

# Parafalcine Subdural Empyema in a Woman with Recurrent Acute Otitis Media

Chang-Han Lo<sup>1</sup>, Chun-Chieh Lin<sup>2</sup>, Yuan-Hao Chen<sup>3</sup>, Giia Sheun Peng<sup>2</sup> and Yueh-Feng Sung<sup>2\*</sup>

<sup>1</sup>Department of Internal Medicine, Tri-Service General Hospital, National Defense Medical Center, Taipei, Taiwan, R.O.C.

<sup>2</sup>Department of Neurology, Tri-Service General Hospital, National Defense Medical Center, Taipei, Taiwan, R.O.C.

<sup>3</sup>Department of Neurological Surgery, Tri-Service General Hospital, National Defense Medical Center, Taipei, Taiwan, R.O.C.

## Abstract

Subdural empyema (SDE) most frequently arises as a complication of paranasal sinusitis and is a serious intracranial infection. Parafalcine SDE, resulting from acute otitis media, is a rare phenomenon. Here, we report the case of 57 year old woman, with a history of nasopharyngeal carcinoma (NPC) with radiotherapy, 28 years ago and recent diagnosis of recurrent acute otitis media, who was admitted to the emergency department with a 2 days history of progressive right-sided limb weakness. Neurological examination revealed right-sided hemiparesis without meningeal signs. Non-enhanced computed tomography (CT) scans of the brain revealed a hypodense lesion in the left parafalcine region. Gadolinium-enhanced magnetic resonance imaging demonstrated layers of rim-enhancing subdural fluid collection and swelling of the surrounding brain, suggestive of empyema. The patient underwent surgical evacuation of empyema and was treated with intravenous antibiotics for 6 weeks. The patient recovered well without neurological deficits. Follow-up brain CT 6 weeks later showed complete resolution of previous lesions. Acute otitis media complicated by SDE is a rare clinical phenomenon that carries a high mortality rate. The complication risk may be higher in NPC patients following radiotherapy. Early diagnosis of SDE and prompt surgical evacuation of purulent material can result in a full recovery.

**Keywords:** Subdural empyema; Parafalcine; Otitis media; Magnetic resonance imaging

## Introduction

Intracranial complications from acute or chronic otitis media have become less frequent since the advent and development of modern antibiotics. However, they still represent a challenge for early recognition and adequate treatment. Intracranial subdural empyema (SDE), an accumulation of purulent material in the space between the cranial dura mater and arachnoid mater, is an uncommon but serious intracranial infection. It is most frequently a complication of sinusitis or, less frequently, otitis media, mastoiditis or neurosurgical intervention [1,2]. Purulent material can accumulate anywhere within the subdural space, with the cerebral convexity being the most common location [3]. SDE of the parafalcine region is rarely seen [4]. Here, we report the case of a 57 year old woman, with recurrent acute otitis media complicated by parafalcine SDE.

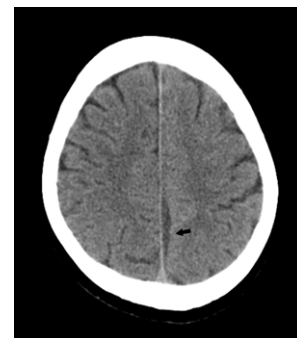
## Case Report

A 57 year old female presented to the emergency room with a 2 day history of progressive right-sided limb weakness. The patient had a history of nasopharyngeal carcinoma (NPC) with radiotherapy, 28 years ago, and a 1 year history of hypothyroidism (treated with levothyroxine) and carotid artery stenosis. Three weeks before being admitted to hospital, she was diagnosed with acute otitis media at a local clinic. Although otalgia improved after oral antibiotic therapy, a fever and headache developed a few days later. She was admitted to hospital and symptoms of fever and headache were resolved after a 1 week course of intravenous antibiotic therapy.

