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Fatal Central Nerve System Infection After Acupuncture Through the Extra-Axial Space of the Cervicomedullary Junction

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Abstract

A previously healthy 55-year-old woman complained of headache, vomiting, and become drowsy after acupuncture (C1 to C5) due to left neck pain. Examination showed sluggish light reflex, pupil dilatation, and neck stiffness. Brain CT and MRI confirm ed procedure-related multiple air-bubbles at the cervicomedullary junction. Spinal MRI revealed leptomeningeal enhancement with abscess formation. The CSF biochemical profiling was identified to be *Slackia exigua*; gram-positive and anaerobic bacillus. It suggests that direct inoculation of *Slackia exigua* had occurred during acupuncture. She became comatose. Performing acupuncture without adequate and aseptic controls may cause grave CNS infection.

Keywords: *Slackia exigua*; Acupuncture; Leptomeningeal enhancement; Cervicomedullary junction; Meningoencephalitis; Ventriculitis

Introduction

Meningoencephalitis with ventriculitis is a rare infection of the Central Nervous System (CNS) involving infection of the ventricular drainage system [1]. It is a fatal life-threatening infection with high morbidity and mortality range from 30 to 70%. Therefore, early diagnosis and treatment are essential for patient outcomes [1]. Ventriculitis is the secondary manifestation following meningitis, meningoencephalitis, brain abscess, or iatrogenesis. Invasive procedures, such as brain surgery or spinal surgery have been reported as probable causes of ventriculitis [2]. Staphylococci belong to skin flora is the major bacterial pathogen [3], and other strains have also been reported.

Slackia exigua infection has emerged as a rare complication after a neurosurgical procedure. It was mainly with wound infection or periodontal infection [4]. To improve musculoskeletal pain, acupuncture is widely and frequently performed in East Asia including in Korea [5]. Herein, we report a case of fatal CNS infection caused by *Slackia exigua* after acupuncture through the extra-axial space of the cervicomedullary junction.

Case Presentation

A previously healthy 55-year-old woman was admitted to a tertiary hospital with irritability and a decreased consciousness. She was denied any history of trauma, infection, or exposure to toxins including smoking, alcohol, or drugs. On the day of admission, the patient had undergone acupuncture due to a history of left neck pain. She had received acupuncture on her neck from C1 to C5, complained of severe headache and vomiting, and become drowsy. At admission, the patient's body temperature was 37.7 °C.

On physical examination, local inflammation and swelling were observed in the neck area. Neurological examination revealed drowsiness and a sluggish pupillary reflex to light, bilateral pupil dilatation, and neck stiffness. Analysis of the patient's cerebrospinal fluid revealed elevated protein level (307.4 mg/dL), a leukocyte count of 800/mm3 (89% neutrophils), and low glucose concentration (25 mg/dL). Brain computed tomography on admission showed multiple air-bubbles at the cervicomedullary junction and diffuse dilatation of whole ventricles with fluid accumulation (Figure 1A). Brain Magnetic Resonance Imaging (MRI) showed dilatation of whole ventricles, indicating hydrocephalus, and also showed diffuse high signal intensity in the cisternal space with swelling of the brain parenchyma and subtle leptomeningeal enhancement (Figure 1B).

Assessment of cultures showed anaerobic colonies of gram-positive bacilli and biochemical profiling identified the bacterial colony to be *Slackia exigua*. Initial treatment involved a controlled CNS dose of empirical antibiotic therapy including intravenous cefepime, vancomycin, and ampicillin, and dexamethasone (4 mg) every 6 hours. After the results of biochemical profiling of cultures were obtained, the antibiotic treatment was changed to intravenous cefepime and metronidazole. During treatment, spinal MRI revealed prominent leptomeningeal thickening with enhancement along the whole spine, and intramuscular edematous swelling with air density and abscess formation in the neck (Figure 2). Meningoencephalitis with ventriculitis was treated additional using an external ventricular drain; however, the patient became comatose due to diffuse cerebral swelling and relied on mechanical ventilation.

