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Original article

Microbiological and clinical characteristics in acute bacterial prostatitis according to lower urinary tract manipulation procedure

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ABSTRACT

We conducted a retrospective analysis of acute bacterial prostatitis (ABP) secondary to manipulation to document clinical features, management and microbiology based on the route of prior manipulation, which can be divided into two subgroups: transrectal and transurethral procedure. The medical records of 158 cases compatible with a confirmed diagnosis of ABP secondary to manipulation from 7 urological centers between 2001 and 2012 were reviewed. When subcategorized according to route of prior manipulation of the lower urinary tract, there were distinct differences between transrectal and transurethral manipulation group with regard to clinical and microbiological features. *Escherichia coli* was the most common causative bacterium in both groups, but *Pseudomonas* spp. were much more dominant pathogens in the group by transurethral manipulation than transrectal manipulation group. The susceptibilities to second-, third- and fourth-generation cephalosporins, amikacin, carbapenem and aztreonam were shown to be very low in the transurethral manipulation group. Therefore, it will take account the difference in antibiotic selection in the patients with ABP secondary to manipulation according to the manipulation route.

1. Introduction

Acute bacterial prostatitis (ABP) is characterized by the presence of rectal, low back and perineal pain, systemic (fever, chills, malaise, nausea and vomiting) and voiding (dysuria, urgerncy, frequency and acute urinary retention) symptoms. A digital rectal examination reveals tender, swollen prostate that is irregularly firm and warm. The urine may be cloudy and malodorous due to a concomitant urinary infection; hematuria may also be observed [1–3].

The etiology of spontaneous ABP includes ascending urethral infection and the reflux of infected urine into the ejaculatory and prostatic ducts. In addition, a history of prior manipulation of the lower urinary tract, such as transrectal prostate biopsy, transurethral surgery or catheterization, is for another cause of ABP. It has been already reported that the clinical pattern and microbiological characteristics of ABP in patients with prior manipulation of the lower urinary tract is different from that of spontaneous ABP [4,5]. However, differences according to the route of the prior manipulation, such as transrectal and transurethral, are not clear yet.

This study attempts to analyze microbiological and clinical characteristics depending on manipulation route in patients with a history of previous manipulation of the lower urinary tract to provide information to assist in the selection of empirical antibiotic therapy.

2. Materials and methods

2.1. Patient selection

Seven urological centers in our institution participated in the study. A retrospective analysis of 759 patients hospitalized at the urological centers between March 2001 and October 2012 for ABP was performed. None of the patients had a history of prostate cancer at the time of diagnosis or at a mean of 24 months after the infection episode. The patients with ABP symptoms such as clinical features (fever, problems of voiding, tenderness on digital rectal examination) and a positive urine culture, or those with compatible signs but with negative urine culture due to a previous course of antibiotics were selected. The cases in which the ABP diagnosis was

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Table 1
Characteristics of acute bacterial prostatitis patients between Lower Urinary Tract manipulation route.

	Total ($n = 158$)	Transrectal manipulation ($n = 69$)	Transurethral manipulation ($n = 89$)[a]	*P*-value
Age	59.91 ± 12.73	59.64 ± 11.93	60.14 ± 13.44	0.510
Symptoms				
Fever[b]	80.4% (127)	89.9% (62)	73.0% (65)	0.027
Pain[c]	57.6% (91)	63.8% (44)	52.8% (47)	0.212
Dysuria	54.4% (86)	44.9% (31)	61.8% (55)	0.041
Retention	37.3% (59)	13.0% (9)	56.2% (50)	0.000
Voiding symptoms	64.6% (102)	51.0% (35)	75.3% (67)	0.005
Storage symptoms	43.7% (69)	46.4% (32)	41.6% (37)	0.561
Initial urinalysis				
Hematuria[d]	73.4% (116)	81.1% (56)	67.4% (60)	0.076
Pyuria[e]	71.5% (113)	62.3% (43)	78.6% (70)	0.040
WBC (10^{-9}/L)	18.68 ± 24.71	19.82 ± 22.67	16.24 ± 25.75	0.492
TRUS (mL)	40.29 ± 25.20	46.50 ± 29.61	34.94 ± 20.88	0.115

WBC, white blood cell; TRUS, transrectal ultrasound.
[a] Catheterization ($n = 40$), Urodynamic study ($n = 27$), Cystoscopy ($n = 14$), TUR-BT ($n = 8$).
[b] Body temperature>37.5 °C.
[c] Suprapubic pain, arthralgia and myalgia.
[d] >4 Red blood cells/high power field.
[e] >4 White blood cells/high power field.

doubtful were excluded. Patients with other causes of febrile urinary tract infection (orchitis, pyelonephritis) were also excluded. Among 607 cases compatible with a confirmed diagnosis of ABP, 158 cases with a history of prior manipulation of the lower urinary tract, such as transrectal prostate biopsy, transurethral surgery or catheterization, were enrolled in the study.