On arrival, vital signs were as follows: temperature, 37.5°C; pulse rate, 88 beats/min; respiration rate, 17 breaths/min; and blood pressure, 163/82 mmHg. Physical examinations showed swelling of the eardrum with fluid accumulation in the left middle ear. Neurological examinations revealed right-sided limb weakness, with the lower extremity more severely affected (upper limb 4/5 and lower limb 2/5, MRC grade), without neck rigidity, Kernig's, or Brudzinski's signs. Laboratory evaluations revealed a white blood cell count of 7670/

μL with neutrophils at 73.5%, C-reactive protein at 3.18 mg/dL, and an erythrocyte sedimentation rate of 90 mm/hr. A non-enhanced computed tomography (CT) scan of the brain showed a small hypodense lesion in the left parafalcine region (Figure 1). Gadolinium-enhanced magnetic resonance imaging (MRI) demonstrated layers of rim-enhancing subdural fluid collection (Figure 2A and 2B). The fluid collection exhibited high signal intensity on diffusion-weighted imaging with corresponding mildly decreased apparent diffusion coefficient values (Figure 2C and 2D), suggestive of reduced water diffusion. Imaging findings were indicative of parafalcine SDE.

The patient underwent craniotomy and evacuation of the



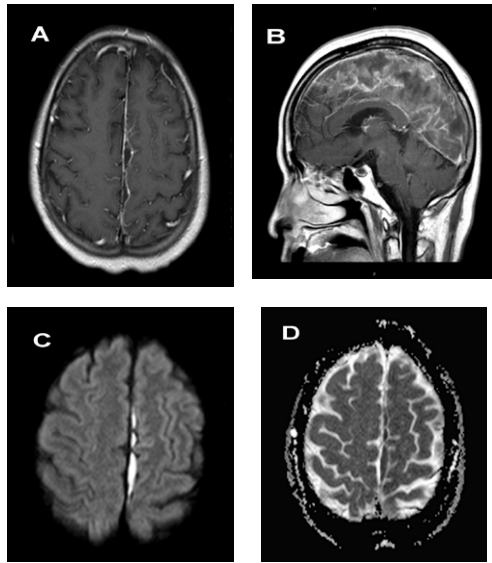
**Figure 1:** Brain CT scan shows a hypodense lesion in the left parafalcine region (black arrow).

\*Corresponding author: Yueh-Feng Sung, Address: No. 325, Section 2, Cheng-Gong Road, Neihu 114, Taipei, Taiwan, R.O.C., Tel: +886 2 87923311-16875; Fax: +886 2 87927174; E-mail: [sungyf@ndmctsgh.edu.tw](mailto:sungyf@ndmctsgh.edu.tw)

Received June 25, 2014; Accepted August 22, 2014; Published August 25, 2014

**Citation:** Lo CH, Lin CC, Chen YH, Peng GS, Sung YF (2014) Parafalcine Subdural Empyema in a Woman with Recurrent Acute Otitis Media. J Clin Case Rep 4: 399. doi:10.4172/2165-7920.1000399

**Copyright:** © 2014 Lo CH, et al. This is an open-access article distributed under the terms of the Creative Commons Attribution License, which permits unrestricted use, distribution, and reproduction in any medium, provided the original author and source are credited.



**Figure 2:** MRI images of the patient. A: Axial contrast-enhanced T2-weighted image shows layers of rim-enhancing subdural fluid collection. B: Sagittal contrast-enhanced MRI showing empyema extending along the entire length of the falx. C and D: Axial diffusion-weighted image and apparent diffusion coefficient map show reduced water diffusion in the SDE.



**Figure 3:** Brain CT shows complete resolution of the previous hypodense lesion.

parafalcine pus, followed by intravenous infusion of antibiotics (ceftriaxone 2 gm q12 h and linezolid 600 mg q12 h) for 6 weeks. No pathogens were identified in the purulent material culture. Antiepileptics were prescribed for seizure prevention. Weakness of the right limbs gradually improved over 2 weeks after surgery. Follow-up CT scans performed 6 weeks later showed complete resolution of the previous lesions (Figure 3).

## Discussion

SDE resulting from acute otitis media is a rare occurrence. A retrospective study conducted by Penido et al.[5] analyzed 33 patients with intracranial infections resulting from otitis media. Of the 56 complications in total, the majority of cases were either brain abscess (26 cases) or meningitis (21 cases). Only two cases of SDE were reported [5]. In their study, intracranial infections were almost exclusively located in the temporal lobe and cerebellum, which can be ascribed to the direct extension of infection through bone erosion.

