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**Influence of tracheostomy on the incidence of catheter-related bloodstream
infection in the catheterization of jugular vein by posterior access**

Leonardo Lorente¹, MD, PhD;
Alejandro Jiménez², PhD;
Isabel Roca¹, MD;
María M. Martín¹, MD, PhD;
María L. Mora¹, MD, PhD

¹Intensive Care Unit and ²Research Unit
of the Hospital Universitario de Canarias (Tenerife, Spain).

Author responsible for correspondence:

Leonardo Lorente.
Intensive Care Unit.
Hospital Universitario de Canarias.
Ofra s/n. La Cuesta.
La Laguna. 38320. Santa Cruz de Tenerife.
Spain.
Tel: 00-34-22678381.
Fax: 00-34-22647112.
e-mail: lorentemartin@msn.com

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ABSTRACT

There is not data about the influence of tracheostomy in the incidence of catheter-related bloodstream infection (CRBSI) on the catheterization of the jugular vein by posterior access and there are no recommendations relating to this circumstance in the guidelines of the Centers for Disease Control and Prevention (CDC) and of Healthcare Epidemiology of America/Infectious Diseases Society of America (SHEA/IDSA) for the prevention of CRBSI. The novel finding of this observational study was that there was a higher incidence of CRBSI in the catheterization of jugular vein by posterior access in patients with tracheostomy than without it (13.24 vs 0 episodes of CRBSI per 1,000 catheter-day; Odds Ratio = 23.92; 95% CI = 1.86-infinite; $p = 0.008$). Thus, the presence of tracheostomy is a risk factor of CRBSI on the catheterization of jugular vein by posterior access.

INTRODUCTION

The incidence of catheter-related bloodstream infection (CRBSI) has been extensively studied [1-8]. In some studies the presence of tracheostomy was found as a risk factor of catheter-tip colonization [1,2] and a risk factor of CRBSI [3,4] in the catheterization of the jugular vein by central access and of the subclavian vein. However, there is not data about the influence of tracheostomy on the incidence of CRBSI in the catheterization of the jugular vein by the posterior access.

Besides, in the guidelines for the prevention of intravascular catheter-related infection of Centers for Disease Control and Prevention (CDC) published in 2002 [9] and in the guidelines of Healthcare Epidemiology of America/Infectious Diseases Society of America (SHEA/IDSA) published in 2008 [10], there were no recommendations regarding to this circumstance. Thus, the objective of this study was to determine the influence of tracheostomy on the incidence of CRBSI in catheterization of the jugular vein by the posterior access.

METHODS

A prospective observational four-year study was carried out in the Intensive Care Unit of the University Hospital of the Canary Islands (Tenerife, Spain). We included all patients undergoing to the catheterization of the jugular vein by the posterior access. The study was approved by the institutional review board, which waived the need for informed consent.

The choice of the venous access and the decision to remove the catheter were made by the patient's physician. The catheters were removed using sterile technique by

an ICU nurse. The distal 5-cm segment of the catheters was cut with sterile scissors, placed in a sterile transport tube and cultured using the semiquantitative method described by Maki et al [11]. Microbiological surveillance during ICU-stay included twice weekly cultures of urine, tracheal aspirate and wounds.

CRBSI was defined according to the following criteria: positive blood culture obtained from a peripheral vein, and signs of systemic infection (fever, chills, and/or hypotension), with no apparent source of bacteremia except central venous catheter, and catheter-tip colonization (growth of a microorganism >15 colony-forming units from the central venous catheter tip) with the same organism as in blood culture (the same species with identical antimicrobial susceptibility).

Statistical analyses were performed with SPSS 12.0.1 (SPSS Inc., Chicago, IL), LogXact 4.1 (Cytel Co., Cambridge, MA) and StatXact 5.0.3 (Cytel Co., Cambridge, MA). Continuous variables are reported as means and standard deviations and categorical variables as frequencies and percentages. We compared continuous variables between groups using Wilcoxon-Mann-Whitney test and categorical variables using Kruskal-Wallis test for singly ordered RxC tables. We used Poisson regression logistic analysis for the comparison of CRBSI incidence per 1000 catheter-days between groups. The magnitude of the effect is expressed as Odds Ratio (OR) and its 95% confidence interval (95% CI). A P-value less than 0.05 was considered as statistically significant.

