Chronic Subdural Hematoma Infected by *Propionibacterium Acnes*: A Case Report

Shusuke Yamamoto Takashi Asahi Naoki Akioka Daina Kashiwazaki
Naoya Kuwayama Satoshi Kuroda

Department of Neurosurgery, Graduate School of Medicine and Pharmacological Science,
University of Toyama, Toyama, Japan

Key Words

Infected subdural hematoma · Craniotomy · *Propionibacterium acnes*

Abstract

We present a very rare case of a patient with an infected subdural hematoma due to *Propionibacterium acnes*. A 63-year-old male complained of dizziness and was admitted to our hospital. He had a history of left chronic subdural hematoma due to a traffic accident, which had been conservatively treated. Physical, neurological and laboratory examinations revealed no definite abnormality. Plain CT scan demonstrated a hypodense crescentic fluid collection over the surface of the left cerebral hemisphere. The patient was diagnosed with chronic subdural hematoma and underwent burr hole surgery three times and selective embolization of the middle meningeal artery, but the lesion easily recurred. Repeated culture examinations of white sedimentation detected *P. acnes*. Therefore, he underwent craniotomy surgery followed by intravenous administration of antibiotics. The infected subdural hematoma was covered with a thick, yellowish outer membrane, and the large volume of pus and hematoma was removed. However, the lesion recurred again and a low-density area developed in the left frontal lobe. Craniotomy surgery was performed a second time, and two Penrose drainages were put in both the epidural and subdural spaces. Subsequently, the lesions completely resolved and he was discharged without any neurological deficits. Infected subdural hematoma may be refractory to burr hole surgery or craniotomy alone, in which case aggressive treatment with craniotomy and continuous drainage should be indicated before the brain parenchyma suffers irreversible damage.

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Introduction

Infected subdural hematoma is a quite rare disorder. Only 27 cases have previously been reported in the literature. A preexisting subdural hematoma may transform to an infected subdural hematoma mainly through hematogenous infection. According to previous reports, the phlogogenic fungus of an infected subdural hematoma widely varies, including *Escherichia coli*, *Klebsiella*, *Salmonella* and Methicillin-resistant *Staphylococcus aureus* (MRSA) [1–26]. In this report, we present an adult case that developed chronic subdural hematoma infected by *Propionibacterium acnes*.

Case Report

A 63-year-old male was admitted to our hospital due to dizziness. He had a past history of head injury due to traffic accident and was conservatively treated 5 years ago. On follow-up CT scan 1 year later, he still had a small volume of chronic subdural hematoma on the left side. On admission, physical and neurological examinations revealed no definite abnormality. All of the laboratory data were also within normal limits. Plain CT scan demonstrated that a hypodense crescentic fluid collection enlarged and extended over the surface of the left cerebral hemisphere. The fluid cavity was loculated, suggesting repeated hemorrhage in the subdural space. The midline structures of the brain were shifted to the right side (fig. 1). He was diagnosed with a chronic subdural hematoma and underwent hematoma aspiration through a burr hole under local anesthesia. The hematoma cavity was filled with unusual white-colored sediment, which was aspirated through the burr hole as much as possible. After surgery, he was free from dizziness and was discharged.

Follow-up CT scans taken one month after surgery, however, showed that the subdural fluid collection enlarged again (fig. 2a). He underwent second surgery through the previous burr hole. During surgery, the white-colored sediment was subjected to a culture test. Although he was neurologically intact, subdural fluid collection increased in volume again 1 week after the second surgery (fig. 2b). The left middle meningeal artery (MMA) was embolized with N-butyl-2-cianoacrylate, because the blood flow from the MMA was considered involved in the repeated enlargement of the hematoma. Subsequently, *P. acnes* was detected in culture examination, and the patient was diagnosed with an infected subdural hematoma. One month later, follow-up CT scan revealed that the subdural hematoma further enlarged, and the low-density area developed in the left frontal lobe (fig. 3a). He underwent a third burr hole surgery. Since the culture examination of the hematoma contents identified *P. acnes* again, strong antibiotic therapy was started with ampicillin sodium 12 g per day in 6 divided doses for 12 days followed by ampicillin/sulbactam 12 g per day in 4 doses. However, the infected subdural hematoma increased in volume during 2 weeks after the third burr hole surgery (fig. 3b), and the patient underwent large frontotemporal craniotomy. The infected subdural hematoma was covered with a thick, yellowish outer membrane, and the large volume of pus and hematoma were removed. However, the volume of the infected subdural hematoma increased again 3 days later (fig. 4a). He underwent a second craniotomy surgery. Pus was completely removed, and two Penrose drainages were put in both the epidural and subdural spaces. Subsequently, ampicillin sodium (12 g per day in 6 divided doses) was administered for 34 days. Then, amoxicillin (2 g per day) was administered for 10 days, and amoxicillin/clavulanate (3 g per day) was further added for 60 days. The discharge from the drainages gradually decreased and the drainages were removed 48 days after the second craniotomy surgery. Plain CT scan showed complete disappearance of the infected

chronic hematoma (fig. 4b). He was discharged without any deficits, although neuropsychological function was not examined. No recurrence has occurred for the past 2 years.

