Streptococcus pneumoniae Meningitis Presenting with Acute Urinary Retention and Emphysematous Cystitis

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Abstract

A combination of acute urinary retention and aseptic meningitis has occasionally been described, which is referred to as meningitis-retention syndrome. In contrast, acute urinary retention has rarely been reported in bacterial meningitis. We herein report a case of *Streptococcus pneumoniae* meningitis presenting with acute urinary retention which led to emphysematous cystitis in an elderly woman. She presented with impaired consciousness and a distended lower abdomen. She was diagnosed with pneumococcal meningitis by lumbar puncture. Abdominal computed tomography revealed the presence of emphysematous cystitis. She completely recovered with antibiotic therapy without any complications. Acute urinary retention can occur secondary to pneumococcal meningitis.

Key words: *Streptococcus pneumoniae*, bacterial meningitis, acute urinary retention, emphysematous cystitis

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Introduction

Acute urinary retention is a urological emergency and occurs even when there is no apparent underlying urological cause. A combination of acute urinary retention and aseptic meningitis has been occasionally described, which is referred to as meningitis-retention syndrome (MRS) (1, 2). In contrast, only a few cases of acute urinary retention together with bacterial meningitis have so far been reported (3-6). *Streptococcus pneumoniae* is the most common causative agent of bacterial meningitis in adults (7). Pneumococcal meningitis is associated with a high mortality rate and various neurological complications (8). However, no case of acute urinary retention has been reported in pneumococcal meningitis. We herein report a case of pneumococcal meningitis presenting with acute urinary retention, leading to emphysematous cystitis.

Case Report

A 77-year-old woman was transferred to a regional medical center due to an altered mental status since that morning.

She had been well until the previous day. Head computed tomography (CT) and brain magnetic resonance imaging (MRI) showed no abnormal findings. Laboratory data showed a slight elevation in liver function tests. However, a physical examination and ultrasonography of her abdomen did not show any abnormal findings. She was suspected as having cholangitis and was transferred to our hospital that evening. Although she had a history of gastrectomy and cholecystectomy, she had no history of diabetes mellitus, urinary tract infection (UTI), or splenectomy. She took no medication and had no record of receiving a pneumococcal vaccine.

Her consciousness was impaired and she had a distended lower abdomen without signs of peritoneal irritation. Abdominal CT showed no findings of cholangitis or biliary stones. However, CT revealed gas within the bladder wall and lumen with bilateral hydronephrosis (Figure). She was diagnosed with emphysematous cystitis and her impaired consciousness was thought to be a result of severe infection at that time. She was subsequently admitted to our hospital. A urethral catheter was placed and 1,110 mL of residual urine was discharged. The administration of meropenem 1.5 g/day was initiated.

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Figure. (a) Abdominal computed tomography shows distension of the urinary bladder with gas within the bladder wall (white arrowheads). Intraluminal air is also present (white arrow). (b) Abdominal computed tomography also shows bilateral hydronephrosis without gas.

On day 2 after hospitalization, Gram-positive diplococcus was detected from blood cultures obtained at admission. On physical examination, her blood pressure was 112/59 mmHg, pulse rate was 106 beats/min, respiratory rate was 24 breaths/min, and temperature was 37.2°C. Her Glasgow Coma Scale score was 12/15 (E4V3M5) and she was disoriented with neck stiffness. Her cranial nerves were intact. Her deep tendon reflexes were normal. No pathological reflexes, ataxia, or motor and sensory disorders were noted. Her breath and heart sounds were clear. She had no pain, hypoalgesia, or skin eruptions in the sacral dermatomes. Laboratory tests showed a white blood cell count of 20,000/ μ L, with 78% neutrophils, hemoglobin level of 10.5 g/dL, a platelet count of $11.0 \times 10^4/\mu$ L, and a C-reactive protein level of 29.98 mg/dL (Table). On urinalysis, microscopic hematuria, proteinuria, and pyuria were observed. Gram staining of the urine specimen showed Gram-negative rods. On lumbar puncture, her cerebrospinal fluid (CSF) pressure was 90 mmH₂O and with a cell count of 5,397/ μ L (94% neutrophils). The CSF protein level was 500 mg/mL and the glucose level was 28 mg/dL. Gram staining of the CSF showed Gram-positive diplococcus and a latex agglutination test for the CSF was positive for pneumococcal antigen. We diag-

nosed the patient with bacterial meningitis caused by *S. pneumoniae* together with emphysematous cystitis. We changed the antibiotics from meropenem to vancomycin 1.5 g/day and ceftriaxone 4 g/day. Penicillin-susceptible *S. pneumoniae* was confirmed from blood cultures (minimum inhibitory concentration 0.06 μ g/mL). We discontinued vancomycin on day 3. Unfortunately, no organism grew in the CSF culture. This lack of growth could be because the specimen was obtained after administering meropenem. The urine culture taken at admission showed *Escherichia coli*, which present at 10^5 CFU/mL, and susceptible to all antibiotics tested. To treat pneumococcal meningitis and emphysematous cystitis caused by *E. coli*, we continued ceftriaxone for 14 days, followed by cephalexin 2,000 mg/day for 7 days. On day 10, we removed her urethral catheter. She could thereafter urinate without any residual urine. She completely recovered without any neurological deficit and was discharged on day 16.

