Group B Streptococcal Meningitis Presenting as Stroke in a Nondebilitated Man

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An unusual case of group B streptococcal meningitis in an adult is described. The evidence presented suggests that early vascular involvement during the meningitic process resulted in cerebral infarction, thereby explaining the patient’s sudden deterioration and atypical presentation.

INTRODUCTION

Group B streptococcus (GBS)\textsuperscript{d} is a frequent cause of meningitis in the neonatal period where it is associated with colonization of the maternal vagina. At ages greater than a few months, however, streptococcal meningitis is uncommon and more traditionally associated with group A streptococci [1, 2]. The few adult cases reported involving Lancefield group B organisms are typically either patients with chronic, debilitating diseases or maternal cases, as a sequela to childbearing. We present here a case of GBS meningitis in a nondebilitated, elderly man that presented as a posterior circulation stroke. This is the first documented case of cerebral infarction resulting from GBS in an adult.

CASE REPORT

A 61-year-old white male was brought to The Cambridge Hospital after being found unconscious. At the time of presentation, the only history available was of acute deterioration in a previously ambulatory man. Subsequent investigation revealed no major past medical history. He was a long-time tenant at a local YMCA and had retired from the Postal Service seven months prior to admission. He had a history of moderate alcohol use and had recently complained to a friend that he was having difficulty passing urine. During the two days prior to admission, the individual repeatedly ventured outside in no apparent distress. On the morning of the day of admission, the patient was observed sitting on the edge of his bed. Approximately two and one-half hours later, he was found lying on the floor of his room. Emergency medical personnel noted the patient to be diaphoretic and responsive only to painful stimuli.

On admission to the Emergency Department, he was prostrate, making only minor movements, with a blank stare and no apparent awareness of his environment. He was of normal body habitus and had a rectal temperature of 38.1°C, a regular pulse at 130 beats per minute, blood pressure of 140/104 mm Hg and a respiratory rate between 32 to 36 breaths per min. Subsequently, he began to exhibit recurrent apneic episodes, with an apparent Cheyne-Stokes respiratory pattern, and was endotracheally intubated. Shortly thereafter, all spontaneous movements ceased. Foley catheter placement was difficult due

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\textsuperscript{d}Abbreviations: GBS, Group B Streptococcus; CSF, cerebrospinal fluid.
to a mental stricture. On neurological examination, the patient was found to be deeply comatose with only minimal response to noxious stimuli. There was diffuse cranial nerve dysfunction with gaze fixed just to the right of midline. The eyelids were partially open, and the pupils were unequal (right eye, 5 mm and left eye, 3 mm) and unreactive to light. The optic fundi were not well visualized. Spontaneous eye movements were limited to a fine conjugate tremor. There was no tracking of visual stimuli and no eye movement in response to passive head rotation. Blink response and corneal reflexes were absent. With caloric stimulation, it was possible to elicit conjugate deviation to the right followed by movement back toward, but not to the left of, midline. During this test, there were some eye movements with arcuate trajectories; these constituted the only vertical motion that could be elicited. At this time, there were no spontaneous movements, although stereotyped bucking was elicited with endotracheal suction. The patient's face, neck and body were lacking in muscle tone and without rigidity. Tendon reflexes were unremarkable except for diminished ankle jerks. Babinski's sign was present bilaterally. The neurological findings were noted to be consistent with a posterior circulation stroke.

Initial laboratory data (Table 1) were significant for an elevated leukocyte count and low platelet count. Serum glucose, urea nitrogen and creatinine were moderately elevated. There were also indications of liver function abnormalities, with elevations in total bilirubin, lactate dehydrogenase and aspartate aminotransferase levels. There was no evidence of recent alcohol or drug use, and no acetones or ketones were present. Arterial blood gas analysis (Table 1) was consistent with a mild respiratory alkalosis on supplemental oxygen.

Computerized tomogram of the head, without contrast, showed only partial widening of the ventricular system and superficial sulci, but no hemorrhage, mass effect or significant lesions. The patient was transferred to the Intensive Care Unit where a lumbar puncture was performed. Turbid fluid gushed out of the needle with opening and closing pressures, both greater than 45 cm H₂O. Immediately following the lumbar puncture, the patient had a tonic-clonic seizure and was started on anticonvulsant medication. Analysis of the cerebrospinal fluid (CSF) revealed a number of striking abnormalities (Table 1).

