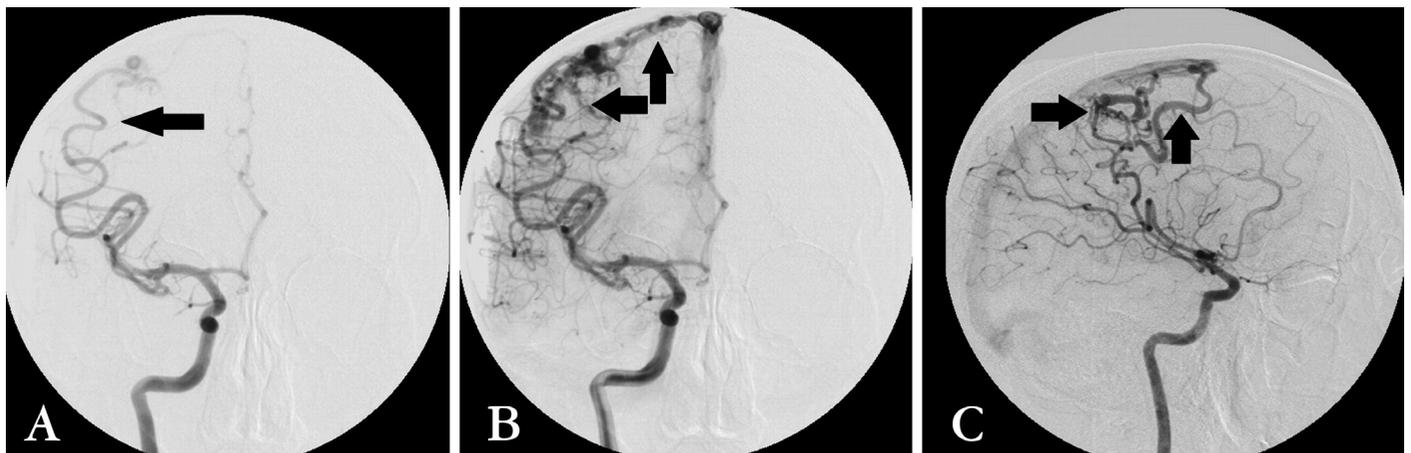
revealed no focal asymmetry and epileptiform disorder. Cranial computed tomography (CCT) and cranial magnetic resonance imaging (MRI) showed no abnormalities. DSA was performed to exclude a vascular pathology. Agitation, confusion, and headache developed within the first hours after DSA. A neurologic examination revealed lethargic consciousness and the patient was not cooperative, and 4+ nuchal rigidity was detected. His body temperature was 38.9 °C and his blood pressure was 190/110 mmHg.

Initially, this condition was considered as a vascular complication due to DSA and a contrast medium appearance mimicking SAH was observed in the right parietal region on CCT (Figure 1). No acute diffusion restriction was detected on diffusion-weighted MRI. On DSA, the tortuous vascular structures detected in the extracerebral space close to the right frontoparietal vertex were evaluated as an arteriovenous malformation (AVM) or arteriovenous fistula (AVF) (Figure 2).

In laboratory examinations, a complete blood count examination revealed a leukocyte count of 12,100/mm<sup>3</sup>, hemoglobin of 14.5 g/dL and platelet count of 261,000 K/uL. Fasting blood glucose, urea, liver function tests, renal function tests, lipid, creatinine



**Figure 1.** Axial cranial computed tomography: Contrast medium enhancement mimicking subarachnoid hemorrhage in the right parietal region



**Figure 2.** Digital subtraction angiography: A) Anteroposterior early phase, B) Anteroposterior late phase, C) Lateral late phase: Fistula and malformation between the middle cerebral artery and the superior sagittal sinus in the right frontoparietal region

phosphokinase, and electrolytes were within normal limits in routine blood biochemistry examinations.

The lumbar puncture examination results were as follows: cerebrospinal fluid (CSF) was clear, CSF glucose: 107 mg/dL (normal, 40-70 mg/dL), CSF chloride: 108 mmol/L (normal, 118-132 mmol/L), Gram stain and central infective polymerase chain reaction were normal. A central or systemic infection was not detected in the patient after reevaluation with the Infectious Disease Clinic.

