Fulminant Subdural Empyema Treated With a Wide Decompressive Craniectomy and Continuous Irrigation

—Case Report—

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Abstract

A 56-year-old male presented with fulminant subdural empyema manifesting as rhinorrhea, periorbital cellulitis, fever, convulsions, and consciousness disturbance. Neuroimaging showed pansinusitis with skull destruction and extensive subdural empyema. Decompressive craniectomy, irrigation of the empyema, and subdural drainage were performed. Endoscopic sinus surgery was performed to remove the source of infection at the same time. Streptococcus milleri was cultured from the pus. Continuous irrigation of the subdural space with saline containing gentamicin for 7 days resulted in prompt elimination of pus and debris. The patient was discharged with only a slight neurological deficit.

Key words: subdural empyema, continuous irrigation, decompressive craniectomy, pansinusitis

Introduction

Subdural empyema accounts for 15% to 25% of focal intracranial infections. Delay in diagnosis and surgical intervention might result in a fatal outcome. The most important factors correlated with favorable outcomes are early aggressive removal of the source of infection, drainage of pus, and appropriate antibiotic administration. We describe a case of fulminate subdural empyema treated with decompressive craniectomy. Continuous subdural irrigation in addition to simple drainage was useful to resolve the inflammation, resulting in a favorable outcome.

Case Report

A 56-year-old male was admitted to our hospital with generalized seizure. He had had rhinorrhea 3 months earlier. His left periorbital region had begun to swell 4 weeks earlier and became consistently larger until admission. He became febrile 2 days earlier and began to have speech disturbances the day before admission. He was treated with oral antibiotics under a diagnosis of blepharitis at a nearby hospital.

On admission to our hospital he was comatose in Glasgow Coma Scale score 5. His pupils were anisocoric (right < left) and his left eyelid was edematous. Although he was afebrile at that time, laboratory findings showed signs of marked systemic inflammation. Three-dimensional computed tomography revealed panparanasal sinusitis that had destroyed the anterior and posterior walls of the frontal sinus (Fig. 1). T1-weighted magnetic resonance imaging with gadolinium demonstrated meningeal enhancement in the left hemisphere in addition to a hypointense subdural fluid collection in the left frontotemporal and interhemispheric subdural spaces, moderate brain swelling in the left hemisphere, and sinusitis (Fig. 2). He was initially treated with intravenous antibiotics [ampicillin sodium·cloxacillin sodium [Vicillin; Meiji Seika, Tokyo] 4 g/day, ceftriaxone sodium 2 g/day] and anticonvulsants (phenytoin 250 mg/day), but this protocol did not improve his condition.

Surgery was performed 2 days after admission. Evacuation of pus and removal of infected frontal
bone were performed through a wide decompressive craniectomy in the bilateral frontal and left temporoparietal regions. Simultaneously, endoscopic surgery for pansinusitis was conducted. There was no dural laceration. The subdural empyema was not associated with capsule formation and was tightly adherent to the arachnoid membrane. After irrigation of the subdural space with saline containing 1 mg/50 ml of gentamicin, six drainage tubes were placed over the left convexity area for postoperative irrigation. In addition to continued treatment with intravenous antibiotics and anticonvulsants, continuous subdural irrigation was performed for 7 days via the drainage tubes with saline containing 1 mg/50 ml of gentamicin. Three tubes were used as the inlets and the other three tubes as the outlets. The flow rate was regulated at 10 ml/hr using infusion pumps. These procedures resulted in the prompt elimination of pus and debris. *Streptococcus milleri* was cultured from the pus. This bacterium was sensitive to all antibiotics. Several cultures from the outflow fluid were sterile.

His brain swelling and signs of systemic inflammation improved quickly, but the meningeal enhancement in the left hemisphere still persisted (Fig. 3). He became alert on the 12th postoperative day. Postoperative electroencephalography showed predominant slow waves with rare alpha waves in the left hemisphere. Oral anticonvulsants were continued although there was no epileptic discharge. He was discharged with a slight speech disturbance 59 days after admission.

**Discussion**

In the present case, continuous subdural irrigation was a useful adjunct in the achievement of the favorable outcome. Usually, nonsurgical management of subdural empyema has only been successful if the fluid collection is small or if the patient is neurologically stable and alert, and rapidly improves with only antibiotic treatment.\(^4,5\) However, under other conditions, subdural empyema could be a neurological emergency. The choice of burr hole surgery or craniotomy for surgical intervention remains controversial. Our case was characterized by extremely extensive empyema involving the interhemispheric cistern, so that the efficacy of burr hole surgery was limited, broad destruction of the skull caused by the infection in the frontal sinus, and severe brain swelling. Therefore, we performed decompressive craniectomy.

Subdural drainage is common for the treatment of subdural empyema after either burr hole surgery or craniotomy.
craniotomy. We performed continuous irrigation, since we suspected that the empyema could not be removed completely because of the extensive involvement, including the interhemispheric subdural space, and the viscous character found at surgery. Continuous irrigation is useful for the rapid elimination of pus and constant administration of antibiotics, resulting in early cessation of inflammation, especially when the inflammatory pus is adhesive. However, continuous irrigation is only indicated for subdural empyema associated with capsule formation.6) In the present case, there was no communication between subdural and subarachnoid spaces despite the absence of capsule formation. Therefore, we considered that continuous irrigation could be performed safely and there were no complications in our case. Continuous irrigation was continued for 7 days until the outflow fluid from drainage became clear and empyema disappeared on neuroimaging.

Continuous irrigation is a relatively safe method even if the empyema does not have an outer membrane. High intracerebral pressure secondary to drainage obstruction may occur, so the outflow rate must be monitored closely. A safety valve system has been used to prevent high intracerebral pressure.6) However, careful observation and setting of the drainage tubes through an appropriate craniotomy is required.

References

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