

Clinical Article

Neisseria subflava Septicemia and Meningitis

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Abstract

Neisseria subflava, a gram-negative diplococcus, is a natural inhabitant of the mucus membranes of the upper respiratory tract. We report an unusual case of *N. subflava* septicemia and meningitis in a 20-month-old child. *N. subflava* is recognized on the basis of its colony morphology, pigment production, and by the fermentative patterns of glucose, maltose and sucrose. A review of the literature and discussion is also presented. *Int Pediatr.* 2003;18(2):100-102.

Key words: *Neisseria subflava*, septicemia, meningitis

Introduction

Neisseria subflava, a gram-negative diplococcus, is a natural inhabitant of the mucus membranes of the upper respiratory tract. It is usually considered non-pathogenic; however, it has been reported on occasions to cause serious infections including endocarditis,¹⁻⁵ bacteremia,^{6,7} meningitis,^{6,7} septic arthritis,⁸ endophthalmitis,⁹ and septicemia with petechia.¹⁰ The clinical picture of *N. subflava* infection may resemble that of *N. meningitidis* infection including petechial hemorrhage, purpura, and septic shock.^{6,11} We report an unusual case of *N. subflava* septicemia and meningitis in a 20-month-old child.

Case Report

A 20-month-old white girl with history of prematurity, right hemiplegia and hydrocephalus with ventriculoperitoneal shunt (VPS) was admitted to the hospital with intermittent fever for one week and vomiting for three days. Physical examination revealed

an alert child with a temperature of 36.8°C, pulse 114/min, respiratory rate 36/min and blood pressure (BP) 98/55 mmHg. The tympanic membranes were normal and throat was not inflamed. The heart, lungs and abdomen were normal. She had right-sided pre-existing hemiplegia with increased tone and hyperreflexia. Meningeal signs were absent.

A complete blood count and urinalysis were normal. The cerebrospinal fluid (CSF) obtained by a shunt tap contained 385 white blood cells (WBC)/mm³ (6% neutrophils, 78% lymphocytes, 16% monocytes), 190 red blood cells, protein 330 mg/dl, and glucose <10mg/dl and no organisms were seen on the Gram-stained smear. Shunt externalization was performed. Cultures of the blood, CSF, and catheter tip were obtained and intravenous (IV) vancomycin treatment was started. The CSF culture grew *Staphylococcus epidermidis*. The patient received a 14-day course of vancomycin and gradually improved. A repeat CSF analysis and culture at the end of treatment were negative.

On the following day she underwent surgery for shunt internalization while vancomycin treatment was continued as perioperative prophylaxis. Approximately eight hours after the surgery, she became tachycardic (180/min-220/min), irritable, and hypotensive (BP 65/40 mmHg). Her extremities were cold and dusky, and her skin capillary refill was prolonged (> 4 seconds). Fluid resuscitation was given and intravenous cefotaxime treatment was started after blood and CSF cultures were obtained. Her WBC was 8300/mm³ (24% bands, 34% neutrophils, and 42% lymphocytes).

Cerebrospinal fluid obtained by shunt tap contained 131 WBC/mm³ (66% neutrophils, 18% lymphocytes and 16% monocytes), protein 106 mg/dl, glucose 40 mg/dl, and the Gram-stained smear showed no organisms. Blood and CSF cultures grew a gram-negative diplococcus that was subsequently identified as *Neisseria subflava*. The organism grew aerobically on blood agar as yellow-pigmented colonies. It fermented glucose, maltose, and sucrose, and was oxidase positive,

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nitrate negative, but nitrite positive. Beta-lactamase test was negative. The new VP shunt was removed and an external ventricular drain was placed. She received a 10-day course of IV cefotaxime in addition to supportive care and did well. Repeat blood and CSF cultures were negative. She was discharged home after her shunt was internalized.