Discussion

The course of our patient suggested two important clinical issues. First, bacterial meningitis by *S. pneumoniae* can present with acute urinary retention without other neurological deficits. Second, emphysematous cystitis was successfully treated with antibiotic therapy and bladder drainage.

With regard to the first issue, a combination of acute urinary retention and aseptic meningitis has occasionally been described, which is referred to as MRS (1, 2). MRS is thought to be a mild form of acute disseminated encephalomyelopathy (ADEM) or sacral myeloradiculitis from a postinfectious inflammatory demyelinating response in the peripheral and central nervous systems (1, 2). In contrast, acute urinary retention in bacterial meningitis is uncommon. Only a few cases of acute urinary retention together with tuberculous meningitis (3, 4), meningococcal meningitis (5), and listeria meningitis (6) have been reported. In the cases of tuberculous meningitis, intramedullary tuberculoma of the conus medullaris (3), or dural thickening with debris in the lumbar dural sac was observed (4), which likely caused urinary retention. In the other cases, the pathogenesis of acute urinary retention was not described. Thus, whether acute urinary retention in bacterial meningitis is in the same category as MRS remains unclear. There are several case reports of ADEM associated with pneumococcal meningitis (9). However, we do not believe that our patient was complicated by ADEM because she did not show any abnormal findings in brain MRI and rapidly improved without immunosuppressive therapy. *S. pneumoniae* is the most common causative agent of bacterial meningitis in adults (7). *S. pneumoniae* is associated with a high mortality rate and various neurological complications, including hearing loss, hydrocephalus, ischemic brain injury, and seizures (8). However, there are no reports of acute urinary retention in pneumococcal meningitis. In the present case, bilateral hydronephrosis was observed in abdominal CT (Figure), which suggested urinary

Table. Laboratory Findings on Admission.

Complete blood count		Urine	
WBC	20,000/ μ L	Occult blood	3+
Neutrophils	84.5%	Protein	3+
Lymphocytes	11.5%	Sediment	
Hb	10.5 g/dL	RBC	>100/HPF
Ht	29.7%	WBC	10–19/HPF
Plt	$11.0 \times 10^4/\mu$ L		
Serology		Cerebrospinal fluid	
CRP	29.98 mg/dL	Cells	5397/ μ L
Biochemistry		PMN	94%
AST	67 IU/L	Protein	500 mg/mL
ALT	89 IU/L	Glucose	28 mg/mL
LD	304 IU/L		
CK	418 IU/L		
BUN	20.9 mg/dL		
Cre	0.55 mg/dL		
Na	139 mEq/L		
K	3.2 mEq/L		

HPF: high-power field

PMN: polymorphonuclear leukocytes

retention occurring in the bladder. We did not observe any abnormal neurological findings that were believed to be related to urinary retention. The patient's motor function was normal and sensation was intact in her legs and perineum. Her meningitis and urinary retention promptly improved without complications. Therefore, we did not perform MRI of the spine. One case of autonomic dysfunction after pneumococcal meningitis has been reported (10). In the present case, transient dysfunction of the sacral segments of the autonomic nervous system might have occurred. The cause of acute urinary retention in bacterial meningitis remains to be elucidated.

There has only been one case report on bacterial meningitis together with emphysematous cystitis (11). This report showed that bacterial meningitis occurred secondary to emphysematous cystitis caused by *E. coli*. In the present case, the bacteria detected from the blood and urine were different. We cannot deny the possibility that bacterial meningitis and emphysematous cystitis occurred simultaneously by chance. However, emphysematous cystitis often develops in patients with diabetes mellitus, an immunocompromised state, neurogenic bladder, recurrent UTI, and urinary stasis secondary to bladder outlet obstruction (12, 13). Our patient did not have any underlying disease or a past history of UTI. In our patient, distention of the lower abdomen was not observed in the previous hospital, which suggests that she did not have urinary retention several hours before arrival at our hospital. We consider that acute urinary retention occurred secondary to pneumococcal meningitis, which was then followed by a UTI caused by *E. coli*.

With regard to the second clinical issue, emphysematous cystitis was successfully treated with antibiotic therapy and bladder drainage. Emphysematous cystitis is a rare form of complicated UTI, which is characterized by gas within the bladder wall and lumen. Emphysematous cystitis is a potentially fatal infection, with an overall mortality rate of 3–12%. When emphysematous cystitis occurs along with another

gas-forming disease within the upper urinary tract, emphysematous pyelonephritis, the mortality rate increases by up to 14–20% (14, 15). Surgical intervention is regarded as the treatment of choice for gas-forming disease of the urinary tract, especially emphysematous pyelonephritis. However, several studies have shown the safety and efficacy of conservative management under the correct diagnosis and appropriate antibiotic administration (16). In the present case, the gas-forming disease was limited to the bladder and promptly treated with antibiotics and bladder drainage. We believe that these factors contributed to the successful management of this patient with conservative treatment.

In conclusion, bacterial meningitis by *S. pneumoniae* can present with acute urinary retention without other neurological deficits. Physicians should thus be aware of the presence of urinary retention in pneumococcal meningitis to prevent the occurrence of complicated UTI.

The authors state that they have no Conflict of Interest (COI).

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