JOURNAL OF CLINICAL MICROBIOLOGY, Jan. 2000, p. 462–463 Vol. 38, No. 1
0095-1137/00/$04.00+0

Streptococcus bovis Meningitis in an Infant

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Received 30 June 1999/Returned for modification 29 September 1999/Accepted 14 October 1999

Streptococcus bovis **is a nonenterococcal, group D streptococcus which has been identified as a causative agent for serious human infections, including endocarditis, bacteremia, and septic arthritis. Several cases of adult *S. bovis* meningitis have been reported, usually in association with underlying disease. In the neonatal period, it is an uncommon agent of meningitis. We report, to our knowledge, the third documented case of neonatal *S. bovis* meningitis in the English language literature. As in the previous cases, this neonate showed no anatomical or congenital immunologic lesion which might be expected to predispose the patient to meningitis. Sequencing of the 16S ribosomal DNA gene was performed and a new PCR test was used to secure a more reliable identification of the strain.**

CASE REPORT

A 5-week-old white female with no previous significant medical problems presented with a 14-h history of mild nasal discharge, slight cough, and inconsolable disposition. Vital signs were a temperature of 101.8°F, a pulse of 60 beats/min, respiration at 44 breaths/min, and a blood pressure of 85/60 mm Hg. She was taking formula well and had no vomiting or diarrhea. Her anterior fontanel was round and flat, and her pupils were equal and reactive to light. Her neck was supple, with no rigidity and no lymphandenopathy. Her lungs were clear to auscultation bilaterally, with no crackles, wheezes, or retractions. Her skin was warm and dry with no rashes noted. Extremities and spine showed no abnormality. The rest of the physical exam was unremarkable. A complete blood count showed 16,100 leukocytes/mm^3 (58% neutrophils, 4% bands, 34% lymphocytes, and 4% monocytes), hemoglobin at 12 g/dl, a hematocrit of 34%, a mean cell volume of 93 fl, and a platelet count of 601,000/mm^3. A sepsis workup was initiated, and a lumbar puncture was performed. Cerebrospinal fluid was found to be somewhat turbid, with 1,391 leukocytes/mm^3 and 250 erythrocytes/mm^3. A Gram stain demonstrated a moderate amount of polymorphonuclear cells, with no organisms noted. Cerebrospinal fluid glucose was 1.8 mg/dl, and the protein level was 306 g/dl. Treatment was begun with cefotaxime, ampicillin, and dexamethasone. The patient defervesced over the first 24 h, with an occasional spike to 101.4°F. Her last fever, about 24 h after admission, was 103.1°F.

Culture of the cerebrospinal fluid obtained before antibiotic treatment yielded light growth of *S. bovis*. The organism was sensitive to ampicillin, cefazolin, clindamycin, and ofloxacin. Cultures of blood and urine were negative. Cefotaxime was promptly discontinued. The patient improved during her hospital stay and was discharged after 5 days, without sequelae, and completed a 14-day course of intravenous ampicillin at home. Serum immunoglobulin (Ig) levels were not depressed (IgG, 462 mg/dl; normal limits [NL] = 196 to 404; IgM, 82.5 mg/dl; NL = 23 to 69; IgA, 18.6 mg/dl; NL, not established; IgE, <2 mg/dl, NL = 0 to 9.4), and C3 and C4 levels were within NL.

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Identification of the patient strain of *S. bovis* FM (authors' designation) was established by biochemical and molecular methods. The strain was capable of growth on glucose and maltose, but not starch, indicative of a *S. bovis* variant (biotype II). The organism was coccoid and formed short chains. The 16S rRNA gene of the strain was isolated and partially sequenced as previously described (9) and compared to sequences in GenBank (National Institutes of Health, Bethesda, Md.). The sequence was greater than 99% similar over 513 bp to *S. bovis* ATCC 43143, another clinical isolate. In addition, the FM strain was also analyzed by a newly developed PCR test to differentiate between human and ruminal strains of *S. bovis* based on 16S rRNA gene sequences (11) and was found to be positive for a human *S. bovis* strain (data not shown).

Discussion. Group D streptococci are well recognized as causes of newborn septicemia and meningitis. These infections predominantly have been due to enterococci. *S. bovis* is an uncommon pathogen in the newborn period (1). Headings and associates (5) were the first to report fulmanant neonatal disease due to *S. bovis*. Clinical details of infants having systemic *S. bovis* infection have been identical to those of the syndrome of early group B streptococcal sepsis (5).

Accurate identification of *S. bovis* is critical because other viridans streptococci can mimic *S. bovis*. Most importantly, *S. bovis* should be distinguished from enterococci so that a clinician can choose appropriate antibiotic therapy. Typical isolates of *S. bovis* grow on bile esculin and at 45°C but not in 6.5% NaCl or at 10°C. The group D reaction cannot be relied upon absolutely (2). Differentiation between *S. bovis* biotypes I and II has been recommended based on a correlation between biotype I bacteremia and gastrointestinal lesions (10). Biotype I organisms can be distinguished from biotype II organisms by their ability to ferment mannitol, produce glucans, and degrade starch. Recent data demonstrate that *S. bovis* strains of different origins can be rapidly identified with specific PCR primers targeted at the 16S rRNA gene (Whitehead and Cotta, submitted for publication).

The significance of non-beta-hemolytic streptococci isolated from the cerebrospinal fluid of infants is controversial. It has been suggested that most of these streptococci are clinically insignificant, unless the cerebrospinal fluid exhibits cellular response and elevated protein levels (4, 8). The increased

protein and high polymorphonuclear response in our patient indicates that the isolate *S. bovis* FM is, indeed, clinically relevant.

The majority of patients with meningitis due to non-beta-hemolytic streptococci suffer from underlying diseases. Koorvaar et al. (6) found that underlying diseases were present in all children with non-beta-hemolytic streptococcal meningitis. In previous case reports of neonatal *S. bovis* meningitis, the clinical presentation included respiratory distress or gastroenteritis (3, 7). Our patient showed no history of gastroenteritis and only mild respiratory problems. Other risk factors such as head trauma, neurosurgical procedures, and spina bifida were absent from our patient's medical history. Normal levels of Ig in serum and complement (C3, C4) suggested that humoral immunity was intact.

Isolation and identification of *S. bovis* FM underscores the potential for infection in an immunocompetent host and confirms *S. bovis* as a rare causal agent of neonatal meningitis. Advances in technology since the publication of other neonatal *S. bovis* meningitis cases have allowed us a more certain identification and aided in ruling out the potential of an immunocompromised host.

Nucleotide sequence accession number. The partial 16S rRNA gene sequence of *S. bovis* FM was submitted to Gen Bank and given accession no. AF082730.

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