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Should Blood Cultures Be Performed for Patients with Acute Prostatitis?▽

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The diagnostic and prognostic values of blood cultures (BC) for 347 acute prostatitis inpatients were evaluated. BC were positive for 21% of patients and contributed to the microbiological diagnosis for 5%. Fever duration, length of hospitalization, use of an antibiotic combination, duration of antibiotic use, and urine bacterial titers increased when BC were positive.

Acute prostatitis (AP) affects approximately 1% of men during their lifetimes and presents with a broad clinical spectrum, from cystitis-like syndromes to severe urosepsis (4). Blood cultures (BC) are still drawn for most patients admitted for AP (4), but their diagnostic and prognostic values have not yet been specifically evaluated. Therefore, we undertook to assess retrospectively a series of inpatients with AP in order to compare the diagnostic and prognostic values of BC for 3 subgroups of patients: those with positive BC, those with negative BC, and those for whom BC were not performed.

Inclusion criteria were as follows: inpatient status, age of ≥18 years, availability of urine culture results, and a final physician-assigned diagnosis of AP. Exclusion criteria were incomplete or missing charts. Urine cultures and BC were analyzed according to the national guidelines (6). Urine cultures were considered positive when bacterial titers were $\geq 10^4$ CFU/ml, contaminated when bacterial titers were $\geq 10^2$ and $<10^4$ CFU/ml, and sterile when cultures were negative, with a detection threshold of 10^2 CFU/ml (5, 6). The number of BC performed corresponded to the number of venous punctures for BC sampling. At each venous puncture for BC sampling, approximately 8 ml of blood was collected in an aerobic vial under aseptic conditions. For most patients, an additional anaerobic vial was drawn during the first venous puncture. BC were considered negative when a coagulase-negative *Staphylococcus* grew from a single puncture. The number of positive BC corresponded to the number of punctures for which a significant pathogen was isolated from at least one vial (aerobic or anaerobic). BC were considered contributory to the microbiological diagnosis if a pathogen different from those isolated in urine (whatever the bacterial titer) was isolated from them, or if BC showed pathogens whereas urine cultures were sterile.

In order to study the prognostic value of BC, univariate analysis was conducted to compare clinical profiles, therapeutic management approaches, and cure rates between patients by using 3 categories of patients: those with positive BC, those with negative BC, and those for whom no BC were performed. The significant parameters identified were then analyzed using multivariate regression analysis. Treatment failure was defined by a positive urine culture at the follow-up consultation after discharge. The statistical analysis was conducted with StatView software, version 5.0 (SAS Institute), using a chi-square test for quantitative data analysis and a Student-*t* test for the comparison of qualitative and quantitative data. The results are expressed as means ± standard deviations. A P value of <0.05 was considered significant.

A total of 347 patients were included in the study. Their demographic and clinical characteristics have been described extensively elsewhere (4). Briefly, the mean age was 61 years (range, 18 to 99 years); 82% of patients were febrile; 80% had urinary symptoms suggestive of urinary tract infection (UTI); 68% had painful prostates at digital rectal examination; and 73% had community-acquired infections.

The global results of the study are presented in Fig. 1. Urine leukocyte counts were significant for 309 patients (89%), and urine cultures were positive for 262 (75%), with 2 or more uropathogenic bacteria identified in 17 cases (7%). Among the 89 patients with negative urine cultures, 47 (52%) had previously received antibiotics. A total of 261 (75%) patients had blood drawn for BC, with a mean of 2.9 BC per patient and a total of 755 BC. Fifty-five patients (21%) had positive BC, with a mean of 1.7 positive BC per patient and a total of 96 positive BC. Among the 659 sterile BC, 158 (24%) were performed after the antibiotic treatment had been initiated.

The microbiological diagnosis was influenced by the results of BC for 14 (5%) of the 261 patients for whom BC were performed (Table 1). For 10 patients, uropathogenic bacteria were isolated from the BC (5 patients with *Escherichia coli*, 1 with *Klebsiella*, 1 with *Pseudomonas*, 1 with *Enterococcus*, and 2 with other *Enterobacteriaceae* isolates), whereas the corresponding urine cultures were sterile. For 4 patients, the bacteria isolated from the BC (1 *Proteus*, 1 *Klebsiella*, 1 *Enterococcus*, and 1 *Enterobacter* isolate) were different from those isolated from the urine cultures. For 1 of these 4 patients, 2 pathogens were isolated from the urine culture (an *E. coli* strain at 10^4 CFU/ml and an *Enterococcus* strain at 10^2 CFU/ml), whereas a *Proteus* strain was isolated from the BC. All 14 patients with BC contributory to the microbiological diagnosis had significant leukocyturia, had community-acquired infec-

