

Venous catheter placed in patients from intensive care unit

Cledja Amorim¹, Olga Fischman¹, Arnaldo Colombo², Sinaida Martins³, Giovana Von Konell¹.

¹ Department of Microbiology and Immunology, UNIFESP/EPM, São Paulo, Brasil.

² Division of Infections Disease- UNIFESP/ EPM, São Paulo, Brasil.

³ Control Commission of Hospital Infection- UNIFESP/ EPM, São Paulo, Brasil.

INTRODUCTION

Infection is the most frequent complication associated with intravenous central catheterization (CVC) contributing to a high rate of morbidity and mortality in hospitalized patients, particularly among inpatients in intensive care unit (ICU)^{1,2,3,4,5}.

The three most common causes of catheter-related bloodstream infection are *Staphylococcus epidermidis*, *S. aureus* and *Candida albicans*⁶.

Despite the paucity of published studies on the pathogenesis of catheter-related fungemia, it seems reasonable to discuss mechanisms of fungal infection according to the models that have been proposed to explain catheter-related bacteremia. Thus far, the site care during the catheter insertion and thereafter by healthcare workers, and the skin colonization appear to be potential sources for fungal infections.

The aim of this study was to evaluate the yeast colonization rate of skin peri-insertion and short term CVCs among ICU patients in São Paulo hospital-Brazil.

MATERIAL AND METHODS

Specimen collection and culturing of clinical isolates: From August 1998 to April 1999, all patients admitted at 2 ICU in period of 72h and 48h of insertion CVC of the São Paulo Hospital (São Paulo, Brazil) were prospectively evaluated from the moment of insertion up to discharge or death. Clinical and epidemiologic data were systematically recorded in a worksheet.

Samples for cultures were obtained by swabbing, every 72h, different sites of the extracutaneous catheter: hub, catheter connection (faucet) and skin peri-insertion of CVC. Semi-quantitative cultures were performed on plates of Sabouraud dextrose agar plus chloramphenicol.

Definitions: Colonization of skin peri-insertion of CVC and CVC: growth of one or more colony-forming units (cfu) of *Candida* spp in cultures obtained from the mentioned sites. **Infection of skin peri-insertion:** presence of skin inflammatory signs at the exit site of CVC along with a semi-quantitative culture exhibiting >15 cfu of *Candida*². **Systemic infection related to CVC:** septic patient having a blood culture positive for *Candida* sp, collected by peripheral vein, along with >1000 cfu *Candida* sp on the CVC tip quantitative culture¹.

Yeast identification – yeast isolates were subcultured onto Chromagar *Candida* to ensure viability and strain purity. After that, yeasts were identified by classical method based on micromorphology characters and biochemical tests.

Susceptibility testing: antifungal susceptibility testing of samples isolated from catheter tip culture was performed using the NCCLS (M27-T) reference broth microdilution test.

Statistical analysis: risk factors for catheter colonization/infection were identified by univariate analysis performed by stepwise logistic regression analysis. Variables with *P* values below .10 were included.

RESULTS

TABLE 1 - RATE OF YEAST POSITIVE CULTURES AND DISTRIBUTION OF SPECIES ACCORDING TO THE DIFFERENT SITES EVALUATED.

Site	Positive samples N°	<i>C. albicans</i>	<i>C. tropicalis</i>	<i>C. parapsilosis</i>	<i>C. glabrata</i>	<i>C. guilliermondii</i>
Skin	35	23	8	-	5	1
Hub	14	6	1	3	4	-
Faucet	3	1	1	-	1	-
Tip	7	4	1	-	-	2
Total	59	34	12	3	10	3

TABLE 2 - Candida INFECTIONS RELATED TO CVC

Infection's Site	N°	<i>C. albicans</i> N°	<i>C. tropicalis</i> N°	<i>C. glabrata</i> N°
Superficial	8	2	5	1
Systemic	1	1	-	-
total	9	3	5	1

TABLE 3 - LABORATORY FINDINGS OF CVC TIP CULTURE POSITIVE FOR Candida spp.

