Clostridium pseudotetanicum Bacteremia in a Patient with *Pasteurella multocida* Conjunctivitis

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Received for publication 18 August 1978

Clostridium pseudotetanicum only once previously has been identified as causing disease. *Pasteurella multocida* has been identified only three times as the cause of purulent conjunctivitis. A very debilitated patient had *C. pseudotetanicum* bacteremia and *P. multocida* conjunctivitis from which she recovered only to die of a nosocomial *Staphylococcus epidermidis* septicemia, originating in a site for the administration of intravenous fluids.

Clostridium pseudotetanicum previously has been identified only once as causing disease (7). *Pasteurella multocida* is known to cause local infection after animal bites, especially by cats (3, 8, 12) but only three times has been shown to cause conjunctivitis (2, 9). The patient reported here recovered from these infections only to die of a nosocomial *Staphylococcus epidermidis* septicemia arising in a site for infusion of intravenous fluids. This case is reported because of the unusual pathogens isolated.

MATERIALS AND METHODS

Case report. A 60-year-old white woman was admitted to the hospital on 5 April 1976 because of respiratory distress. Five years before admission, the patient had cardiomegaly. Four months before admission, she complained of shortness of breath and orthopnea. Five days before admission, the patient slipped while getting up from a chair and fell to the floor. She remained lying on the floor until admission. Her husband claimed he gave her only milk to drink. Pet cats were allowed to roam over her. She became progressively obtunded and was discovered by her sisters on the floor in a filthy state and was sent to this hospital.

She had been morbidly obese for many years. She smoked at least one pack of cigarettes a day for 40 years and had drunk more than one-fifth of wine per day for many years. The family denied increased blood pressure, diabetes, heart murmur, fever, chills, or allergies.

Admission physical examination revealed an obtunded, cyanotic, jaundiced, grossly obese woman. The blood pressure was 110/80 supine, the pulse was 170 and regular, Cheyne-Stokes respirations were present, and the oral temperature was 98.6°F (ca. 37°C). The weight exceeded the 300-pound (ca. 136 kg) limit of the bed scales. She exhibited anasarca and was in severe respiratory distress. The conjunctiva were injected, and a purulent exudate was present on the right. Wheezes were heard in all lung fields. Central

venous pressure was estimated at greater than 30 cm of water. The cardiac exam was normal except for distant heart sounds. The abdominal exam was normal except for right upper quadrant tenderness and an enlarged liver, which was percussed to 8 cm below the right costal margin. Cellulitis with crepitation was present over the lower abdomen. On the left side it extended approximately halfway from the inguinal area to the umbilicus. On the right it extended one-quarter of the distance to the umbilicus. Necrotic decubitus ulcerations were present at the junction of the labia majora and buttocks and involved the anterior perineum. Bimanual pelvic examination was normal. Clubbing of the fingers and toes was present. The neurological examination revealed severe lethargy and orientation only to name. Cranial nerves II through XII were intact and all extremities moved in response to pain.

RESULTS

Initial laboratory results. Urinalysis revealed a trace of hemoglobin, 4+ protein, and no glucose. The microscopic examination of catheterized urine showed 50 to 60 erythrocytes per high-power field and 10 leukocytes per high-power field. The urine sodium was 6 meq/liter.

Hemoglobin was 18.6 g/dl; hematocrit was 59.1%; macrocytic indexes were present; white blood count was 7,800 per μ l with 70% neutrophils, 5% bands, 7% lymphocytes, and 9% monocytes.

Platelet count was 129,000 per microliter. The prothrombin time was 20 s, control, 11 s; partial thromboplastin time was 31 s, control, 36 s; the fibrinogen was 375 mg/dl.

The patient's blood urea nitrogen was 36 mg/dl; the creatinine value was 2.0 mg/dl. The creatine phosphokinase was 642 IU/liter (normal 50 to 150 IU/liter). The lactic dehydrogenase was 2,390 IU/liter (normal 90 to 120 IU/liter). Blood electrolytes and serum amylase

were normal. CSF examination was normal. The chest X-ray showed bilateral pulmonary congestion and cardiomegaly. The electrocardiogram showed atrial flutter. Initial arterial blood gasses on 5 liters of oxygen per min were as follows: pH, 7.30; PO₂, 68 mm of Hg; and PCO₂, 51 mm of Hg.

Hospital course. Progressive cyanosis necessitated ventilatory assistance. Cultures of blood (two sets, each included aerobic and anaerobic bottles), urine, stool, and the right eye were obtained before treatment with intravenous aqueous penicillin G and gentamicin. Sulfacetamide sodium 10% ophthalmic solution was applied to the right eye four times daily for 1 week. The patient was treated for alcoholism and congestive heart failure.

Laboratory values the second hospital day included a normal total protein, albumin, and cholesterol; total bilirubin was greater than 10 mg/dl; alkaline phosphatase was 199 IU/liter (normal 30 to 90 IU/liter); serum glutamic oxaloacetic transaminase exceeded 300 IU/liter (normal 10 to 50 IU/liter). A blood alcohol was 113.6 µg/dl. A hepatitis-associated antigen was negative. An arterial ammonia level was 113.8 µg/dl (normal, 18 to 48 µg/dl). The rapid plasma reagin was positive at 1 dilution and the fluorescent treponemal antibody-absorption was positive. On hospital day 3, *Escherichia coli*, 100,000 colonies/ml of urine, sensitive to all tested antibiotics, was identified. The blood cultures grew a gram-positive rod in one of two anaerobic bottles. It was tentatively identified as *C. ramosum* but later identified as *C. pseudotetanicum* by the Center for Disease Control (Atlanta, Ga.). *P. multocida* was subsequently identified as the cause of the right eye conjunctivitis.