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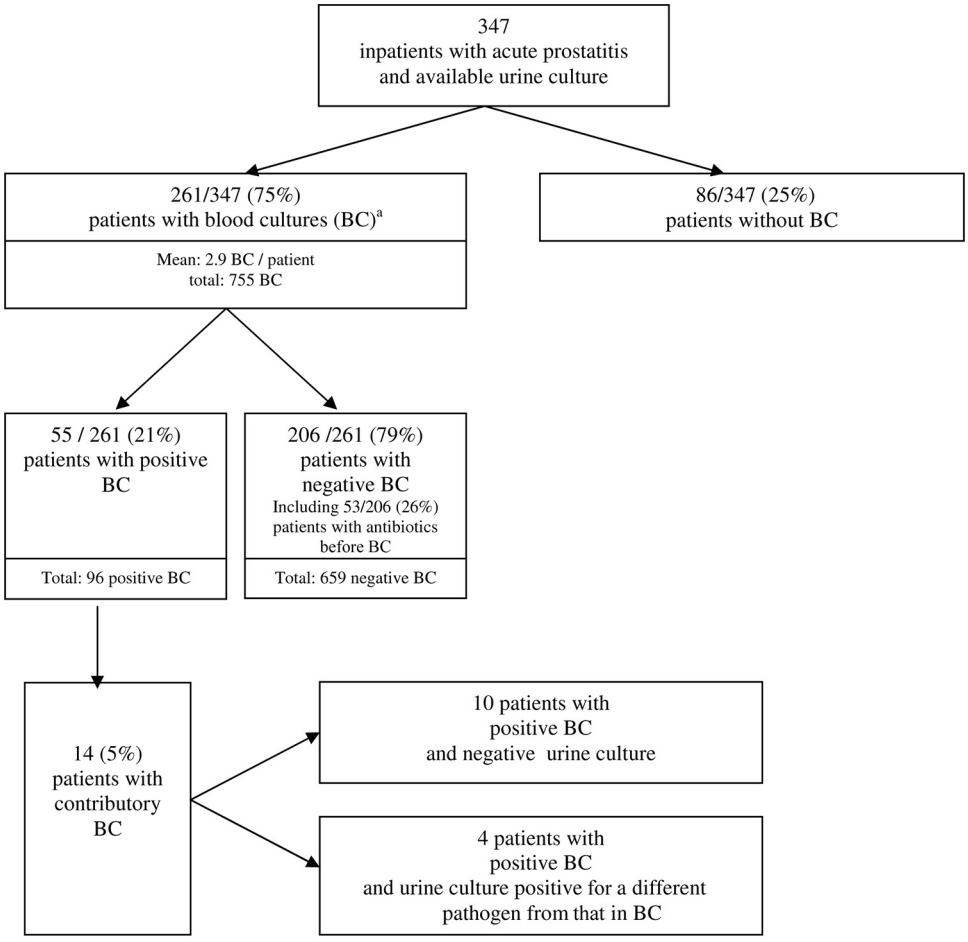

FIG. 1. Global results of the study.

tions, and received a combination of antibiotics. Thirteen patients were febrile (median temperature, 39.2°C [range, 37.7 to 40.3°C]), and 11 had chills. These 14 patients were compared to those with noncontributory BC for the following criteria: department of admission, number of comorbidities, age, urine drainage, temperature, chills, C-reactive protein (CRP) rate, antibiotic treatment before urine or blood culture, and number of microorganisms in urine culture. After logistic regression analysis, only a temperature above 38.4°C (101.1°F) at admission was significantly predictive of a contributory BC.

TABLE 1. Pathogens recovered from urine cultures versus those recovered from the blood cultures performed for 261 patients

Pathogen recovered from urine culture	No. of isolates (% of total isolates) recovered from urine cultures	No. of isolates (% of total isolates) recovered from blood cultures							
		Escherichia coli (n = 36)	*Klebsiella* (n = 4)	*Proteus* (n = 3)	Other *Enterobacteriaceae* (n = 0)	*Pseudomonas aeruginosa* (n = 3)	*Enterococcus* (n = 3)	Other species (n = 6)	None (n = 206)
E. coli	125 (48)	31[a]	0	1[b]	0	0	1[b]	0	92 (34)
Klebsiella	10 (4)	0	2[a]	0	0	0	0	0	8 (4)
Proteus	6 (2)	0	0	2[a]	0	0	0	0	4 (2)
Other *Enterobacteriaceae*[c]	9 (3)	0	0	0	0[a]	0	0	1[b]	8 (4)
P. aeruginosa	9 (3)	0	0	0	0	2[a]	0	0	7 (3)
Enterococcus	4 (2)	0	0	0	0	0	1[a]	0	3 (1)
Other species	10 (4)	0	1[b]	0	0	0	0	4[a]	5 (2)
None	89 (34)	5[b]	1[b]	0	0	1[b]	1[b]	2[b]	79 (38)[a]

[a] For these patients, the pathogens isolated from BC were similar to those isolated from urine cultures.
[b] For these patients, the BC contributed to the microbiological diagnosis (10 patients with sterile urine cultures and positive BC; 4 patients with pathogens isolated from BC different from those isolated from urine cultures).
[c] Species recovered included *Enterobacter* spp. (n = 3), *Serratia* spp. (n = 2), *Citrobacter* spp. (n = 2), and *Providencia* spp. (n = 2).

