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Original Article

Bilateral Chronic Subdural Hematoma Presenting with Pseudo-Subarachnoid Hemorrhage Sign on Computed Tomography

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Abstract

Background: On rare occasions, cisterns are demonstrated as high-density areas on computed tomography (CT) and misdiagnosed with subarachnoid hemorrhage (SAH). This false-positive finding is called pseudo-SAH. **Patients and Methods:** From April 2014 to August 2018, a total of 161 patients with chronic subdural hematoma (CSDH) were treated in our hospital. For these cases, the existence of a pseudo-SAH sign on CT was retrospectively examined. **Results:** One patient with bilateral CSDH showed pseudo-SAH and a further examination to evaluate vascular abnormalities causing true SAH was necessary. In three patients, the Sylvian fissures were demonstrated as high-density areas due to an atherosclerotic middle cerebral artery; however, the condition was not misdiagnosed with SAH. **Conclusion:** In cases of CSDH, there is a possibility that CT demonstrates a pseudo-SAH sign. In such cases, close examinations to exclude true SAH are mandatory.

Keywords: *Bilateral, chronic subdural hematoma, computed tomography, pseudo-subarachnoid hemorrhage*

Introduction

Computed tomography (CT) detects subarachnoid hemorrhage (SAH) as a high-density area. Pseudo-SAH is a false-positive sign whereby cisterns are demonstrated as high-density areas on CT, mimicking SAH. Pseudo-SAH has been reported in patients with chronic subdural hematoma (CSDH),[1-4] acute subdural hematoma,[2] acute epidural hematoma,[2] postresuscitation encephalopathy,[5,6] intracranial hypotension,[7] and chronic hypoxemia.[8] We encountered a patient with bilateral CSDHs whose CT showed high-density areas in the bilateral Sylvian fissures and a mesencephalic cistern mimicking SAH. In our case, it was necessary to rule out true SAH. Although pseudo-SAH has been reported in the literature, it is not common to encounter a case presenting with pseudo-SAH. Therefore, we should keep in mind this false-positive sign. In this report, we analyzed the existence of a pseudo-SAH sign on CT in cases of CSDH. Furthermore, we present our experience of treatment for a patient with bilateral CSDHs showing pseudo-SAH and discuss the radiological characteristics of this condition.

Patients and Methods

From April 2014 to August 2018, a total of 161 patients with CSDH were treated in our hospital. For all lesions, burr hole surgery with irrigation of the hematoma was performed under local anesthesia. Among the patients, 18 had bilateral CSDHs. The radiological findings of these patients were retrospectively examined focusing on the existence of high-density regions in cisterns mimicking SAH. For evaluation of pseudo-SAH sign, an experienced neurosurgeon examined preoperative CT. Because of a retrospective analysis of radiological findings of CSDH patients, cases with true SAH were not included. As for radiological features of true SAH, high density in the basal cistern, hematoma in sulci or parenchyma, and hematoma in ventricles are known.[5] On the other hand, for this study to evaluate pseudo-SAH sign in CSDH patients, we initially examined the existence of high-density region in cisterns. If high-density region was observed, laterality was examined. In cases with atherosclerotic artery or thickened dural membrane, hemilateral high-density cistern with dilated contralateral cistern is common. The remaining case showing bilateral high-density

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Sylvian cisterns, high density in perimesencephalic cistern, and edematous brain were considered a case with pseudo-SAH. The cistern demonstrating high density in cases of pseudo-SAH is not as thick as that of true SAH.

Results

Of the 161 patients, 1 with bilateral CSDHs showed pseudo-SAH on preoperative CT. In three patients with unilateral CSDH, a high-density area in the Sylvian fissure was observed. The reason for this was an atherosclerotic middle cerebral artery (MCA). In these cases, a basal cistern or contralateral Sylvian fissure was demonstrated as a low-density area on CT, though uni/bilateral Sylvian fissures showed a high density. Therefore, the existence of SAH was not suspected.

