Subdural Empyema Treated by Continuous Irrigation and Drainage Catheter Insertion in a Young Adult Patient with Hemiparesis: A Case Report

Sang Hoon Baek, Seok Keun Choi, Jiwook Ryu, Sung Ho Lee

Department of Neurosurgery, Kyung Hee University College of Medicine, Seoul, Republic of Korea

Corresponding author: **Sung Ho Lee**
Department of Neurosurgery, Kyung Hee University College of Medicine, 26 Kyungheedaero, Dongdaemun-gu, Seoul 02447, Republic of Korea
Tel: +82-2-958-8385
Fax: +82-2-958-8380
E-mail: nslsh@khu.ac.kr

Received: August 9, 2017
Revised: August 30, 2017
Accepted: August 30, 2017

Spontaneous subdural empyema is a rare disease in developed society, especially in adults. A 30-year-old male visited our clinic with alteration of consciousness as the main symptom. On initial computed tomography (CT), subdural hematoma was suspected but after performing craniectomy, the lesion was identified as a subdural empyema. Thus, we inserted and maintained a continuous irrigation and drainage catheter for the short term using broad spectrum antibiotics. The patient underwent another operation to remove the remnant empyema and 3 months of rehabilitation following the second operation, after which he went on to lead a normal life without neurologic deficit.

Key Words: Empyema, subdural; Hematoma, subdural, chronic; Sinusitis; Young adult

INTRODUCTION

Spontaneous subdural empyema is a rare disease in developed societies and is even rarer in adults than in children. The most common cause of spontaneous subdural empyema in adults is paranasal sinusitis caused by *Streptococcus pneumoniae*¹⁰⁾. The treatment for subdural empyema is not yet established, although surgical treatment and antibiotic treatment are common.

We examined the efficacy of continuous irrigation and drainage catheter insertion through the following case.

CASE REPORT

A 30-year-old male was brought to our hospital by ambulance in stupor. He had experienced fatigue and paralysis of his right side for a couple of days. A day prior to visiting our hospital, the patient's consciousness had then deteriorated into stupor and was unable to communicate. However, the patient's parents delayed their visit to the hospital for more than 24 hr because they thought the patient would recover. The patient had a history of schizophrenia and had undergone several surgeries for sinusitis. When the patient arrived at the emergency room, his consciousness was in a state of stupor, both pupil reflexes were sluggish with 3 mm diameters, and right side paralysis was Grade I. Body temperature was 39.4°C and blood pressure was 120/80 mmHg. Heart rate was 110 beats/min and respiration

rate was 12 breaths/min. Laboratory findings showed C-reactive protein (CRP) 23.33 mg/dL, white blood cell 15,440/ μ L (Segment neutrophil 85.7%), erythrocyte sedimentation rate (ESR) 95 mm/hr, activated partial thromboplastin time 37.8 sec, prothrombin time (PT) 15.3 sec, and international normalized ratio 1.21.

In computed tomography (CT) scans (Fig. 1), a fluid-fluid layer with heterogeneous density was seen in the subdural space of left cerebral convexity and pneumocephalus around

Fig. 1. Initial computed tomography (CT) scan. Fluid collection (iso to hyperdense to cerebrospinal fluid) is observed in the left frontoparietal lobe convexity area. Enhanced brain CT axial view.

the falx. However, we have only diagnosed the chronic subdural hematoma and subacute subdural hematoma with neglect of this pneumocephalus.

We concluded that it would be difficult to treat this patient with burr hole (BH) trephination because of his diagnosis of chronic subdural hematoma and subacute subdural hematoma, therefore a craniectomy was planned and performed immediately.

However, when we examined the subdural space during the operation, it showed yellowish pus instead of hematoma (Fig. 2). Therefore, we cultured the pus, performed massive irrigation through normal saline, removed the pus, and finished surgery using a continuous irrigation and drainage catheter instead of a Hemovac.

After the operation, the patient was transferred to the intensive care unit (ICU) and the continuous irrigation and drainage catheter maintained for 8 days with midazolam for catheter maintenance.

The infusion rate of continuous irrigation and drainage was maintained at 20 cc/hr on the first day and 10 cc/hr on the second day. We were planning to wean the irrigation by gradually reducing the rate, but the patient began to have seizures as the infusion rate was reduced. We determined that the pus was not cleared well, which caused stimulation of the brain cortex, resulting in seizures, which consequently led us to increase the infusion rate to 30 cc/hr. Until the culture results from the operation were confirmed, we used third-generation cephalosporin and metronidazole as empirical antibiotics. Five days after the culture, *Streptococcus anginosus* was identified and metronidazole was replaced with vancomycin after confirming susceptibility test results.

On post-operative day (POD) 10, endoscopic sinus surgery was performed to treat chronic sinusitis, which was considered the likely cause of the subdural empyema. A culture test was also performed during this surgery and *Streptococcus anginosus* was identified.

