Nosocomial Meningitis due to *Streptoccus salivarius* Linked to the Oral Flora of an Anesthesiologist

To the Editor—We report a case of nosocomial meningitis due to *Streptococcus salivarius* in a 40-year-old man who received spinal anesthesia in the context of orthopedic surgery. The patient was admitted to the emergency department at the University Hospital of Saint-Étienne with a severe headache, fever (temperature, 38.5°C), and neck stiffness that suggested meningitis. No medical history was found except a recent orthopedic surgical procedure performed 2 days earlier in a neighboring hospital. The cerebrospinal fluid (CSF) drawn by lumbar puncture appeared slightly cloudy with 405 white blood cells/mL, including 70% polynuclear cells. Gram-stain of the CSF revealed gram-positive cocci in pairs and short chains, and culture yielded *S. salivarius*. Blood cultures were negative. No dental infection was observed. The patient was treated for 10 days with amoxicillin (200 mg/kg/day administered intravenously) and recovered without complication.

After the reporting of this nosocomial case to the infection control practitioner, an investigation was initiated in the hospital where the spinal anesthesia was performed. Healthcare workers of the anesthesiology department were asked about hygienic measures taken during the spinal anesthesia. These interviews revealed that the anesthesiologist at the hospital did not systematically wear masks while performing bedside spinal procedures, despite a hospital policy requiring surgical masks.

On a voluntary basis, an oral sample, including a dorsal tongue swab and saliva specimen, was taken from the anesthesiologist who performed the spinal anesthesia, and culture yielded *S. salivarius* colonies. The molecular genotyping of the *S. salivarius* strains isolated from the patient and the anesthesiologist was performed using arbitrarily primed polymerase chain reaction using primers 1 and ERIC2 as described elsewhere, with minor changes.[1] Briefly, bacterial DNA was extracted using Nuclisens Easymag (Biomérieux), and electrophoresis was performed with use of a 2100 Bioanalyser instrument using DNA 7500 kit (Agilent). The genotyping results showed that the strains isolated from the CSF of the patient and from the mouth of the anesthesiologist shared strictly identical patterns (Figure 1), which strongly suggests a common origin of the 2 strains.[1,2]

These results were reported to the anesthesiologist with recommendations about hygienic measures, including the necessity of wearing a surgical mask during spinal-epidural anesthesia. *S. salivarius* is a predominant bacterial species in normal oral flora in humans and has been used as a reliable marker for forensic identification of saliva using DNA amplification techniques.[3] Potential sources of bacterial introduction into the intrathecal space during spinal procedures include intrinsic or extrinsic contamination of needles, syringes, or injected medications; inadequately decontaminated patient skin; inadequately cleaned healthcare provider hands; a contaminated sterile field; and droplet transmission from the healthcare worker's upper airway. *S. salivarius* is the most commonly identified species causing bacterial meningitis after spinal injection procedures because of contamination of the procedure site with saliva. The rapidity of *S. salivarius* growth on entry into the spinal column is evident from the typically rapid onset of meningitis (within 7–24 hours).[4] In 2011, a literature review identified 65 cases of meningitis due to *S. salivarius*, 67% of them being of iatrogenic origin (39 of 58; source not identified in 7 cases).[4] Shewmaker et al[5] reported 2 cases of hospital-acquired meningitis after the women received intrapartum spinal anesthesia. One patient died. Blood and CSF samples from both patients and tongue swab specimens from the anesthesiologist yielded isolates of *S. salivarius* that shared the same genotyping pattern. Rubin et al[6] described 6 cases of meningitis after spinal anesthesia associated with a single anesthesiologist over the course of 5 years in the same hospital setting, which suggested a common source

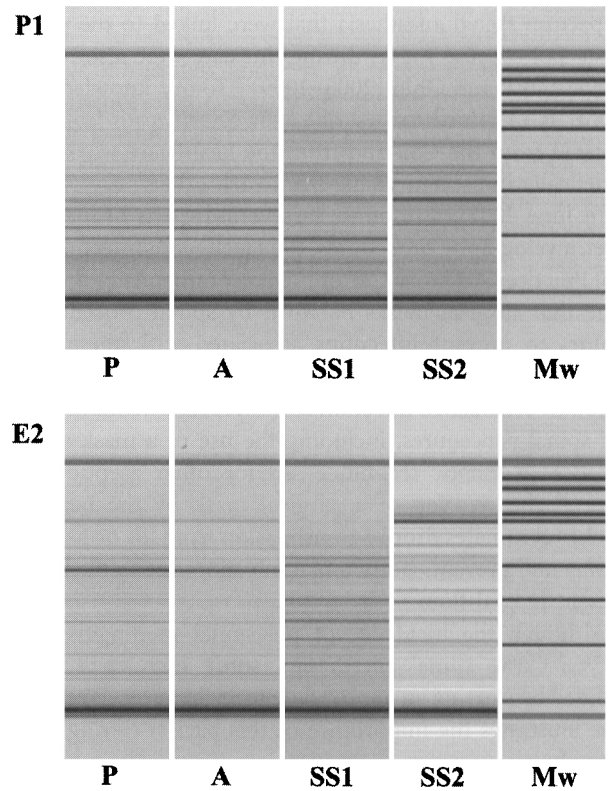

FIGURE 1. Genotyping of *Streptococcus salivarius* isolates from patient (P), anesthesiologist (A), and 2 unrelated epidemiological strains (SS1 and SS2) by arbitrarily primed polymerase chain reaction using primer 1 (P1) and ERIC2 (E2). Mw, molecular weight marker.

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for all of these cases. Cases of bacterial meningitis after intrapartum spinal anesthesia that were linked to the possible misuse of surgical masks during this care were also reported in New York and Ohio (2008–2009).[7] To our knowledge, our report is the third to describe that *S. salivarius* isolates recovered from the CSF and from the healthcare worker were genetically indistinguishable from each other.[5,8]

In June 2007, in response to several reports of meningitis after myelography procedures, the Healthcare Infection Control Practices Advisory Committee recommended for the first time that surgical masks be worn by spinal procedure operators to prevent infections associated with these procedures.[9] The findings of our investigation underscore the need to follow established infection control recommendations during spinal procedures, including the use of a mask and adherence to aseptic technique. As for other aseptic procedures,[10] the wearing of a surgical mask by the healthcare worker eliminates droplet transmission from his or her upper airway and prevents nosocomial infection due to the bacteria present in oral flora.

Although the incidence of postspinal meningitis is low (0.2‰–0.3‰ spinal anesthesia), some such cases can be avoided by wearing an appropriate surgical mask. This clinical case illustrates the importance of this barrier during aseptic procedures.

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