By day 9, cardiopulmonary improvement permitted transfer to a general medicine ward. Antibiotics were stopped after 10 days. On day 13, nosocomial phlebitis of an intravenous fluid administration site on the right arm was noted, and the patient was treated with nafcillin, gentamicin, and aqueous penicillin G. Later that day the patient had a respiratory arrest followed by cardiac arrest and died. Two sets of pre-mortem blood cultures grew *Staphylococcus epidermidis* as did the cellulitis on her arm. Anaerobic cultures were negative. Permission for an autopsy was refused.

DISCUSSION

C. pseudotetanicum was the cause of bacteremia in this debilitated patient who suffered from several infections. Since the organism was isolated from one anaerobic blood culture bottle (Bactec, Johnston Laboratories, Cockeysville,

Md.), it is remotely possible that this was a contaminant. However, despite the initial absence of fever, this patient was extremely ill on admission and quickly developed fever, leukocytosis, and thrombocytopenia; her clinical condition was consistent with a bloodstream infection. Clostridial bacteremia without hemolysis or nonhistotoxic clostridial bacteremia is characterized by fever, leukocytosis, and rapid clinical response to antibiotic therapy and, sometimes, surgical therapy (1, 11, 14). Nonhistotoxic clostridia may invade systemically when host defense mechanisms are lowered (1). Death in such bacteremias is usually from other causes.

The one prior case of *C. pseudotetanicum* septicemia occurred in a patient with leukemia; *C. ramosum* was also isolated. However, no source for the septicemia was reported (7). The origin of the bacteremia in the present case appears to have been the intertriginous perineal decubitus ulceration, which certainly contained fecal flora. This explanation is consistent with the occasional isolation of *C. pseudotetanicum* from the stool (5).

C. pseudotetanicum is a gram-positive, non-motile, terminal spore-forming, anaerobic bacillus. It does not produce lecithinase as do the histotoxic *Clostridium* species. Acid formation in glucose, lactose, sucrose, maltose, and salicin are characteristic. Standard biochemical testing used in our laboratory will not separate it from *C. ramosum*. Gas-liquid chromatography of the constituent organic acids is usually required for separate identification (4).

No published antimicrobial sensitivity studies of *C. pseudotetanicum* are known to us. However, there is no reason to doubt that this patient's improvement occurred in response to penicillin, debridement, and other measures.

Analysis of the enzymes produced by *C. pseudotetanicum* is incomplete. One recent report describes neuroaminidase (EC 3.2.1.18) production by a single strain of this organism. What seems unique about *C. pseudotetanicum* is that the other six *Clostridium* species known previously as neuroaminidase producers produce an enzyme absent from *C. pseudotetanicum*, acylneuroaminatase lyase (13). In examining the present case and the rarity with which *C. pseudotetanicum* is isolated from infected tissues, it is postulated but unproven that acylneuroaminatase lyase is associated with virulence or is a virulence factor for certain *Clostridium* species and that its absence from *C. pseudotetanicum* might be a partial or complete explanation of the lack of virulence of *C. pseudotetanicum*.

P. multocida is a short, ellipsoidal, gram-negative rod which is being reported with increasing

frequency as a cause of human infection. It is a facultative anaerobe which is oxidase positive, citrate negative, and does not liquefy gelatin or reduce methylene blue. It is glucose positive but adonitol, inulin, and starch negative. It can be isolated from the mouth flora of cats, dogs, and birds (3). Local and systemic infections in a variety of clinical forms have been identified (2, 3, 8, 9, 12). Three cases of conjunctivitis previously have been reported, two of which were not related to animal contact (9). The third case was associated with diseased poultry (2). In addition, two cases of corneal ulcer (8, 10) and one case each of keratitis (9), proptosis from pansinusitis (9), and panophthalmitis (6) have been identified. In vitro testing has shown susceptibility to penicillin G, ampicillin, tetracycline, and chloramphenicol (D. L. Stevens, J. W. Higbee, T. R. Oberhofer, and E. D. Everett, Abstr. Annu. Meet. Am. Soc. Microbiol. 1977, A56, p. 10). The clinical results in the present case suggest susceptibility to sulfonamides. Moreover, systemic penicillin therapy in this case was probably sufficient to cure conjunctivitis.

This patient's other infections were not incidental. Her urinary tract infection cleared in response to therapy. Her cellulitis improved markedly, although the decubitus ulcers were not entirely healed when she died. The nosocomial phlebitis was definitely the site of origin of the fatal bacteremia. After recovering from congestive heart failure, acute respiratory failure, acute alcoholism, multifactorial hepatic decompensation, *C. pseudotetanicum* bacteremia, abdominal wall and perineal cellulitis, *P. multocida* conjunctivitis and *E. coli* urinary tract infection, she succumbed to a nosocomial bacteremia due to *S. epidermidis* arising in an arm vein, the site of intravenous infusions. As in an

unfortunate number of ill patients, one of the means used to support her through several life-threatening illnesses resulted in a fatal infection.

ACKNOWLEDGMENTS

Grateful appreciation is expressed to Opal Robb for secretarial assistance.

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