The protocol of the study was first approved by a central ethical committee (Catholic Medical Centre, The Catholic University of Korea College of Medicine, Seoul, Korea, No. PC13RIMI0038) and then by the respective local ethical committees.

2.2. Study variables

Clinical symptoms and a detailed past history were taken together with a physical examination and laboratory investigations. Preoperative antibiotics, treatment parameters and bacteriological results were documented. The clinical features considered were as follows: presenting symptoms (fever, pain, dysuria, retention, voiding); laboratory investigations (urinalysis, white blood cell (WBC) count), preoperative antibiotics, treatment parameters (antibiotic treatment, duration of antimicrobial agents, catheterization); and bacteriological result. Microbial susceptibility and resistance was determined using the agar diffusion method according to the guidelines of the National Committee for Clinical Laboratory Standards [6].

Results were analyzed according to two subgroups; (a) those with transrectal prostate biopsy; and (b) those with transurethral manipulation including catheterization, urodynamic studies, cystoscopy and transurethral surgery performed within 4 weeks before the onset of ABP.

2.3. Statistical analysis

Results (frequency and percentages) were analyzed to characterize all variables using Student's *t*-test, the χ^2 test, and multiple logistic regression analysis. $P < 0.05$ was considered statistically significant.

3. Results

3.1. Initial clinical features

Table 1 shows the initial clinical characteristics of the whole patients and according to the two subgroups. The mean age of population was 59.91 years; 26.0% of the patients had a history of prior manipulation of the lower urinary tract including transrectal prostate biopsy (43.7%, 69/158) and transurethral procedures (56.3%, 89/158). Overall, the patients experienced problems such things as fever (80.4%), voiding symptoms (64.6%), and pain (57.6%). In the group with transurethral manipulation, dysuria, retention of urine and voiding symptoms were significantly more frequent, but fever occurred frequently in the transrectal prostate biopsy group ($P < 0.05$) (Table 1). Table 2 exhibits the distribution of preoperative antibiotics in both groups. The frequency of preoperative antibiotic combinations was higher in the transrectal manipulation group than in the transurethral procedure group (transrectal 47.8%; 33/69 vs transurethral 12.5%; 7/56) ($P = 0.000$, χ^2 test). Second-generation cephalosporins with aminoglycoside were preferred in the transrectal group, and single aminoglycoside was used primarily in the transurethral group.

3.2. Microbiological analysis

Among the isolated pathogens, the most frequent one was *Escherichia coli* (54.6%), followed by *Pseudomonas* spp. and *Klebsiella* spp. Significant differences were noted between the two groups

Table 2
Distribution of preoperative antibiotics before procedure by route of prior manipulation.

	Transrectal manipulation ($n = 69$) *n* (%)	Transurethral manipulation ($n = 56$[a]) *n* (%)	*P*-value
Single therapy			
2nd generation cephalosporin	4 (5.8)	15 (26.8)	0.001
3rd generation cephalosporin	2 (2.9)	1 (1.8)	0.686
2nd generation quinolone	9 (13.0)	2 (3.6)	0.063
3rd generation quinolone	12 (17.4)	3 (5.4)	0.039
Aminoglycoside	9 (13.0)	28 (50.0)	0.000
Total	36	49	
Comibination therapy			
2nd generation cephalosporin + aminoglycoside	20 (29.0)	6 (10.7)	0.012
3rd generation cephalosporin + aminoglycoside	3 (4.3)	1 (1.8)	0.418
2nd generation cephalosporin + quinolone[b]	6 (8.7)	0	–
3rd generation cephalosporin + quinolone[b]	4 (5.8)	0	–
Total	33	7	

[a] Preoperative antibiotics did not be prescribed in 33 patients who underwent catheterization.
[b] Too small number to subdivide according to generations.