

False Subarachnoid Hemorrhage: A Deceptive Presentation of Subarachnoid Hemorrhage

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ABSTRACT

This case presents a special case of an 83-year-old female who had a pseudo-subarachnoid hemorrhage following a thrombectomy for acute cerebral infarction. Head computed tomography (CT) showed imaging revealed findings consistent with subarachnoid hemorrhage accompanied by corresponding neurological clinical manifestations. However, 12 hours later, the diffuse high-density regions within the subarachnoid space disappeared. The patient made a full recovery, returning to baseline neurological function within 3 days.

CASE REPORT

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An 83-year-old woman experienced an abrupt onset of slurred speech during pulmonary venous interventional therapy. Emergency head computed tomography (CT) and cerebral angiography diagnosed acute cerebral infarction, following which she subsequently underwent thrombectomy. Although there was initial improvement in her symptoms, they subsequently worsened, and she eventually lapsed into consciousness. The patient has a history of well-controlled hypertension, and no other significant comorbidities. A head computed tomography (CT) scan revealed diffuse high-density areas within the subarachnoid space, consistent with a diagnosis of subarachnoid hemorrhage (Figure 1A). Symptomatic treatment measures including oxygen inhalation and intracranial pressure reduction were given. A follow-up CT scan performed 12 hours later showed the disappearance of the diffuse high-density areas in the subarachnoid space (Figure 1B). By the third day of hospitalization, the patient's level of consciousness and speech functions had returned to normal.

DISCUSSION

Etiology & Demographics

Pseudo arachnoid hemorrhage have found that its causes can be caused by hypoxic-ischemic injury [1], meningitis [2], hyponatremia [3], leukemia [4], etc. Among them, hypoxic-ischemic injury is the most commonly reported. Still, its causes of hypoxic-ischemic injury are diverse, including cardiac arrest [5], subdural hematoma [6], spontaneous intracranial hypotension [7], respiratory failure [8], COVID-19 infection [9],

pulmonary arterio-venous malformation [10], percutaneous coronary intervention [11], cerebellar infarction [12] and other diseases [13]. However, the demographic characteristics of pseudo subarachnoid hemorrhage are currently unknown.

Clinical & Imaging Findings

In recent years, the hypothesized mechanisms underlying pseudo subarachnoid hemorrhage encompass purulent meningitis leakage, cerebrospinal fluid leakage associated with nonionic contrast agents, superficial venous dilation, shrinkage of the cerebrospinal fluid space, and a relatively low density of the underlying parenchyma [14]. Timely diagnosis and treatment of diseases, and improvement of prognosis remain critical clinical priorities. After head CT examination, the differentiation between subarachnoid hemorrhage and pseudo subarachnoid hemorrhage is principally ascertained by means of cranial angiography, cranial MRI [2, 15-16], and cerebrospinal fluid puncture. Although patients with pseudo subarachnoid hemorrhage demonstrate diffuse high-density shadows in the subarachnoid space on head CT, lumbar puncture findings typically lack the presence of bloody cerebrospinal fluid. In this case, the patient's head CT showed subarachnoid hyperdense shadow and was accompanied by cerebral tissue edema manifestation. It was considered that the recanalization of the cerebrovascular vessels following the removal of the cerebral thrombus had augmented the blood flow filling, and the widening of the cerebral vascular endothelial cell gap had caused the extravasation of contrast medium. SAH is predominantly occurs in the sulcus and basal part of the brain. Epidural hemorrhage typically presents bow-shaped, and pseudo-

subarachnoid hemorrhage is variable in location. Density and signal characteristics: SAH is hyperdense on CT, and the signal characteristics on MRI are related to the time of bleeding; epidural hemorrhage is usually bow-shaped and hyperdense; cerebral venous sinus thrombosis mainly shows hyperdense shadows in venous sinuses.

Differential Diagnosis

Pseudo subarachnoid hemorrhage (PSAH) can mimic true subarachnoid hemorrhage (SAH) on imaging and require careful differentiation. The differential diagnosis primarily includes:

True Subarachnoid Hemorrhage (SAH): Typically results from a ruptured cerebral aneurysm. CT imaging will show hyperdense regions in the subarachnoid space, particularly around the major fissures and sulci.

Subdural Hematoma: While located in a different space, acute subdural hematomas can sometimes encroach upon adjacent structures, mimicking PSAH.

Cerebral Venous Sinus Thrombosis (CVST): CVST may present with hemorrhage due to venous hypertension, often visualized on imaging as high-density areas in the subarachnoid space.