TABLE 2. Multivariate analysis of prognostic factors[a]

Prognostic factor	Value for patients					
	Patients with:		*P* (positive BC vs negative BC)	Patients with:		*P* (BC performed vs no BC)
	Positive BC (*n* = 53)	Negative BC (*n* = 208)		BC performed (*n* = 261)	No BC (*n* = 86)	
Duration (days)						
Fever	3.7 ± 2.2	2.88 ± 2	<0.001	3 ± 2.2	1.4 ± 1.7	<0.001
Hospital stay	10.3 ± 10	9.2 ± 8	0.05	9.5 ± 8.9	9.2 ± 9.8	0.02
Antibiotic treatment	42 ± 27	33 ± 23	0.05	34.3 ± 8.9	29.7 ± 22	0.03
Bacteriological failure rate[b]	3/24 (13)	9/78 (12)	>0.9	12/102 (11)	2/33 (6)	0.5
Death rate (no. dying/total no. [%])	2/53 (4)	7/208 (3)	0.9	9/261 (3)	3/86 (3)	>0.9

[a] For 347 patients with urine cultures.
[b] Calculated as the number of patients with bacteriological treatment failure/number of patients for whom urine cultures were available at follow-up (percentage of patients with bacteriological failure).

Based on univariate analysis, the mean ages, temperatures, numbers of patients with chills, and CRP values were not significantly different among the 3 categories of patients (positive BC, negative BC, BC not performed). In contrast, results with respect to the duration of fever, length of hospitalization, use of antibiotic combinations, duration of antibiotic treatment, rate of bacteriological failure at follow-up, and death rate differed among the 3 categories of patients. Using multivariate regression analysis (Table 2) conducted with the latter 5 parameters (i.e., excluding duration of fever), positive BC were statistically correlated with fever duration. The average urine bacterial titers were higher for patients with positive BC (4.2 ± 1.5 log CFU/ml) than for patients with negative BC (3.4 ± 1.6 log CFU/ml [*P*, 0.05]), and higher than for patients with no BC performed (3 ± 1.6 log CFU/ml [*P*, 0.05]).

AP is usually considered more difficult to diagnose and to treat than acute uncomplicated pyelonephritis (APN) in women. Urine cultures are inconsistently positive in AP (60 to 85%) according to different studies using the same 10^4-CFU/ml cutoff for bacteriuria (2, 4). Microbiological failure rates are higher for urinary tract infections in men (25%) than for uncomplicated APN in women (15%) (5). Therefore, BC could theoretically be useful both for diagnosis when pathogens are not cultured from urine and for prognosis by recognizing patients at a higher risk of a severe outcome. In uncomplicated APN, different studies established that BC should not be performed routinely (3, 7), because though commonly positive (20 to 30%), they rarely (2%) contribute to the microbiological diagnosis, and they do not represent an unfavorable prognostic factor. Thus, recent guidelines recommend against performing BC for uncomplicated APN (1).

In this study, BC were positive at a rate very similar (20%) to that observed in studies of APN but contributed more frequently to the microbiological diagnosis (5% of the patients). It can be argued that this 5% rate is low and that BC are not cost-effective. However, at an individual level, there were some benefits. BC led to microbiological diagnoses for 10 patients whose urine cultures were sterile. For 4 other patients, the organisms recovered from BC differed from the organisms recovered from urine cultures, because of obvious anomalies in the urine sampling (several pathogens in the culture for 3 patients; *Gardnerella vaginalis* in the culture for the 4th patient). To decrease the number of unnecessary BC, we searched for clinical or biological criteria that would help in screening the patients whose BC would have contributed to the diagnosis. We found that BC were always sterile when patients had previously received antibiotics and that a temperature above 38.4°C (101.1°F) was predictive of positive BC. If performed only for patients whose fever was >38.4°C (*n* = 233) and who did not receive antibiotics before BC sampling, BC would have contributed to the diagnosis for 14/186 patients (8%). Positive BC were associated with higher fevers, more-frequent chills, longer fever durations, and higher urine bacterial titers, but not with older ages or higher numbers of comorbidities. Hence, positive BC might reflect high-bacterial-density infections. This raises the question of whether AP with high bacterial densities should be managed differently. At the initial phase of AP, the treatment should be guided by the severity of the symptoms, but during this period, the results of BC are still pending. Whether the antibiotic treatment should be extended subsequently because of positive BC remains questionable. In fact, in our series of patients, those with positive BC received longer antibiotic treatments (42 days, versus 33 days for patients with sterile BC). The link between positive BC, longer hospital stays, and intensified antibiotic treatments is difficult to analyze retrospectively. Was the treatment reinforced because of the BC results or because of the clinical condition? Although antibiotic combinations were more frequently administered to patients with positive BC than to those with negative BC, fever duration was correlated with positive BC. This fact suggests that BC might really have prognostic value for the management of AP patients. Other studies with prospective collection of data, in order to better define the diagnostic and prognostic values of BC in AP management, are warranted. Pending such results, we would recommend drawing BC at least for AP inpatients with high fevers who have not yet received antibiotic treatment.

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