On POD 14, a follow-up CT confirmed that the pus around

Fig. 2. Intraoperative finding. In the subdural space, a large amount of yellowish pus was found.

the falx had reappeared, and a second operation was performed. A BH was drilled in the frontal area, and an additional craniotomy was performed in the occipital area for irrigation and removal of pus. A continuous irrigation and drainage catheter was attempted once again, but the space was very narrow and adhesion was severe, thus, only simple irrigation was performed and the operation completed.

The patient's consciousness and paralysis slowly recovered the day after the second operation. His right side paralysis had improved from Grade I to III on POD 7.

The pus was mostly absent from the follow-up CT obtained on POD 14 of the second operation. The patient continued to receive rehabilitation treatment and was re-admitted for cranioplasty two months later. The patient's consciousness was restored to an alert state and the right side paralysis also recovered.

Cranioplasty was performed using a titanium mesh as autologous bones could not be used due to infection. About three months later, his consciousness and paralysis had been fully recovered.

DISCUSSION

Subdural empyema is a rare disease⁶. Subdural empyema can be found in all ages, but it is found more commonly in men, and the causes are different in each age group. Subdural empyema occurs in infants and children as a complication of bacterial meningitis. Paranasal sinus disease and otitis media are common causes in adolescents and adults^{1,7,10}.

Iatrogenic procedures (craniotomy, subdural hematoma drainage), penetrating head trauma, and seeding from distant infection sites (endocarditis, sinusitis) can also cause subdural empyema^{6,7,10}. *Streptococcus anginosus* is found in many parts of the human body and can cause chronic pansinusitis. In our case, *Streptococcus anginosus* was identified in the first bacterial culture test for the first operation, and then both *Streptococcus anginosus* and *Staphylococcus haemolyticus* were identified in the bacterial cultures performed during otopharyngeal surgery. In general, aerobic and anaerobic *Streptococci* are the most common organisms causing subdural empyema^{2,4,7,10} as in our case in which *Streptococcus anginosus* was cultured. *Streptococci* often cause sinusitis. The patients had undergone several sinusitis surgeries. We concluded that pansinusitis was the cause of subdural empyema in our patient, because the same bacteria were identified in culture results of neurosurgery and otolaryngology surgery (Fig. 3).

Subdural empyema is very dangerous because neurological symptoms can progress rapidly with a mortality rate of 2% to 12%^{5,7,9}. However, treatment of subdural empyema remains controversial^{6,10}. It is common to combine antibiotic therapy with surgical treatment. For antibiotic treatment, broad-spectrum antibiotics (third-generation cephalosporin, vancomycin, and metronidazole) are used^{1,10} and the general duration of treat-

ment is 3 to 4 weeks²). However, subdural empyema is difficult to treat with antibiotic treatment alone because it is difficult for antibiotics to enter the subdural space. In most cases, surgical treatment is necessary. There is no established treatment when it comes to surgical treatment, but simple drainage of pus through a craniotomy or craniectomy is commonly used⁸). The continuous irrigation and drainage that we performed is helpful for the rapid and continuous removal of pus, especially when the pus is adhesive³). Continuous irrigation and drainage has the advantage that it can clean the areas that simple irrigation is unable to reach. In our case, the pus was well controlled while maintaining the continuous irrigation and drainage catheter. Although a second operation was performed due to a focal recurrence of pus, there wasn't further recurrence afterwards. The results of our patient treated with this method were very satisfactory with good recovery.

Because subdural empyema is very rare, it is important to

Fig. 3. Paranasal sinuses computed tomography scan, coronal view. Fluid in the maxillary sinus (arrows) — this fluid collection was read as pansinusitis by radiologist.

Fig. 4. Pneumocephalus (arrow) around the falx on initial computed tomography.

suspect and differentiate it from subdural hematoma. We initially diagnosed the lesion as a subdural hematoma because thorough patient evaluation was difficult at the time of the initial diagnosis as the patient was in an emergency situation, and we believe that neglecting the pneumocephalus that was found in the first CT is the cause of misdiagnosis (Fig. 4). Magnetic resonance imaging (MRI) would have been helpful if we had had suspicions of subdural empyema and had planned to perform additional tests.

CONCLUSION

As the incidence of subdural empyema is very low, it is important to suspect subdural empyema to avoid a misdiagnosis. If subdural empyema is suspected, MRI and laboratory findings (CRP, ESR, etc.) would be helpful. After diagnosis, antibiotic treatment and surgical treatment should be combined for effective treatment. We performed short-term continuous irrigation and drainage catheter insertion and systemic antibiotic treatment satisfactory results. If a patient is confirmed to have subdural empyema, we believe short-term continuous irrigation and drainage catheter insertion and systemic antibiotic treatment may be helpful.

CONFLICTS OF INTEREST

No potential conflict of interest relevant to this article was reported.

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