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Case report

Central nervous system infection caused by vancomycin-intermediate *Staphylococcus aureus* (SCC*mec* type IV, ST8)

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ABSTRACT

A 77-year-old Japanese man with a history of surgical treatment of chronic subdural hemorrhage was hospitalized for drainage of a subdural abscess and brain abscess in the right occipital area. Pus obtained from both the subdural abscess and brain abscess grew vancomycin-intermediate *Staphylococcus aureus* (VISA) (minimum inhibitory concentration = 4 μg/mL), which was confirmed by population analysis. The SCC*mec* type and sequence type were subsequently identified as IV and ST8, respectively. The VISA strains were both sensitive to levofloxacin, clindamycin, minocycline, and linezolid. The patient was successfully treated with linezolid and discharged on day 51 after admission. We herein describe the first reported case of a brain abscess and subdural abscess caused by VISA in Japan.

1. Introduction

Staphylococcus aureus is the most frequent causative pathogen of surgical site infections [1]. In Japan, methicillin-resistant *S. aureus* (MRSA) is more prevalent than methicillin-susceptible *S. aureus* [2], and most strains are multidrug-resistant [3]. This prevalence has caused clinicians to frequently use anti-MRSA agents, mainly vancomycin.

Reduced susceptibility of *S. aureus* strains to vancomycin was reported before the clinical use of vancomycin [4]. The prevalence of these resistant strains has been increasing according to a recent report, possibly due to the increase in vancomycin use [5]. Vancomycin-intermediate *S. aureus* (VISA) is currently recognized as a causative infectious pathogen in the United States [6]. On the other hand, VISA has rarely been isolated in Japan. Hiramatsu [7] described the first VISA surgical site infection, but there have been no case reports of central nervous system VISA infection in Japan.

We herein report a case of brain abscess and subdural abscess formation caused by VISA, subsequently identified as SCC*mec* type IV and sequence type 8 (ST8).

2. Case report

A 77-year-old Japanese man visited our emergency department because of a decreased consciousness level and vomiting. According to his sister, his activities of daily living had decreased for the last couple of weeks, and he recently experienced difficulty walking and eating. He had a long-term history of hypertension, diabetes mellitus, and compensated liver cirrhosis. He also had undergone multiple administrations of anti-MRSA antimicrobial agents including vancomycin (3 weeks) and linezolid (2 weeks) for an MRSA subdural abscess after an operation for chronic subdural hemorrhage 2 years previously. Kirby–Bauer disk diffusion revealed antimicrobial susceptibility of the previous MRSA strains to levofloxacin (≥19 mm), minocycline (≥19 mm), and vancomycin

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(≥15 mm). After treatment, the subdural abscess (Fig. 1a) was found to be encapsulated without a systemic inflammatory response, and minocycline was prescribed for about 2 years. He was self-supported until 3 months before the current episode. Brain computed tomography did not detect enlargement of the subdural abscess.

Physical examination of the current episode revealed muscle weakness in both legs, but no other neurological deficits. Blood tests revealed a mildly elevated leukocyte count (8800/μL) and elevated serum C-reactive protein level (4.4 mg/dL). Computed tomography showed a newly identified low-density area (maximum diameter, 22 × 17 mm) in the right occipital lobe area (Fig. 1b). The presence of an abscess was considered based on magnetic resonance imaging findings (Fig. 1d–f). The patient was hospitalized in the Department of Neurosurgery for treatment. (day.1) After admission, subdural and brain abscess drainage along with removal of the titanium plate that had been implanted for the subdural hemorrhage operation were performed. The pus (specimen 1) obtained from the subdural abscess was white and solid; it could not be completely removed because it was adhered to the brain cortex. After removal of the titanium plate and subdural abscess, we aspirated the brain abscess with the assistance of head computed tomography. The pus (specimen 2) was a white, highly viscous liquid. Gram staining of both pus specimens (specimens 1 and 2) revealed no organisms, and two sets of blood cultures cultivated no bacteria. Intravenous vancomycin and ampicillin/sulbactam were administered postoperatively, and contact precaution was implemented in a non-private room setting because of the patient's history of MRSA isolation.