As a result, in 1 of the 161 (0.62%) patients, a pseudo-SAH sign was observed on CT, and an examination to rule out SAH was necessary.

Case Report

An 83-year-old woman experienced transient headache 2 weeks before the first appearance. Two weeks later, she failed to get up one morning. When a family member checked on her, she complained of severe headache involving the whole head and vomited. She consulted a local physician; however, her symptoms did not improve, and her headache was continuous. Therefore, she was referred to one of our facilities. CT revealed high-density areas in the bilateral Sylvian fissures and mesencephalic cistern, tight basal cistern, and bilateral CSDHs [Figure 1a]. The density of the pre-pontine cistern was low. She was drowsy and complained of headache. She showed no significant laterality of muscle power. Our initial diagnosis was bilateral CSDHs associated with suspected SAH. Three-dimensional CT angiography (3D-CTA) showed no vascular abnormalities including a cerebral aneurysm [Figure 1b]. The final diagnosis was a tight Sylvian fissure due to increased intracranial tension caused by bilateral CSDHs. She underwent burr hole surgery, and the bilateral CSDHs were evacuated with saline under local anesthesia. Postoperative CT showed no SAH-like findings, and the bilateral Sylvian fissures and basal cistern were decompressed and demonstrated low densities [Figure 1c]. Brain atrophy was significant. Her headache was improved after surgery. Her postoperative course was uneventful. She regained consciousness and was discharged on the 5th postoperative day on the foot.

Discussion

Both CSDH and SAH are well-known diseases and the treatment strategies have been established. For cases with SAH, emergency treatment to prevent rebleeding from a ruptured cerebral aneurysm is necessary. Therefore, if SAH is associated with CSDH, the emergency operation for vascular anomaly should be first considered. In our case, CT showed pseudo-SAH with bilateral CSDHs. Although the CT findings were not typical of true SAH, radiological examination such as 3D-CTA to exclude vascular anomalies was performed. The radiological evaluation showed no cerebral aneurysm or vascular anomaly that could cause SAH. Therefore, the final diagnosis was CSDHs presenting with a pseudo-SAH sign.