Discussion

The incidence of infected subdural hematoma is quite low, and only 27 cases have been reported in the literature (table 1) [1–26]. Although subdural empyema occurs mainly due to the spread of infectious focus near the cranium, infected subdural hematoma most likely occurs through a hematogenous infection to a preceding chronic subdural hematoma [14, 18]. Previous reports strongly suggest that old patients [13] and compromised patients with an underlying disease such as diabetes, myelodysplastic syndrome [13, 18] and agranulocytosis [14] are susceptible to emerge an infected subdural hematoma. An infected subdural hematoma is reported to cause confusion or seizure as well as signs of infection such as fever and the elevation of white blood cells or C-reactive protein [21]. The phlogogenic fungus of an infected subdural hematoma widely varies, including *Klebsiella*, *Salmonella* and MRSA. *E. coli* has mostly been detected in old patients [5, 7, 9, 16], in the majority of whom urinary infection is the preceding infection [5, 7, 16]. Chronic cholecystitis is also indicated as the preceding infection [9].

Our patient was not so old and had no underlying diseases that may impair the immune system. He presented neither consciousness disturbance nor seizure. Laboratory examination on admission showed no signs of infection and inflammation. Therefore, the contamination of the bacteria was suspected when *P. acnes* was first identified by culture examination of the specimen obtained from the second burr hole surgery. However, he was finally diagnosed with an infected subdural hematoma, because *P. acnes* was detected repetitively. Infected subdural hematoma caused by *P. acnes* has not been reported yet.

Both burr hole and craniotomy surgery have been recommended as surgical treatment for an infected subdural hematoma. Otsuka et al. [18] reviewed the surgical results of a total of 18 cases undergoing burr hole or craniotomy surgery. As the results, they found no significant difference between the two groups. In the present case, however, repeated burr hole surgery was not successful, and craniotomy surgery and long-term drainage were required. Therefore, the surgical option should be determined according to the severity of the infected subdural hematoma, and craniotomy surgery should be planned without hesitation once the lesion recurs after burr hole surgery. More importantly, the present case developed a low-density lesion in the left frontal lobe after repeated recurrence. The lesion may represent the spread of the infection into the brain parenchyma, but it completely disappeared after craniotomy surgery. In 2002, Honda et al. [16] reported a case that developed cerebral infarction adjacent to the infected subdural hematoma probably because of arterial damage by infection. In 2001, Arboix et al. [27] reported that unusual cause was identified in 70 (6.0%) of 1,164 patients with ischemic stroke. Of these 70 patients, 11 developed ischemic stroke because of infection. Therefore, an infected subdural hematoma should appropriately be treated before the brain parenchyma is irreversibly damaged.

Conclusion

We presented a very rare case of an infected subdural hematoma requiring craniotomy surgery and long-term administration of antibiotics. We speculate that the preexisting subdural hematoma was transformed to an infected subdural hematoma via hematogenous

infection by *P. acnes*. Infected subdural hematoma may be refractory to burr hole drainage or craniotomy alone, in which case aggressive treatment with craniotomy and continuous drainage should be indicated prior to the irreversible damage of the brain parenchyma.

Disclosure Statement

The authors have no conflicts of interest or any financial disclosures to make. All authors who are members of the Japan Neurosurgical Society (JNS) have registered online self-reported COI Disclosure Statement Forms through the website for JNS members.

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Table 1. Summary of clinical features in previously reported cases with an infected subdural hematoma