Table 1. Laboratory data.

| Blood:                  |                |
|------------------------|----------------|
| Leukocytes             | 16.9 x 10^3/mm³ |
| Neutrophils            | 81%            |
| Bands                  | 4%             |
| Glucose                | 183 mg/dL      |
| Urea nitrogen          | 45 mg/dL       |
| Creatinine             | 1.9 mg/dL      |
| Total bilirubin        | 3.8 mg/dL      |
| Lactate dehydrogenase  | 332 U/L        |
| Aspartate aminotransferase | 73 U/L    |

| Arterial blood gases: |                |
|----------------------|----------------|
| pH                   | 7.49           |
| pCO₂                 | 16 mmHg        |
| pO₂                  | 104 mmHg       |
| Bicarbonate          | 12.1 mmol/L    |

| Cerebrospinal fluid:  |                |
|----------------------|----------------|
| Erythrocytes         | 248/mm³        |
| Neutrophils          | 43,073/mm³     |
| Monocytes            | 15,931/mm³     |
| Glucose              | 1 mg/dL        |
| Protein              | 510 mg/dL      |
The fluid was hazy and xanthochromic with a marked leukocytosis dominated by neutrophils. CSF glucose was barely detectable, and protein was elevated. The CSF was negative for organisms on Gram stain and for cryptococcal antigen. The diagnosis of fulminant nonviral meningitis was made. Additional historical information was subsequently obtained. Staff members at his place of residence reported that for a week prior to admission the patient had complained of "flu-like" symptoms and that his sheets had been "drenched in sweat."

The patient was initially treated empirically with a broad spectrum of antimicrobial agents, including antimycobacterial drugs. Overnight, the cultured CSF grew GBS, sensitive to penicillin, as did blood and urine but not sputum. On the second hospital day, specific treatment with intravenous penicillin, plus gentamicin for synergy, was instituted. The patient was also given dexamethasone for the initial four hospital days. Shortly after his admission, the patient developed diabetes insipidus, which was controlled using desmopressin. He became afebrile and remained so. After fourteen days of treatment with intravenous antibiotics, the patient remained comatose with no change in his neurological exam. As recovery was judged to be extremely unlikely, the patient was extubated and pronounced dead shortly afterward.

At autopsy, performed at the Massachusetts General Hospital, the skull and spinal column did not reveal any evidence of trauma or other abnormalities. There was partial stenosis of the superior sagittal sinus by a thrombus most severe in its anterior portions. A thick yellow subdural and subarachnoid exudate was present over the hemispheric convexities in a frontoparietal distribution. The basal meninges and cranial nerves appeared to be uninvolved. The cerebrospinal fluid was serosanguinous and viscous. The brain itself was notable for widespread subacute bland infarctions involving the arterial border zones of the medial frontoparietal cortex bilaterally and scattered areas of both hippocampi and the cerebellum. The left cerebellar hemisphere was nearly totally necrotic, and the right hemisphere contained multiple infarctions. Multiple infarctions were also present in the pons and in the left rostral medulla. Small infarctions were present in the body of the corpus callosum and bilaterally in the pyramids at the level of the inferior olive. The infarctions showed no cavitation or hemorrhage, consistent with subacute infarctions with an approximate age of one to two weeks. Microscopically, the vessels supplying the infarcted regions contained foci of arteritis with thrombi. Widespread ventriculitis was present; however, on Gram-stained sections of tissue, there was no evidence of bacterial invasion of brain parenchyma. There was an abscess involving both anterior and posterior lobes of the pituitary.

The prostate showed mild benign hyperplasia. The urinary bladder was dilated with marked trabeculation and thickening of the wall consistent with chronic obstruction. The kidneys were unremarkable. The remainder of the autopsy findings were non-contributory.