Indirect spread, by retrograde thrombophlebitis involving valveless venous systems, which communicate with the dura [3], can explain the parafalcine location of empyema in the present study.

Causative pathogens are often polymicrobial. The most common organisms found in intracranial SDE are anaerobic and microaerophilic streptococci [1]. In studies examining intracranial complications arising from otitis media, proteus mirabilis is the most commonly cultured bacterium [5]. However, as per our patient, sterile cultures are not uncommon [3-5]. In addition to virulence and type of microorganism, factors influencing the spread of infection may also include host resistance. In our patient, a defective CNS barrier owing to previous radiotherapy for NPC may have given the microorganism(s) easy access to the intracranial space. This hypothesis is supported by one study that found a high concurrence of bacterial brain abscess and chronic otitis media in NPC patients following radiotherapy [6].

The major clinical symptoms of SDE include fever, headache, vomiting, neck stiffness, hemiparesis, and focal seizures [3,4] which are related to increased intracranial pressure, meningeal irritation, and cerebritis. Diagnosis of SDE, however, may not be as clear because of the absence of focal signs in the initial stage of disease. Moreover, systemic symptoms can be masked by previous antibiotic therapy for otitis media. Diagnosis of SDE is typically performed using brain imaging. Previous studies highlight the need for contrast-enhanced CT scans for improved diagnosis of intracranial infections. However, computed tomography may not be as sensitive as MRI for diagnosis of SDE [7,8]. One study highlights the advantage of diffusion MR imaging for distinguishing SDE from effusion and in follow-up examinations of subdural collections [9].

Pharmaceutical treatment alone is not sufficient for treatment of SDE. Craniotomy can provide for the complete evacuation of purulent material, and more importantly, release the compression of the underlying cerebral hemisphere [10]. In cases of chronic otitis media, evacuation of the primary infectious focus before or concomitantly with neurosurgical intervention is also recommended [5].

## Conclusion

Acute otitis media complicated by SDE is a rare clinical phenomenon that carries a high mortality rate. The complication risk may be higher in NPC patients following radiotherapy. Early diagnosis and management, including urgent evacuation of the empyema collection and appropriate antibiotic therapy, can lead to a full recovery and positive clinical outcome.

## References

1. Greenlee JE (2003) Subdural Empyema. *Curr Treat Options Neurol* 5: 13-22.
2. Osborn MK, Steinberg JP (2007) Subdural empyema and other suppurative complications of paranasal sinusitis. *Lancet Infect Dis* 7: 62-67.
3. Nathoo N, Nadvi SS, van Dellen JR, Gouws E (1999) Intracranial subdural empyemas in the era of computed tomography: a review of 699 cases. *Neurosurgery* 44: 529-535.
4. Salunke PS, Malik V, Kovai P, Mukherjee KK (2011) Falcotentorial subdural empyema: analysis of 10 cases. *Acta Neurochir (Wien)* 153: 164-169.
5. Penido Nde O, Borin A, Iha LC, Suguri VM, Onishi E, et al. (2005) Intracranial complications of otitis media: 15 years of experience in 33 patients. *Otolaryngol Head Neck Surg* 132: 37-42.
6. Fang PH, Lin WC, Tsai NW, Chang WN, Huang CR, et al. (2012) Bacterial brain abscess in patients with nasopharyngeal carcinoma following radiotherapy: microbiology, clinical features and therapeutic outcomes. *BMC Infect Dis* 12: 204.

7. Viola S, Montoya G, Arnold J (2009) Streptococcus pyogenes subdural empyema not detected by computed tomography. *Int J Infect Dis* 13: e15-17.
8. Younis RT, Anand VK, Davidson B (2002) The role of computed tomography and magnetic resonance imaging in patients with sinusitis with complications. *Laryngoscope* 112: 224-229.
9. Wong AM, Zimmerman RA, Simon EM, Pollock AN, Bilaniuk LT (2004) Diffusion-weighted MR imaging of subdural empyemas in children. *AJNR Am J Neuroradiol* 25: 1016-1021.
10. Nathoo N, Nadvi SS, Gouws E, van Dellen JR (2001) Craniotomy improves outcomes for cranial subdural empyemas: computed tomography-era experience with 699 patients. *Neurosurgery* 49: 872-877.