- a) **CT manifestations of subarachnoid hemorrhage (SAH):** Dense opacities are manifested on the cerebral cortex and within the sulci, typically exhibiting a laminar pattern. On CT, blood in SAH is often located in the sulcus, basal base, and surface of the brain. MRI manifestations of SAH: It may present as a high signal on T1-weighted images and a low signal on T2-weighted images. In some cases, DWI may show a high signal in the affected area.
- b) **CT manifestations of epidural hemorrhage:** It frequently manifests as a diffuse hyperdense shadow, often exhibiting an arcuate or crescentic shape within the epidural space. It is commonly associated with head trauma, accompanied by signs such as fractures. MRI manifestations of epidural hemorrhage: A high signal is observed on T1-weighted images, and a low signal is seen on T2-weighted images, usually distributed along the epidural surface.
- c) **CT manifestations of cerebral venous sinus thrombosis:** Characteristically, a dense shadow of the venous sinus is typically presented, and it may be accompanied by cerebral edema or hemorrhage. The presence of intra-sinus thrombosis can be visualized, and this can be further elucidated by CT Vascular Imaging (CTV). MRI manifestations of cerebral venous sinus thrombosis: On T1-weighted images, a high signal within the venous sinus may be manifested, while T2-weighted images may show

a low signal. Diffusion-Weighted Imaging (DWI) may show ischaemic changes in the area of interest.

Treatment & Prognosis

There is currently no standardized treatment plan for pseudo subarachnoid hemorrhage. The therapeutic approaches and prognoses vary depending on the underlying cause. Generally, the treatment focuses on addressing the primary cause while implementing symptomatic treatment simultaneously.

TEACHING POINT

This report presents a unique case of pseudo subarachnoid hemorrhage with neurological symptoms and imaging characteristics indicative of subarachnoid hemorrhage. Pseudo subarachnoid hemorrhage, which can be induced by a multiplicity of factors, represents a rare pathological state that frequently poses challenges in terms of treatment. Typically, it is essential to determine and address the underlying cause from an etiological perspective. Given the paucity of literature concerning these disorders, this case report is proffered with the aim of enhancing awareness regarding such conditions.

DISCLOSURES

We declare that there are no known competing financial interests or personal relationships that might potentially have influenced the work reported in this paper.

CONSENT

Written informed consent was obtained from the patient(s) for publication of this case review, including accompanying images.

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FIGURES

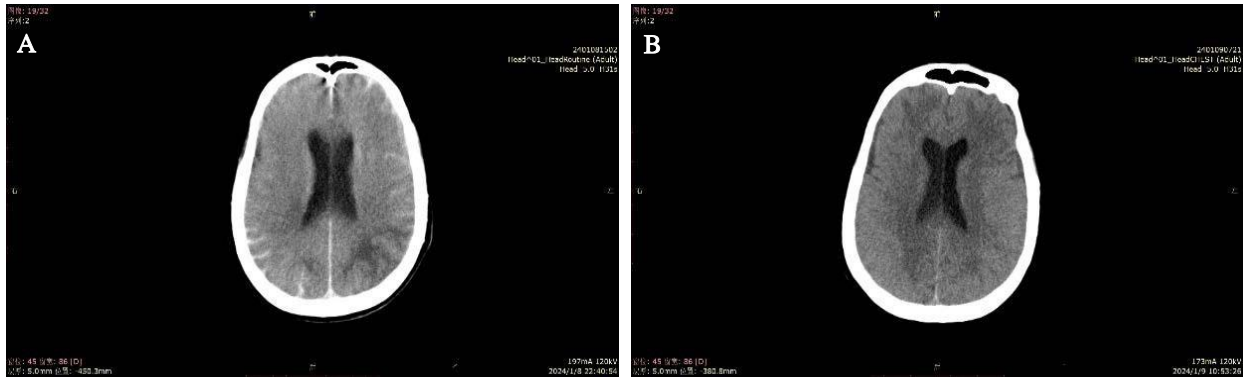


Figure 1: 83-year-old female with pseudo subarachnoid hemorrhage. (A) The head CT showing diffuse high-density areas in the subarachnoid space. (B) Follow-up head CT after 12 hours demonstrating the disappearance of the diffuse high-density areas in the subarachnoid space.

KEYWORDS

Pseudo Subarachnoid Hemorrhage; Head CT; Thrombectomy; Subarachnoid Hemorrhage; High-Density

ABBREVIATIONS

CT = Computed Tomography
MRI = Magnetic Resonance Imaging
PSAH = Pseudo Subarachnoid Hemorrhage

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