The cultures of pus specimens 1 and 2 grew small, yellow-pigmented colonies on a 5% sheep blood agar plate and chocolate agar plate in air supplemented with 5% carbon dioxide after 48 h of incubation at 35 °C; they did not grow adequately after 24 h of incubation. Identification was initially performed by the MicroScan WalkAway-96 using the Pos Combo 3.1J panel (Siemens Healthcare Diagnostics K.K.; Tokyo, Japan). However, the MicroScan could not identify the species, possibly because the strain was a slow-growing type and the biochemical reactions on the panel were therefore unable to react correctly. Because automated identification was unsuccessful, we attempted to confirm the characteristics of the strain as follows: growth, mannitol fermentation (growth), and egg-yolk reaction on 7.5% mannitol salt agar with egg yolk (Eiken Chemical Co., Ltd., Tokyo, Japan); growth on MRSA-selective agar (CHROMagar MRSA; Kanto Chemical Co., Ltd., Tokyo, Japan), coagulase activity using rabbit plasma (Denka Seiken Co., Ltd., Tokyo, Japan), and type III coagulase production (Denka Seiken Co., Ltd., Tokyo, Japan). Based on the results obtained from these tests, we identified the strain as *S. aureus*. Susceptibility testing using the MicroScan WalkAway showed resistance to cefoxitin and oxacillin and susceptibility to macrolides, clindamycin, minocycline, and fluoroquinolones. The minimum inhibitory concentration (MIC) of vancomycin was 4 μg/mL by automation with the prompt method; thus, we re-evaluated the MIC of vancomycin with the standard turbidity method recommended by Siemens using the MicroScan panel and Etest (SYSMEX bioMérieux Co., Ltd. Kobe, Japan). Both MICs after 24 h of incubation were 4 μg/mL by both methods, and we determined these MRSA strains to be VISA on day 10.

The VISA isolation results were immediately relayed to an infection control specialist and infection control nurses on the same day. The patient was transferred to a private isolation room in which an exclusive nurse cared for patients with multidrug-resistant organisms. Active screening for VISA, including nasal

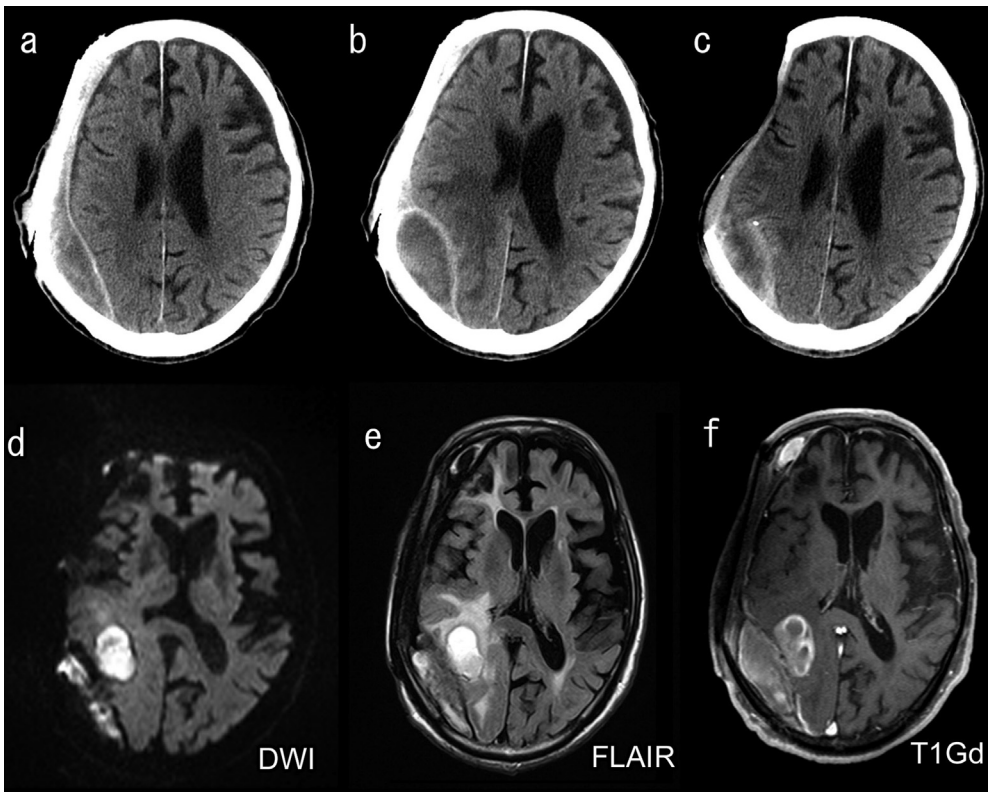

Fig. 1. Clinical images of brain abscess and subdural abscess. Computed tomography (a–c) was performed when the patient was discharged 2 years ago (a), when he was hospitalized for the drainage of a brain abscess and subdural abscess (b), and when he was discharged 51 days after admission (c). Magnetic resonance imaging (d–f) was performed on admission. (d) Diffuse weighted imaging, (e) fluid-attenuated inversion recovery, and (f) gadolinium-enhanced T1-weighted imaging.

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