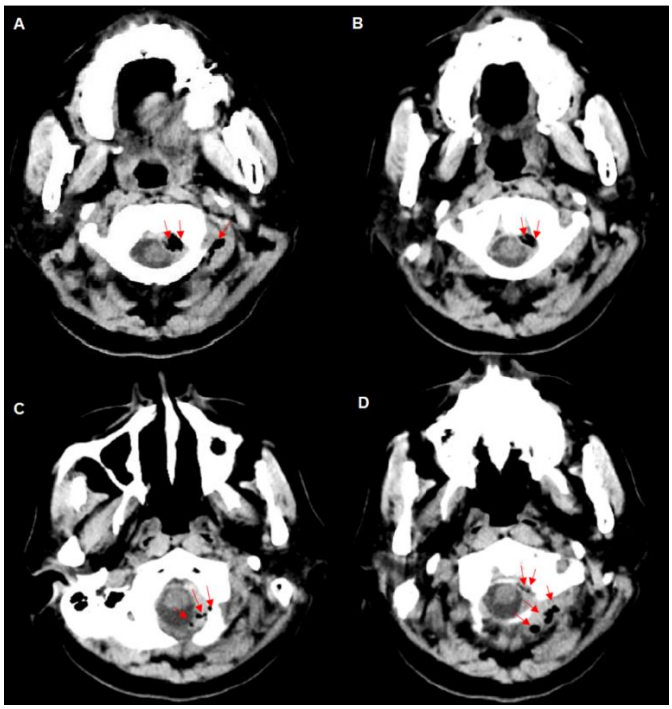

Figure 1: Brain computed tomography and brain magnetic resonance image; **(A):** Non-contrast enhanced brain computed tomography illustrated multiple air-bubbles (black and white arrow) with engorged venous structure (white arrow) in cervicomedullary junction level; **(B):** T2-fluid attenuated inversion recovery image showed diffuse high signal intensity in cisternal space of both cerebral hemispheres (yellow arrow) with diffuse swelling of brain parenchyma (white arrows) and ventricular enlargement with fluid debris levels in both occipital horns (red arrows).

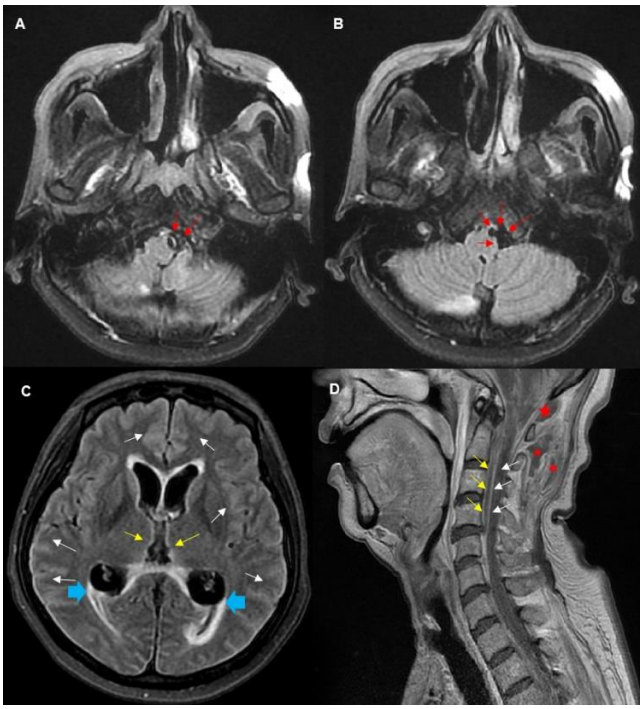

Figure 2: Spine magnetic resonance image; Spine magnetic resonance image (T1 enhanced) showed prominent leptomeningeal thickening with enhancement along the whole spine (white arrows), and anterior epidural plegmon formation along the C2 to T3 level with air signal intensity (yellow arrows). In addition, spine magnetic resonance image shows intermuscular edematous change with enhancement of posterior paraspinal muscle along with occiput to T1, and suboccipital abscess formation (red stars).

Discussion

To our knowledge, this is the first reported case of meningoencephalitis with ventriculitis caused by *Slackia exigua* following acupuncture of the meninges of the cervicomedullary junction.

Given that neurological symptoms occurred directly after the patient underwent acupuncture on the neck, it is reasonable to suggest that direct inoculation of *Slackia exigua* had occurred during acupuncture, thus causing meningoencephalitis with ventriculitis; the absence of systemic leukocytosis in the laboratory test and no growth of bacterial in the blood culture also suggest that direct inoculation of *Slackia exigua* during acupuncture may be the cause of CNS infection. The causative organism, *Slackia exigua*, has not been previously reported as a cause of CNS infection. Previous studies have known that *Slackia exigua* was gram-positive and anaerobic bacillus from various types of wound infection, especially periodontal infection [4]. In addition, *Slackia exigua* is associated with poor dental health and underlying conditions, including injection drug use, malignancy,

alcoholism, neurological deficit, hypertension, and unclear leukocytopenia, and diabetes mellitus. *Slackia exigua* is also an uncommon and life-threatening infection. The etiology and incidence of *Slackia exigua* is not well understood and there have been few reported cases [6]. Thus, it is reasonably assumed that insufficient aseptic technique during acupuncture may have inoculated into the CSF proven in brain and spine image [7].

Acupuncture is a procedure involving stimulation of anatomical regions including the paravertebral area, muscle fascia, and ligament by the various size of needles and techniques [8]. It incorporates medical traditions from China, Japan, Korea, and other East Asia countries [9]. Occasionally, acupuncture is performed by unqualified and unskilled practitioners, without adequate disinfection of the patient's skin, and without the adequate sterilization of needles used for this procedure. In these circumstances, complications from acupuncture may occur including infective endocarditis, pneumothorax, systemic bacteremia, spinal cord injury, and local cellulitis [8]. Therefore, performing acupuncture without adequate training and aseptic controls may cause grave central nervous system infection due to the direct inoculation of bacteria.

Conclusion

In this case, the patient may have received the acupuncture without proper aseptic preparation. Our case demonstrates that meningoencephalitis with ventriculitis caused by *Slackia exigua* could associate the acupuncture due to the direct inoculation of bacteria. To prevent grave infections following acupuncture, and aseptic technique should be implemented during the procedure.

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