No. 1035 Differentiation between True Infection and Contamination of Coagulase-Negative Staphylococci by Developing a Prediction Rule

Takahisa Fujino, MD, Takahiro Matsuo, MD, Mahbubur Rahman, MD, PhD, MPH, Nobuyoshi Mori, MD,
St. Luke's International Hospital, Tokyo, Japan

St. Luke's International Hospital
9-1 Akashi-cho, Chuo-ku, Tokyo
Japan 104-8560
Tel (+81) 3-3541-5151
Fax (+81) 3-3544-0649
e-mail : tafu@luke.ac.jp

Introduction

- ❏ Coagulase-negative staphylococci (CoNS) are one of the most common contaminant microorganisms isolated from blood cultures (BCs)[1].
- ❏ It is often difficult to determine whether it is true infection (TI) or contamination.

Objectives

- ❏ To investigate clues that differentiate TI from contamination.
- ❏ To develop a prediction rule.

Materials and Methods

Design: Retrospective cohort study

Setting: St. Luke's International Hospital ,Tokyo, Japan
(520-beds, tertiary-level community teaching hospital)

Study period: April 2004 – July 2017

Exclusion: Patients with polymicrobial infection and patients who were less than 18 years old.

Definition: We defined the TI on the following criteria.
1) Patients with persistent bacteremia due to CoNS
2) BCs that were positive more than 2 sets
3) Patients with foreign body 28 days before taking BCs.
We defined remaining patients as contamination

Methods: Demographic, clinical, microbiological and outcome data were analyzed to differentiate TI from contamination.

Statistical analysis:
- ❏ Bivariate associations were assessed using chi-square test or Fisher's exact test for categorical variables and Student t test for continuous variables.
- ❏ Multivariable analysis was carried out using logistic regression procedure. All tests were two-sided and a p value <.05 was used to indicate statistical significance.

Results

1. Baseline Characteristics

	TI (N=201)	Contamination (N=726)	P value
Age, mean (SD)	69.7 (17)	68.7 (17.1)	.471
Sex, n (%)			.728
male	116 (57.7)	409 (56.3)	
female	85 (42.3)	317 (43.7)	
BMI, mean (SD)	21.0 (4.4)	21.7 (4.5)	.082
BCs collection location, n (%)			< .001
General wards	131 (65.2)	311 (42.9)	
Unit	70 (34.8)	414 (57.1)	
Inpatient vs Outpatient, n (%)			< .001
Inpatient	482 (66.4)	170 (84.6)	
Outpatient	244 (33.6)	31 (15.4)	
Malignant tumor, n (%)	82 (40.8)	210 (28.9)	.001
Steroid use in 90 days, n (%)	68 (33.8)	181 (24.9)	.012
Chemotherapy in 90 days, n (%)	31 (15.4)	74 (10.2)	.038
CVC, n (%)	101 (50.3)	236 (32.5)	< .001
quick SOFA, n (%)			.809
Positive	98 (48.8)	347 (47.8)	
Mortality in 30 days, n (%)	35 (17.4)	96 (13.2)	< .001
Mortality in 90 days, n (%)	56 (27.9)	149 (20.5)	.027
Time to positivity, n (%)			< .001
< 24 hours	81 (40.3)	121 (16.7)	
24-48 hours	103 (51.2)	454 (62.5)	
> 48 hours	17 (8.5)	151 (20.8)	

2. Multivariate Analysis & Prediction rule of CNS true infection.

		OR (95%CI)	P value	Point
TTP (h)	>48	Reference		0
	24-48	1.93 (1.11-3.36)	.019	2
	<24	4.83 (2.68-8.68)	<.001	5
BCs collection location	Unit	Reference		0
	General wards	2.21 (1.58-3.10)	<.001	2
CVC	(-)	Reference		0
	(+)	1.91 (1.37-2.66)	<.001	2

3: Ability of prediction rule.

Cutoff point	Sensitivity	Specificity	LR+	LR-
2 >	98.5%	8.82%	1.80	0.17
4 >	83.1%	43.4%	1.47	0.39
7 ≦	32.8%	87.6%	2.65	0.77
9 ≦	18.9%	96.6%	5.49	0.84

Discussion

- ❏ To the best of our knowledge, this is the first study to make the useful prediction rule differentiating TI from contamination.
- ❏ **Previous studies showed that TTP was a useful factor to differentiate TI from contamination.** In theory, larger amount of bacteria will grow faster than smaller amount of bacteria4). Result of this study is consistent with past studies[2].
- ❏ Location of blood collection identified as a predictor for differentiating TI and contamination is new. **In this study, contamination was more often in unit than in general ward.**
- ❏ This result was due to difference of source of culture. In unit, patients had more intravascular catheter (CVC, PICC, A-line), and at least one of the BC was drawn from intravascular catheter to diagnose catheter-related blood stream infection (CRBSI). Because of colonization of CVC, BCs drawn from CVC has lower positive predictive value than percutaneous cultures[3].
- ❏ Presence of CVC is also identified as a predictor for TI in this study. This is also consistent with past studies[4].
- ❏ Prediction rule developed in this study seems to be meaningful in the clinical situation. If score is 0 point, it is acceptable for clinicians not to use antibiotics, and if score is 7 points or more, using antibiotics is reasonable. **These findings may lead to a reduction in inappropriate antibiotic use.**

Conclusion

- ❏ Time to positivity, location of blood collection and the presence of CVC were associated with true infection.
- ❏ The prediction rule developed in this study can be useful for clinicians for making decision whether to use antibiotics or not.

References

[1] Wisplinghoff H, et al. Clin Infect Dis. 2004 1;39(3):309-17.
[2] Kassis C,et al. J Clin Microbiol 2009;47(10):3255–60.
[3] DesJardin JA et al. Ann Intern Med 1999;131(9):641–7.
[4] Silva HL, et al. Braz J Infect Dis 2000;4(6):271–4.