

Central Venous Catheters and Catheter Locks in Children With Cancer: A Prospective Randomized Trial of Taurolidine Versus Heparin

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Background. To determine if the catheter lock taurolidine can reduce the number of catheter-related bloodstream infections (CRBSI) in pediatric cancer patients with tunneled central venous catheters (CVC). **Procedure.** During a study period of 34 months, 129 newly placed tunneled CVCs in 112 patients were randomly assigned to standard lock with heparin solution or experimental lock with a taurolidine solution (ClinicalTrials.gov Identifier NCT00735813). **Results.** Sixty-five CVCs were included in the standard group and 64 CVCs in the experimental group. The groups were comparable regarding patients' characteristics. A total number of 72 bloodstream infections of which 33 were CRBSIs were observed during 39,127 CVC-days. A lower rate of CRBSI (0.4 per 1,000 CVC-days) was observed in the experimental arm compared with the standard arm (1.4 per 1,000 CVC-days, incidence rate ratio

(IRR) = 0.26; 95% confidence interval (CI) 0.09–0.61; $P = 0.001$). A lower rate of total bloodstream infections (1.2 per 1,000 CVC-days) was also observed in the experimental arm compared with the standard arm (2.5 per 1,000 CVC-days, IRR = 0.49; 95% CI 0.29–0.82; $P = 0.004$). Median interval from catheter insertion until first CRBSI was significantly lower in the standard group (156 days, range 12–602) compared with the experimental group (300 days, range 12–1,176; $P = 0.02$). Premature removal of the CVC due to infection and overall CVC survival were similar in the two study groups. **Conclusion.** Locking of long-term tunneled CVC with taurolidine significantly reduces catheter-related bloodstream infections in children with cancer. *Pediatr Blood Cancer*
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Key words: catheter lock; catheter-related bloodstream infections; central venous catheter; pediatric; taurolidine

INTRODUCTION

Central venous catheters (CVC) are an inevitable part of the treatment of children with cancer. Although these catheters have been made to reduce the risk with catheter-related infections (CRI), there is a major risk factor of bloodstream infections (BI).^{1–4} Even so, there seems to be little knowledge about how a CVC is inserted into a patient. Several things in a catheter can be very difficult to control and are likely to increase the number of inserted CRBSI.^{5,6}

There is a clear need to lock the catheter to prevent clotting when the catheter is not in use although heparin may influence the growth of bacteria and the heparin resistance (H). A CVC lock with low blood protein/antibiotic solution lock is the best choice in preventing CRBSI, but it is not routinely recommended due to the risk of reducing immune responsiveness (IR).⁷

Taurolidine is derived from the naturally occurring amino-sugars and isomeric and isomultimeric (IM). Taurolidine and its active isomers exhibit an action that is not only gram but also binds with the protein part of the bacterial cell wall and thereby interferes with cell wall synthesis and probably also with cell wall synthesis (CWS). Taurolidine has also been reported to have anti-infective properties (IT) and may reduce heparin resistance (H).⁸ The substance has shown a broad spectrum of antimicrobial activity against both gram-positive and gram-negative bacteria as well as fungi. Taurolidine used as a catheter lock has shown efficacy in preventing CRBSI in adult patients (IT).⁹ This non-randomized study of the use of taurolidine as a catheter lock in children with cancer reduced the rate of gram-positive bloodstream infections (BI), the overall inserted catheter-related bloodstream infections (CRI) has been reported.¹⁰

We report the results of a prospective, randomized, controlled open-label study in which CVCs locked with a taurolidine solution were compared to CVCs locked with a standard heparin solution.

PATIENTS AND METHODS

Patients

The study was conducted at the Department of Pediatrics at Aarhus University Hospital, which is a tertiary referral center for pediatric hematology and oncology. Patients in Denmark, Norway, and Sweden were included from April 2008 to December 2010. The follow-up time was up to August 2012.

Patients in general eligibility were as follows: pediatric patients aged 0–18 years who suffered from an oncologic disease and who required a tunneled CVC. Patients were included if they were transferred to another department where admission to the protocol could not be guaranteed.

Additional Supporting Information may be found in the online version of this article.

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