

Streptococcus pneumoniae as an agent of urinary tract infection

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Abstract

Introduction. *Streptococcus pneumoniae* is a Gram-positive coccus causing mainly otitis media, community-acquired pneumonia, or even an invasive infections as bacteraemia. Generally, it is not accepted as the agent responsible for urinary tract infection (UTI). The case report describes *S. pneumoniae* isolate from the urine of 63-year-old woman with clinical and bacteriological symptoms of UTI, isolated independently in two bacteriological urine analyses.

Results. The urine analyses showed leucocyturia. No other infections or genitourinary disorders were found. The patient was treated with BISEPTOL (trimethoprim/sulfamethoxazole) at a dose of 160/800 mg, twice a day for five days. After the treatment, the urinalysis showed the absence of the microorganisms in bacteriological evaluation.

Conclusion. *S. pneumoniae* is considered to be a rare pathogen of UTI in adults.

Key words

Streptococcus pneumoniae, UTIs, urinary tract infection, cystitis, pneumococcosuria

INTRODUCTION

Streptococcus pneumoniae is one of the major pathogens of otitis media, pneumonia, meningitis and bacteraemia, including septicaemia [1]. Generally, this bacterial species is not accepted as a potential etiologic agent of urinary tract infections (UTI). The first study presenting the isolation of pneumococci from urine was published in 1980, and described a patient with infection of the urinary tract caused by serotype 3 [2]. The literature is scarce regarding *S. pneumoniae* as the etiological agent of UTI, and the findings are quite controversial.

CASE REPORT

The urine sample was taken from a 63-year-old woman with clinical symptoms of UTI, such dysuria showed as painful urination, without fever, who consulted the first contact family doctor. The patient had not been hospitalized in the last year. No other disorders concerning the infections were found. The urine was streaked on Columbia agar with 5% sheep blood, Chapman agar, MacConkey agar, UTI agar and Sabouraud agar by the Hoeprich method using 10 µl of urine sample. Drug susceptibility was detected on the basis of the European Committee for Antimicrobial Susceptibility Testing (EUCAST) recommendations. The cultivation of throat and nose specimens were also performed. The serotype of *S. pneumoniae* was detected using Quellung reaction.

The study design and protocol study were approved by the Ethical Committee of the Medical University of Lublin (KE-0254/75/2011).

RESULTS

Urinalysis showed leucocyturia (10^3 cells/µL). After incubation, the growth of alpha-haemolytic microorganisms was observed on the Columbia agar. The titer of the microorganism was found to be 10^5 colony forming units per milliliter (CFU/mL). Gram staining showed Gram-positive cocci. Additional tests were performed: latex agglutination test for Slidex Pneumo Kit for rapid identification of *S. pneumoniae*, optochin test and bile solubility test. Susceptibility to optochin with the diameter zone of 20 mm, and the positive result in the bile solubility test established *S. pneumoniae*. Due to the isolation of an unusual uropathogen, the second urine sample was taken after two days, which confirmed the isolation of *S. pneumoniae*. Cultivation of swabs from the throat and nose did not detect *S. pneumoniae*. X-ray of the chest did not show any changes in the lung which could suggest the respiratory tract infections. Susceptibility to antibiotics is shown Table 1.

On the basis of the Quellung reaction, the 22F serotype was detected. The vaccination status of the patient with antipneumococcal vaccine was not known. The patient was

Table 1. The susceptibility of *Streptococcus pneumoniae* isolated from urine

Antibiotics	Susceptibility
oxacillin*	S
erythromycin	S
clindamycin	S
levofloxacin	S
moxifloxacin	S
tetracycline	S
thrimethoprim/sulfamethoxazole	S
vancomycin	S

Legend: *susceptibility to oxacillin interferes with the susceptibility to other beta-lactams antibiotic with anti *S. pneumoniae* activity (e.g. ampicillin, amoxicillin, cefuroxime, ceftriaxone, cefotaxime); S – susceptible

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treated with BISEPTOL (trimethoprim/sulfamethoxazole), 160/800 mg, twice a day for five days. After ten days, as the antibiotic therapy was completed, the urine sample was analyzed and no presence of *S. pneumoniae* was found; the non-significant bacteriuria was detected as isolation of *Enterococcus* spp. 10^2 CFU/mL. The urine analysis did not show any abnormalities.

DISCUSSION

According to bacteriological standards, the bacteriuria is usually diagnosed as the isolation of the microorganisms as $\geq 10^5$ CFU/mL with the coexistence of clinical signs of urinary tract infections, including changes in urinalysis. On the basis of above definition, the described case represents urinary tract infections (UTI), such as cystitis, caused by *S. pneumoniae*. However, the isolation of *S. pneumoniae* from urine is unique [3]. The isolation of pneumococci from urine is established in 0.08% for children and in 0.18% for adults [4]. On the other hand, isolation of this pathogen from urine is difficult, mainly due to low pH – *S. pneumoniae* can only survive for several hours in the environment with pH between 5 – 6 [5]. The obtained positive result is most probably due to the short period between collection of the urine sample and cultivation. Opinions concerning the role of *S. pneumoniae* as the cause of UTI are divergent. Some authors suggest that in children the positive culture is the result of perineal or urogenital sites colonization, probably as the result of contamination with nasopharyngeal secretions via the hands [6, 7, 8]. Earlier data [5] presented unexpected pneumococcosuria in adults, especially in women, quite often with genitourinary disorders in 50% of correlation between presence of *S. pneumoniae* in urine and asymptomatic urinary tract infection. Moreover, the authors suggest that in the absence of systemic infections pneumococcosuria may heal spontaneously without treatment.

The presented patient did not have any genitourinary disorders or any other *S. pneumoniae* infections. The presence of bacteriuria together with leukocyturia and the symptoms of UTI indicated that this microorganism was a potential agent of the infection. The isolated 22F serotype usually expressed susceptibility to antimicrobial drugs, which has been confirmed in the current study. Moreover, in recent years, the infections caused by this serotype have increased significantly [9]. It has to be remembered, that this serotype is not included in the available pneumococcal conjugate vaccine (PCV), but is present in the 23-valent polysaccharide vaccine.

The pathogenesis of pneumococcosuria is unknown. It is well known that due to the immune clearance mechanism of the urinary tract, normally it should be difficult for *S.*

pneumoniae to cause infection. However, abnormality within the urinary tract as the compromised host immune system mechanism may be regarded as a risk factor, as suggested by other authors [10]. Recent studies showed the influence of genetic factors associated with human chemokine receptor 1, Toll-like receptor 4, CD14 and Fc Gamma receptor IIa and susceptibility to pneumococci [11]. The polymorphism in any of the genes encoding the above-mentioned factors may be associated with abnormalities in the urinary tract leading to UTI caused by *S. pneumoniae* [12].

Streptococcus pneumoniae may be considered as rare pathogen of UTI, even in the absence of any disorders, including other pneumococcal infections and the presence of clinical and bacteriological symptoms of urinary tract infections. However, more data are needed to evaluate the involvement of pneumococci in the epidemiology and pathogenesis of UTI.

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