**DISCUSSION**

Beyond the neonatal period, it is unusual to see meningitis due to GBS. Since the initial case report of GBS meningitis by Rantz in 1942 [3, 4] involved an adult patient, there have been 59 adult cases [5-28], which were recently reviewed [29, 30]. Although cerebral infarction is a well documented complication of meningitis in the pediatric age group, [31-34], including four cases secondary to GBS in neonates [33-35], this is the first reported case of cerebral infarction in an adult.

Inoculation during delivery with vaginal GBS provides a direct mode of transmission to the neonate. In contrast, the mechanism by which this organism is acquired and gains access to the adult central nervous system is less clear [36]. One apparent exception to this would be the peripartum cases in which the mother herself develops GBS disease as a
sequelae to the childbearing process, with or without concomitant infection of the neonate [6, 8, 9, 14, 25]. More frequently, GBS disease in adults, including meningitis, is associated with chronic debilitating diseases, notably diabetes mellitus and cancer [8, 12, 17, 24, 28]. In addition, a number of the reported meningitis cases were associated with a loss of physical barriers protecting the central nervous system, for instance secondary to surgery, fistula or herniation into the orbit [17, 18, 25]. Because of these associations, it is generally inferred that diminished host immunocompetence plays an important role in the pathophysiology of GBS disease. In contrast, it is much less common for GBS meningitis to present, de novo, in previously healthy, nonparturient adults. We found only seven such cases documented in the literature [6, 17, 22, 29, 30].

In addition to colonizing the vagina, GBS is not infrequently found in the urinary tract. Therefore, it is not surprising that a significant proportion of adult GBS septicemia and meningitis cases are associated with pre-existing urological disorders or pyelonephritis [14, 22, 25, 26]. Since the patient discussed here had both chronic urinary outflow obstruction and GBS bacteriuria, the urinary tract seems the likely source of his bacteremia with subsequent meningitis. Nevertheless, the possibility that the urine was seeded secondarily by blood borne organisms cannot be ruled out.

The patient's history of a protracted febrile illness followed by apparent improvement then precipitous neurological deterioration is unusual for meningitis and warrants further discussion. Given the combined evidence of profound cranial nerve dysfunction on initial neurological exam, the arterial involvement and brainstem infarcts seen at autopsy, together with the estimated age of the infarcts and absence of direct cranial nerve involvement, a likely explanation for the patient's sudden decline can be advanced. The patient likely harbored a GBS bacteremia, which led to an occult meningeal infection with early cerebrovascular involvement, the last resulting in a series of posterior circulation strokes.

The presence of arteritis and thrombi within the relevant arteries suggests that vasospasm need not be invoked to explain these infarctions [37]. In contrast, the "watershed" infarcts of his cerebral hemispheres and the hippocampal lesions are evidence of a period of severe global cerebral ischemia. Since this patient likely already had brainstem lesions when first examined, it is difficult to determine when the hemispheric damage occurred, although autopsy findings indicate that it was close to the time of admission. One or more episodes of profound hypotension would seem to be a likely etiology for these lesions, and it is tempting to blame a seizure, such as the one witnessed after the lumbar puncture, with transient circulatory collapse. These multiple infarctions left the patient neurologically devastated without hope of recovery, despite subsequent elimination of the GBS organism from his blood and CSF. Although stroke late in the course of fulminant meningitis is well recognized, it is unusual to see cerebral infarction as the predominant feature at presentation [32]. Furthermore, since the arterial wall is more resistant to bacterial invasion, infarcts during the course of meningitis are more commonly associated with venous occlusion [32, 33]. In the present case, the latter mechanism is unlikely. Although thrombus was found in the superior sagittal sinus, stenosis was only partial, and the strokes were not hemorrhagic as would have been expected with venous occlusion. Finally, the patient's diabetes insipidus is clearly due to the pituitary abscess.

GBS disease in adults is associated with a high rate of morbidity and mortality. This is particularly alarming when one considers that the incidence of reported cases is rising [12, 20, 36, 38, 39]. One feature of the present case, which made it intractable to therapeutic intervention, was the occurrence of catastrophic stroke early in the course of the meningitic process. Whether the Lancefield group B organism has a particular predilection for early cerebral vascular involvement is not yet clear.
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