RESULTS

We found two CRBSI in 16 catheterizations with tracheostomy during 151 catheter-days, and none CRBSI in 153 catheterizations without tracheostomy during

1,496 catheter-days. There were no significant differences between patients with and without tracheostomy in age, sex, APACHE-II, diagnosis group, order of catheter insertion, use of mechanical ventilation, use of antimicrobials, use of total parenteral nutrition, and duration of the catheter (Table 1).

Poisson regression analysis showed a higher incidence of CRBSI in patients with tracheostomy than without tracheostomy (13.24 vs 0/1,000 catheter-day; **Odds Ratio=23.92; 95% CI=1.86-infinite; p=0.008**).

The microorganisms responsible for the two CRBSI were: one coagulase-negative staphylococci and one *Staphylococcus aureus*.

In both cases of CRBSI there was not found criteria of respiratory infection. We did not find any bacteremia with the same microorganism in tracheal aspirate and catheter tip.

DISCUSSION

The novel finding of our study was that the incidence of CRBSI on the catheterization of jugular vein by posterior access was higher in patients with tracheostomy than without it.

This finding is in harmony with the results of previous studies reporting that the presence of tracheostomy is a risk factor of catheter-related infection during the catheterization of high venous access [1-4]

Some limitations of our study should be recognized. There was not randomization in respect to the site of catheterization. We did not recorded data in relation to the specific experience of each operator in central venous catheter insertion and the training of nursing staff performing catheter and the tracheostomy care. There

were not used molecular techniques to genetically relate the microorganism isolated from the catheter, the peripheral vein blood culture and the tracheal aspirate. Approximately the 80% of both groups of patients received antibiotics and it is possible that in some patients the respiratory cultures were negative due to the suppressive effect of concurrent antibiotic therapy. Finally, the confidence intervals were very broad, probably due to the small numbers, but nevertheless the results were statistically significant.

In conclusion, the presence of tracheostomy is a risk factor of CRBSI on the catheterization of jugular vein by posterior access.

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Table 1. Characteristics of patients undergoing to catheterization of jugular vein by posterior access with and without tracheostomy.

Characteristics	Posterior access of jugular vein without tracheostomy (n=153) (1496 d)	Posterior access of jugular vein with tracheostomy (n=16) (151 d)	<i>P</i>
Age – years (mean ± SD)	58.02±16.61	57.62±18.10	0.93
Male sex – no. (%)	85 (55.6)	9 (56.3)	0.99
APACHE-II – score (mean ± SD)	14.00±5.27	13.94±4.75	0.96
Diagnosis group – no. (%)			0.95
· Cardiology	32 (20.9)	4 (25.0)	
· Respiratory	28 (18.3)	3 (18.8)	
· Digestive	10 (6.5)	1 (6.3)	
· Neurological	38 (24.8)	3 (18.8)	
· Traumatology	39 (25.5)	5 (31.3)	
· Intoxication	6 (3.9)	0 (0)	
Order of catheter insertion – no. (%)			0.88
· First	121 (79.1)	12 (75.0)	
· Second	26 (17.0)	3 (18.8)	
· Third	6 (3.9)	1 (6.3)	
Use of mechanical ventilation– no. (%)	117 (76.5)	12 (75.0)	0.99
Use of antimicrobials– no. (%)	118 (77.1)	13 (81.3)	0.99
Use of total parenteral nutrition– no. (%)	22 (14.4)	2 (12.5)	0.99
Reason for catheter removal – no. (%)			0.96
· Death	21 (13.7)	2 (12.5)	
· Suspicion of catheter-related infection	14 (9.2)	2 (12.5)	
· Change with guidewire due to longer need	19 (12.4)	2 (12.5)	
· No longer needed	95 (62.1)	10 (62.5)	
· Accidental removal	4 (2.6)	0 (0)	
Duration of the catheter – days (mean ± SD)	9.78±3.45	9.44±3.81	0.71
CRBSI – no. (%)	0 (0)	2 (12.5)	0.008
Number CRBSI/1000 catheter-day	0	13.24	0.008

CRBSI: catheter-related bloodstream infection