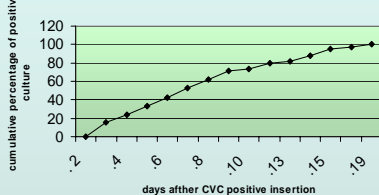
Patient's initial	N° colonized tips	Colony forming unity plate	Yeast species	Candidemia*
SGM	01	12 x 10 ⁷	<i>C. albicans</i>	No
OKJ	01	5.2 x 10 ⁷	<i>C. albicans</i>	No
HID	01	2 x 10 ⁶	<i>C. albicans</i>	Yes
MIV	01	8 x 10 ⁷	<i>C. albicans</i>	No
GMQ	01	0.4 x 10 ⁹	<i>C. guilliermondii</i>	No
DRS	01	0.8 x 10 ⁹	<i>C. tropicalis</i>	No
	01	8 x 10 ⁹	<i>C. guilliermondii</i>	No

* All patients had blood cultures collected by peripheral vein up to 48h before or after the removal of the central venous catheter.

TABLE 4 - RISK FACTORS FOR CVC COLONIZATION IDENTIFIED BY UNIVARIATED ANALYSIS

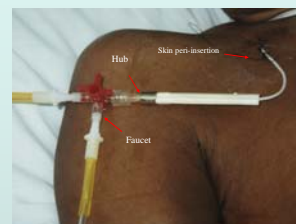
Variable	OR	P
Hospitalization time	1.1315	0.0003
Time of catheterization	1.1315	0.0003
Catheter's kind (lumen double)	3.6781	0.0588
NPP administration	0.2662	0.0523
Via of vein access (jugular vein)	4.5852	0.0018

Colonization of CVCs by Candida spp according to the time of CVC insertion *



* cumulative data considering only positive cultures the cumulative curve was performed based on data of CVC

External sites of collection



CONCLUSIONS

- 1 - A high incidence of catheter colonization caused by *Candida* spp (20%) was documented among critical patients submitted to central venous catheterization.
- 2 - About 50% of CVC colonization episodes had the first culture positive for *Candida* spp identified before 7 days of CVC use.
- 3 - The species distribution of *Candida* spp. identified during CVC colonization/infection episodes was *C. albicans* (54%), *C. tropicalis* (19%), *C. glabrata* (16%), *C. parapsilosis* (5%), *C. guilliermondii* (5%).
- 4 - Hospitalization period, time of catheterization, lumen double catheter, via of vein access (jugular vein) and NPP administration were all identified as risk factors for CVC colonization in a univariate analysis.
- 5 - Positive CVC quantitative culture for *Candida* spp may be not associated with candidemia.

REFERENCES

1. CERCENADO, E.; ENA, J.; RODRIGUEZ-CRÉIXEMS, M.; ROMERO, I.; BOUZA, E. – Conservative procedure for the diagnosis of catheter related infections. *Arch. Intern. Med.*, 159: 1417 – 1420, 1990.
2. CLERI, D.G.; CORRADO, M.L.; SELIGMAN, J. – Quantitative cultures of intravenous catheter and other intravascular inserts. *J. Infect. Dis.*, 141: 781 – 786, 1980.
3. NETTLEMAN, M.D. – The global impact of infection control. In: Wenzel, R.P. – *Prevention and Control of Nosocomial Infections*. 3 ed., Baltimore, Williams & Wilkins, 13 – 20, 1993.
4. RUBINSTEIN, E.; GREEN, M.; MODAN, M.; AMIT, P.; BERNSTEIN, L.; RUBINSTEIN, A. – The effects of nosocomial infection on the length and cost of hospital stay. *J. Antimicrob. Chem.*, 9: 93 – 100, 1982.
5. WENZEL, R.P.; THOMPSON, R.L.; LANDRY, S.M.; RUSSEL, B.S.; MILLER, P.J.; PONCE DE LEON, S.; MILLE, G.B. – Hospital acquired infections in intensive care unit patients: an overview with emphasis on epidemics. *Infect. Control*, 4: 371 – 375, 1983.
6. WEY, S.B. & COLOMBO, A.L. – Fungal infections of catheter. In: SEIFERT, H.; JANSEN, B.; FARR, B.M. *Catheter-related infections*. New York, 6: 139 – 157, 1997.