The clinical status of the patient was diagnosed as a contrast-medium-related headache mimicking SAH after DSA. The patient underwent fluid replacement along with prednisolone at a dosage of 1 mg/kg/day and anxiolytic treatment. On the third day, the patient's clinical condition and nuchal rigidity improved. Steroid therapy was reduced and discontinued, and the patient was discharged at the end of the 7<sup>th</sup> day without any symptoms.

Fifteen days later, the patient was reevaluated in the outpatient clinic, and it was found that his clinical condition was better and that he could normally sustain his daily life as he used to. It was observed that the hyperdense area mimicking the appearance of SAH in the right parietal region disappeared in the follow-up CCT. The patient underwent endovascular embolization. It was learned that his symptoms had improved in the second month after the embolization. The previous symptoms were thought to be related to AVM and AVE.

## Discussion

Post-DSA neurologic complications occur due to direct effects of the contrast medium, embolisms due to atherosclerotic changes or technical features of the procedure being performed. In a study in 2224 patients with ischemic stroke, neurologic complications developed in 4% of patients. It was determined that 3% of these complications were transient and 0.06% were mortal. Another study found that the probability of developing neurologic deficit after DSA was 2-3% (9,10). One point three percent of neurologic deficits occur within the first 24 hours. Less than 0.1% occurs after a week (11). Generally, all neurologic deficits are observed in patients over 50 years of age with a history of transient or persistent ischemic attack; it is rarely seen in young patients (12). Technical complications of the interventional procedure should be investigated in young patients with neurologic deficits after DSA.

In a study performed in 2924 patients who underwent cerebral angiography, clinical complications were detected in 36 patients. Cerebral hemorrhage and/or SAH were observed in 12 patients. Ten patients had transient neurologic deficit and one patient had a contrast medium adverse reaction. In addition, 10 patients had carotid or vertebral artery dissection during the procedure. Only one of these patients had severe headache unresponsive to treatment (13). Severe and medical treatment-refractory cases after the procedure are rare. For this reason, it is important to investigate secondary causes in such headaches.

Post-DSA headache is a common condition. Headache is seen in 35.4% of patients after an average of 24 hours following DSA, and the majority of these patients are females (14). In prospective evaluations, it was determined that these headaches were generally benign (15). Migraine-type headache, tension-type headache, and postoperative atypical headaches are frequently seen after

DSA procedures. Headaches are especially seen in patients with a history of diabetes mellitus and cerebrovascular disease. All secondary causes should be carefully investigated in these types of headaches that occur after intervention (16). After that, blood pressure, body temperature, and blood glucose level should be evaluated. These headaches can be treated with intravenous fluids, antiemetics, analgesics, anti-inflammatory drugs, and local or general anesthetics. In this present case, we achieved good clinical improvement with hydration, steroid, and escitalopram treatment. We concluded that the local irritation of the contrast medium, and the headache and nuchal rigidity were decreased with these treatments.

Secondary headaches are mostly due to technical complications of the DSA procedure and contrast medium adverse reactions. SAH due to the deterioration of the integrity of the vascular wall can also be rarely seen in patients. SAH-like headache is rare and important in terms of differential diagnosis. In some cases, leakage of contrast medium due to dissection or vascular malformations can also be confused with SAH (15). On the other hand, headache, increased blood pressure, agitation, fever and nuchal rigidity were observed in our patient 3 hours after angiography. This situation was primarily considered as a complication of the interventional procedure. Although SAH was suspected as a result of clinical examination, CSF findings and a neuroradiologic examination were not supportive.

As a result, it was determined that headache can be seen frequently after DSA procedures and that these patients are often female. After DSA procedures, SAH-like clinical presentations due to the contrast medium effect may occur and it can make the primary situation even more complicated. Post-procedure headache mimicking SAH with all its clinical features is very rare. It should not be forgotten that SAH-like hyperdense appearance might occur with contrast medium use in cases of cerebral vascular abnormality.

## Ethics

**Informed Consent:** A consent form was completed by the patient.

**Peer-review:** Externally peer-reviewed.

## Authorship Contributions

Surgical and Medical Practices: F.E., Ş.Ö., Concept: F.E., Design: F.E., Ş.Ö., A.H.E., Data Collection or Processing: F.E., H.K., A.H.E., Analysis or Interpretation: F.E., Ş.Ö., H.K., Literature Search: F.E., A.H.E., Writing: F.E.

**Conflict of Interest:** There is no conflict of interest with authors.

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