Discussion

Neisseria subflava is a member of the chromogenic, usually nonpathogenic group of *Neisseria*.¹² It is recognized on the basis of its colony morphology, pigment production, and by the fermentative patterns of glucose, maltose and sucrose. *N. subflava* is distinguished from *N. meningitidis* by its ability to grow on most varieties of agars at 22°C and by its greenish-yellow pigmentation.^{9,10} It is a natural inhabitant of the nasopharynx, saliva, sputum, and mucous membranes of the respiratory tract.⁹ A variety of names have been given to this organism in the past, including *N. flava*, *N. perflava*, and *N. pharyngis*; currently *N. subflava* is the preferred name.¹³

A review of the literature from the past five decades revealed scattered reports of invasive *N. subflava* infections in children. In 1985, Demmler et al⁶ reported a case of *N. subflava* meningitis in a 3-year-old child and reviewed 12 other pediatric cases of *N. subflava* infection previously reported between 1928 and 1984. Since then three additional case reports have been published.^{8,11,16} The ages of all 16 reported patients ranged from 3 months to 18 years with female to male ratio of 2:1. Five children had meningitis, 4 bacteremia, 3 endocarditis, one septic arthritis, one pneumonia with bacteremia, and one had asymptomatic bacteruria. Eight of the 9 children with meningitis or bacteremia had petechiae or purpura. Ten of the 15 patients were previously healthy; the other five had predisposing conditions for infection. Each of the 3 children with endocarditis had underlying cardiac pathology including rheumatic heart disease in one, Blalock-Tausig shunt in another, and ventricular septal defect and aortic insufficiency in a third patient. The child with asymptomatic bacteruria had an indwelling urinary catheter because of an underlying obstructive uropathy. One bacteremic child had neutropenia and mucositis secondary to chemotherapy treatment.

The recovery of nongonococcal, nonmeningococcal *Neisseria* from the blood may

represent contaminated specimen or a true bacteremia.¹⁴ Correlation with the patient's clinical condition and associated laboratory data is usually helpful in distinguishing between the two possibilities. Our patient developed septicemia and meningitis shortly after her shunt internalization surgery. The isolation of the organism from blood and CSF, the clinical signs of sepsis, the presence of WBC in the CSF, and increased number of band forms in the peripheral blood WBC were indicative of genuine acute infection.

The most common portal of entry for this organism into the circulation is considered to be the oropharynx, because the organism is part of the upper respiratory tract normal flora. Of the 16 previously reported cases of *N. subflava* invasive infection, 6 had coexisting acute upper respiratory tract infection,^{7,8,10} and two had dental abscesses,^{3,6} and one had mucositis.¹¹ Other portals of entry previously reported included the urinary tract¹⁵ and air droplet contamination during surgery.⁴

Because *N. subflava* is a common respiratory tract inhabitant, we postulate that the portal of entry of the organism in our patient was the upper airway. Manipulation of the oropharynx during intubation at the time of surgery very likely caused mucosal injury and blood seeding. The infection occurred in spite of the perioperative prophylactic intravenous vancomycin which is not active against *Neisseria* organisms. Moreover, vancomycin treatment may have altered the oropharyngeal flora and promoted the over growth of *N. subflava*.

Of the 16 patients previously reported, three with endocarditis responded to treatment with penicillin in combination with either sulfadiazine or streptomycin. Four patients with meningitis were cured with penicillin alone or in combination with sulfadiazine. One patient with septic arthritis responded to cefuroxime and another with bacteremia, neutropenia and mucositis responded to imipenem. Three patients died, one with meningitis and two with bacteremia within a few hours of admission. One patient with bacteremia and another with bacteruria recovered without receiving antibiotic therapy. Our patient responded to treatment with intravenous cefotaxime.

Although the majority of nonpathogenic *Neisseria*, including *N. subflava*, are sensitive to penicillin, initial empiric therapy should cover possible beta-lactamase-producing strains. Further antimicrobial therapy should

be guided by sensitivity results. Although our patient's organism was sensitive to penicillin, we opted treatment with cefotaxime because of its better diffusion into the CSF.

Our patient underscores the point that non-pathogenic *N. subflava* can cause septicemia and meningitis clinically indistinguishable from those caused by *N. meningitidis*.

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