Case No.	Authors [ref]	Year	Age, years	Sex	Symptoms	Surgical treatment	Prognosis	Phlogogenic fungus
1	Coonrod and Dans [1]	1972	53	M	fever, aphasia, anisocoria, hemiparesis	bilateral craniotomy	excellent	β-hemolytic <i>Streptococcus</i>
2	Braun and Axelrod [2]	1980	77	F	headache, fever, hemiparesis, disturbance of cons., convulsion	unknown	unknown	<i>E. coli</i>
3	Casson et al. [3]	1981	70	M	convulsion, headache, hemiparesis	bilateral burr hole	good	<i>E. coli</i>
4	Boles et al. [4]	1983	55	M	fever, disturbance of cons., anisocoria	craniotomy	good	<i>Salmonella sandiego</i>
5	Kaminogo et al. [5]	1984	76	F	headache, fever, disturbance of cons., hemiparesis	right craniotomy + left burr hole	excellent	<i>E. coli</i>
6	Dewar et al. [6]	1989	45	M	fever, disturbance of cons.	craniotomy	good	<i>Streptococcus anginosus</i>
7	Bakker et al. [7]	1993	88	F	disturbance of cons., monoparesis	burr hole	dead	<i>E. coli</i>
8	Dill et al. [8]	1995	4	M	fever, meningitis	burr hole	excellent	<i>Streptococcus pneumoniae</i>
9			81	F	headache, fever, meningitis, hemiparesis, disturbance of cons.	craniotomy	good	<i>S. aureus</i>
10	Hirano et al. [9]	1995	86	M	fever, disturbance of cons., hemiparesis	burr hole	dead	<i>E. coli</i>
11	Aoki et al. [10]	1997	70	M	fever, disturbance of cons., convulsion, hemiparesis	craniotomy	excellent	<i>Campylobacter fetus</i>
12	Yamasaki et al. [11]	1997	58	M	fever, convulsion	bilateral burr hole	excellent	<i>Enterococcus faecalis</i>
13	Sawauchi et al. [12]	1998	77	F	fever, hemiparesis	burr hole ×2	excellent	<i>E. coli</i>
14	Kan et al. [13]	1998	64	M	fever, disturbance of cons., anisocoria	craniotomy	good	<i>Salmonella enteritidis</i>
15	Kawamoto et al. [14]	1998	63	M	fever, disturbance of cons., convulsion, hemiparesis	burr hole	dead	<i>S. aureus</i>
16	Ishii et al. [15]	2001	20	M	fever, nausea, headache	burr hole	excellent	<i>C. fetus</i>
17	Honda et al. [16]	2002	71	F	disturbance of cons., hemiparesis	burr hole ×2, craniotomy	excellent	<i>Klebsiella pneumoniae</i>
18	Sato et al. [17]	2005	50	M	fever, disturbance of cons., bilateral mydriasis	craniotomy	excellent	MSSA
19	Otsuka et al. [18]	2007	87	M	disturbance of cons., convulsion	burr hole	dead	unknown
20	Hoshina et al. [19]	2008	1	M	fever, convulsion	burr hole ×2	excellent	<i>S. pneumoniae</i>
21	Narita et al. [20]	2009	80	M	fever, headache, disturbance of cons.	burr hole	dead	<i>E. coli</i>
22	Kobayashi et al. [21]	2009	75	F	fever, disturbance of cons., convulsion, hemiparesis, aphasia	burr hole ×2, craniotomy	good	<i>E. coli</i>
23	Hayakawa et al. [22]	2010	65	M	fever, headache, monoparesis	burr hole	good	<i>Salmonella enterica</i> serovar Typhimurium
24	Iimura et al. [23]	2010	6 m	M	fever, convulsion	burr hole	excellent	<i>E. coli</i>
25	Kagami et al. [24]	2011	68	F	headache	burr hole	dead	<i>S. pneumoniae</i>
26	Dost et al. [25]	2012	86	M	fever, diarrhea, disturbance of cons.	burr hole ×2	good	<i>C. fetus</i>
27	Fujii et al. [26]	2013	76	M	fever, headache, disturbance of cons., hemiparesis	burr hole, craniotomy	excellent	MRSA
28	Present case	2014	63	M	dizziness	burr hole ×3, embolization of MMA, craniotomy ×2	excellent	<i>P. acnes</i>

cons. = Consciousness; MSSA = methicillin-sensitive *Staphylococcus aureus*; m = months;

Fig. 1. Plain CT scans on admission demonstrate that a hypodense crescentic fluid collection enlarged and extended over the surface of the left cerebral hemisphere. The fluid cavity was loculated, suggesting repeated hemorrhage in the subdural space. The midline structures of the brain were shifted to the right side.

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Fig. 2. Plain CT scans show the recurrence of the left chronic subdural hematoma 1 month after the first burr hole surgery (**a**) and 1 week after the second burr hole surgery (**b**).

Fig. 3. **a** Plain CT scans demonstrate the recurrence of the left infected subdural hematoma 1 month after the embolization of the MMA. Note the low-density area in the left frontal lobe adjacent to the overlying hematoma. **b** Plain CT scans reveal that the volume of the left infected subdural hematoma increased again during 2 weeks after the third burr hole surgery.

Fig. 4. **a** Plain CT scans demonstrate that the left infected subdural hematoma recurred quickly 3 days after the first craniotomy surgery. **b** Plain CT scans show a complete disappearance of the infected subdural hematoma about 5 months after the second craniotomy surgery. Note the disappearance of the low-density area in the left frontal lobe.