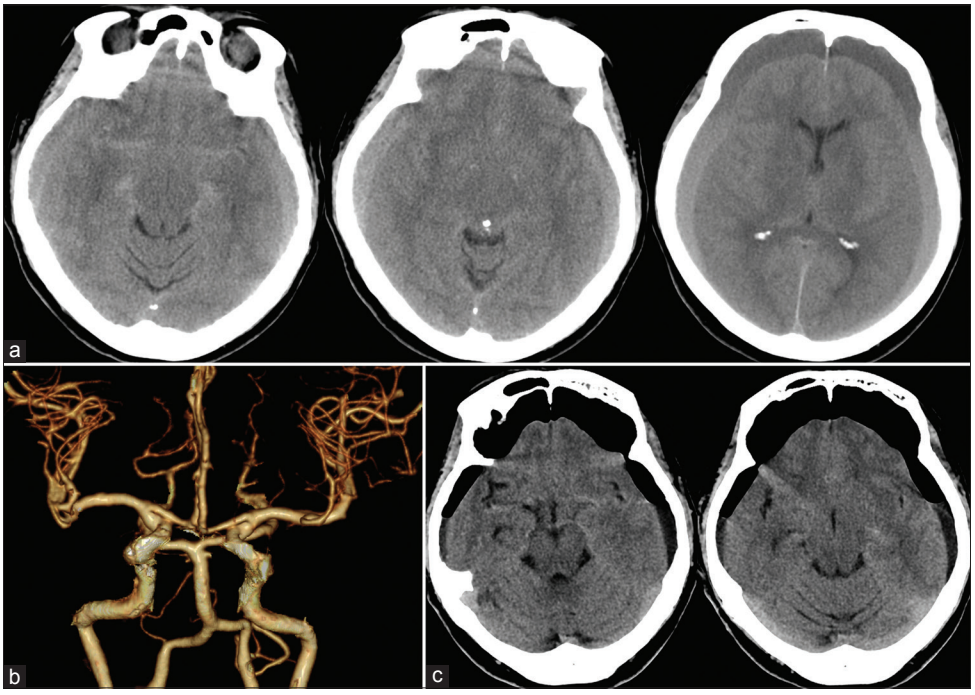

Figure 1: (a) Preoperative computed tomography showing high-density lines in the bilateral Sylvian fissures and mesencephalic cistern. The basal cistern was compressed and demonstrated an iso to slightly high density. The brain was markedly compressed by bilateral chronic subdural hematomas. (b) Three-dimensional computed tomography angiography revealing no vascular abnormalities including an aneurysm, which can cause subarachnoid hemorrhage. (c) Postoperative computed tomography showing decompression of the brain. Pseudo-subarachnoid hemorrhage sign is not present

Pseudo-SAH is a phenomenon observed on CT and known as a radiological pitfall.[3] However, it is not common to encounter a patient presenting with pseudo-SAH. According to the evaluation of patients with CSDH, the incidence of pseudo-SAH being confused with SAH was <1%. We encountered more CSDH cases without a pseudo-SAH sign before this examination period; therefore, the true rate of pseudo-SAH in CSDH cases might be much lower.

Pseudo-SAH is observed in cases with both increased[5] and decreased[7,9-12] intracranial pressure. Radiological characteristics of pseudo-SAH are high-density areas in cisterns and sulci compared with brain parenchyma. Different from the findings of true SAH, the disappearance of sulci and a basal cistern without thick SAH layers or intraparenchymal hematoma are observed on CT in pseudo-SAH.[3] Westwood *et al*.[9] reported a case of pseudo-SAH in bilateral Sylvian and interhemispheric fissures, but not in the basal cistern. In our case, although the bilateral Sylvian fissures and mesencephalic cistern showed high-density regions, these regions were thin. The basal cistern was compressed; however, it was not opacified as high. Therefore, for in cases with tight Sylvian fissures and suspected SAH, the basal cistern should be carefully observed. If the basal cistern demonstrates a high density, SAH should be considered. High-density areas in the Sylvian fissure are also observed in elderly patients with atherosclerotic MCA. In such cases, the basal cistern shows a low density and is not compressed or unclear. If the cistern is observed around MCA, or contralateral MCA is also atherosclerotic, there might be no misdiagnosis with SAH.

In elderly patients with CSDH, the brain is atrophic and symptoms do not become apparent until the hematoma extensively compresses the brain. Furthermore, if CSDHs exist bilaterally, there might be no apparent laterality in motor weakness. In such a case, the patient's or other people's recognition of motor weakness is delayed, and headache may be the main symptom. Therefore, in elderly patients with bilateral CSDHs, the brain and cisterns are markedly compressed when a patient's symptoms become apparent. In such a situation, the Sylvian fissures are observed as high-density areas and misdiagnosed with SAH. In our patient with severe headache, the Sylvian fissures showed a high density and were tight, and the basal cistern was compressed and disappeared. Our patient experienced transient headache about 2 weeks before admission. This headache was like a warning sign of a small amount of SAH before massive hemorrhage due to aneurysm rupture. Therefore, it was necessary for us to exclude the possibility of the combination of SAH and bilateral CSDHs.

Conclusion

Even though the incidence is low, we should be aware that CSDH patients may show pseudo-SAH on CT. Once SAH is suspected, close examinations to exclude true SAH are mandatory.

Declaration of patient consent

The authors certify that they have obtained all appropriate patient consent forms. In the form the patient(s) has/have given his/her/their consent for his/her/their images and other clinical information to be reported in the journal. The patients understand that their names and initials will not be published and due efforts will be made to conceal their identity, but anonymity cannot be guaranteed.

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Conflict of interests

There are no conflicts of interest.

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