Emphysematous cystitis: mortality, risk factors, and pathogens of a rare disease

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Abstract

Although high mortality rates have been reported for emphysematous pyelonephritis (EP), information on emphysematous cystitis (EC), which is less common, is sparse. Here, we report one new case of severe EC and 136 cases of EC that occurred between 2007 and 2016, and review information about the characteristics, diagnosis, treatment and mortality of these patients, and the pathogens found in these patients.

The mean age of the 136 patients was 67.9±14.2 years. Concurrent emphysematous infections of other organs were found in 21 patients (15.4%), with emphysematous pyelonephritis being the most common of these infections. The primary pathogen identified was Escherichia coli (54.4%). Patients were mainly treated by conservative management that included antibiotics (n=105; 77.2%). Ten of the 136 patients with EC died, yielding a mortality rate of 7.4%. Despite the relatively low mortality rate of EC compared with that of EP, a high degree of suspicion must be maintained to facilitate successful and conservative management.

Introduction

Emphysematous urinary tract infections (UTIs) are potentially life threatening. Although mortality rates of approximately 24% have been reported for emphysematous pyelonephritis (EP),1 information on emphysematous cystitis (EC), which is less common, is sparse. The first case of pneumaturia, which was most likely a symptom of EC, was reported in Curiosities of Nature by Raciborsky in 1671.2 Here, we report one new case of severe EC and 136 cases of EC that occurred between 2007 and 2016, and review information about the characteristics, diagnosis, treatment and mortality of these patients, and the pathogens found in these patients.

Case Report

A 45-year old patient was admitted to our hospital with new diagnosed hepatic lesions of unknown dignity. Contrast-enhanced computed tomography (CT) of the abdomen revealed an advanced emphysematous cystitis involving the perirenal space (Figure 1A), and accompanying non-emphysematous, abscessing prostatitis (Figure 1B). He had no fever, tachycardia or tachypnea, white blood cell count (WBC) was 13.9×10^3/L, C-reactive protein (CRP) was 30.0 mg/L. He had a history of traumatic spinal cord injury L3 with intermittent self-catheterization, and arterial hypertension. The identified pathogen was Klebsiella pneumoniae. Despite the urgent need for i.v. antibiotics, the patient dismissed himself from inpatient care on oral Co-Amoxiclav. He did not show up in our hospital for a short-term follow-up appointment.

Discussion and Conclusions

Searching Medline for emphysematous cystitis and cystitis emphysematosa we found 140 articles; among the search results, 106 articles reported a total of 136 cases of EC. We recorded the following information for these cases, using Thomas et al.3 as a reference: patient age, sex, and diabetes status; concurrent emphysematous infections involving other organs; urinary pathogens; white blood cell count (WBC); C-reactive protein (CRP) levels; treatment; imaging modality; and outcome. Incomplete data were allowed.

The mean age of the 136 patients was 67.9±14.2 years (ranging from 11 to 96; the mean age for men was 65.7 years; the mean age for women was 69.3 years). A total of 88 patients were female (61.0%) and 46 were male (33.8%; the sex was not available for 7 patients). A total of 86 patients had diabetes (63.2%); there were 58 diabetic women (69.9%) and 26 diabetic men (56.5%). In 37 cases, plain radiography was used as the diagnostic tool (27.2%); CT (computed tomography) was used in 98 cases (72.0%), ultrasound was used in 9 cases (0.7%), and cystoscopy was used in 5 cases (0.4%). The mean WBC was 13.6±10.7×10^3/L (n=78) and the mean CRP level was 48.0±77.6 mg/dL (n=32) on admission. Concurrent emphysematous infections of other organs were found in 21 patients (15.4%), with emphysematous pyelonephritis being the most common of these infections. The primary pathogen identified from urinary cultures was Escherichia coli (54.4%; Table 1). Patients were mainly treated by conservative management that included antibiotics (n=105; 77.2%) and bladder drainage, with additional glycemic control in diabetic patients. Surgical treatment was reported to be necessary in 11 patients (8.1%), and included cystectomy and nephrectomy in concurrent EP. Ten of the 136 patients with EC died,

| Pathogen                      | No. | %     |
|-------------------------------|-----|-------|
| Escherichia coli              | 74  | 54.4  |
| Klebsiella pneumoniae         | 16  | 11.8  |
| Enterobacter spp.             | 4   | 2.9   |
| Group D Streptococcus        | 2   | 1.5   |
| Enterococcus spp.             | 2   | 1.5   |
| Citrobacter spp.              | 2   | 1.5   |
| Klebsiella aerogenes          | 1   | 0.7   |
| Proteus mirabilis             | 1   | 0.7   |
| Acinetobacter baumannii       | 1   | 0.7   |
| Corynebacterium genitalium    | 1   | 0.7   |
| Candida spp.                  | 1   | 0.7   |
| Aspergillus spp.              | 1   | 0.7   |

Table 1. Patients’ characteristics and pathogens identified in these patients by urinary culture.

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Key words: Pathogens; emphysematous cystitis; mortality; urinary tract infection.

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yielding a mortality rate of 7.4%.

EC is most often found in diabetic women who are in their 6th or 7th decade of life. Consistent with the female predominance of EC, we found a female-to-male ratio of 2.2:1 among the reported EC patients with diabetes; diabetic women showed an incidence rate of 91.5 per 1000 person-years for UTIs in general, whereas the rate was 28 in men. Although most cases of EC are successfully treated by medical management that is built on an appropriate antibiotic regimen, more advanced cases of EC require surgical treatment. With a mortality rate of 7.4%, EC is markedly less life threatening than is EP. Although the pathogenesis of emphysematous UTIs, including EC, is not yet fully understood, gas-producing bacterial fermentation is required. Immunological host defense impairments, such as neurogenic bladder, immunosuppression, and diabetes, favor bacterial colonization of the urinary tract. Additionally, the increased availability of fermentation substrate in diabetic urine makes diabetic patients especially prone to emphysematous UTIs.

Despite the relatively low mortality rate of EC compared with that of EP, a high degree of suspicion must be maintained to facilitate successful and conservative management.

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