Ethanol locks in the prevention and treatment of catheter-related bloodstream infections
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CRD summary
This review concluded that preventive ethanol locks decreased the rates of catheter-related bloodstream infection and catheter removal, and ethanol lock treatment appeared to be efficacious alongside systemic antibiotics. The potential for publication bias, poor design of most of the included studies, and lack of validity assessment, mean that the authors’ conclusions may not be reliable.

Authors’ objectives
To evaluate ethanol lock cleansing for the prevention and treatment of catheter-related bloodstream infection.

Searching
PubMed was searched for English-language studies published up to January 2013; search terms were reported. Relevant articles were checked for further studies.

Study selection
Primary studies, with more than one patient, that assessed ethanol locks for the prevention or treatment of catheter-related bloodstream infection were eligible for inclusion. Studies had to report the rate of infection, clinical cure, catheter removal or line salvage, as the primary outcome.

The included studies on prevention were conducted between 2007 and 2013. Most were of children, who had short-bowel syndrome, other gastrointestinal disease or malignancy. Most catheters were silicone, and catheter age ranged from newly placed to two years old, where reported. The concentration of ethanol was 70%, and in most studies the lock was changed daily; in some studies it was changed weekly. Dwell time ranged from 15 minutes to over 48 hours.

The included studies on treatment were conducted between 2003 and 2013. Most patients were children receiving concomitant parenteral nutrition or with haematological malignancies, or both. Systemic antimicrobials were used with the ethanol locks, and the concentration of ethanol was 70% in most studies. The dwell time ranged from two to 72 hours. The duration of treatment ranged from one to 14 days.

The authors did not state how many reviewers assessed studies for inclusion.

Assessment of study quality
The authors did not state that they assessed validity.

Data extraction
For prevention studies, the rates of infection and catheter removal, per 1,000 catheter days, were extracted or calculated from the data reported. For treatment studies, the rates of clinical cure and line salvage were extracted or calculated.

Two reviewers independently extracted data from the included studies and discrepancies were resolved through discussion.

Methods of synthesis
A narrative synthesis was presented.

Results of the review
Thirteen studies of prevention (627 participants; range six to 376) and nine studies of treatment (213 catheters; range two to 80) were included. Three were randomised controlled trials (RCTs), two were cohort studies, two were prospective single-arm studies, five were case series, and 10 were retrospective chart reviews.

All 13 prevention studies reported decreased rates of infection or patients infected with ethanol locks; the difference was statistically significant in eight studies. Studies that reported the rate of infection demonstrated a decrease from
9.11 to 1.92 per 1,000 catheter days (11 studies). Nine studies assessed catheter removal; six assessed the rate of removal from any cause, of which five reported a significant benefit with ethanol locks. Eight studies reported a rate of removal (infected or any cause; the other study reported the number of patients whose catheter was removed), and demonstrated a decrease from 6.13 to 1.85 per 1,000 catheter days.

Across all of the treatment studies, the rate of clinical cure ranged from 67% to 100%; the overall rate was 90% (192 of 213 catheters). The rate of line salvage ranged from 71% to 100%; the overall rate was 84% (179 of 213 catheters).

The incidence of adverse reactions was low across all prevention and treatment studies. Further results were presented for specific ethanol lock regimens.

**Cost information**
The authors stated that ethanol locks were relatively inexpensive for treatment at a cost of approximately $16 per patient.

**Authors’ conclusions**
The literature suggested that preventive ethanol locks decreased the rates of infection and catheter removal, and that ethanol lock treatment appeared to be efficacious alongside systemic antibiotics.

**CRD commentary**
The review question was clear. A very limited search for English-language studies was undertaken, with no attempts to identify unpublished studies; relevant studies may have been missed. The authors acknowledged that studies with negative results might not have been published, and therefore not included, which could bias the results of their review.

Many of the included studies had poor designs, and their validity was not assessed, reducing the reliability of the conclusions. The authors acknowledged that many studies did not report information on peripheral blood cultures, meaning that some patients might not have had a catheter-related bloodstream infection. All of the prevention studies found decreased rates of infection with ethanol locks, but the largest study (over half of all patients) found no statistically significant difference between groups. The treatment studies did not have control groups, so the cure rates may have been due to the concomitant antibiotics, rather than the ethanol locks. A narrative synthesis was appropriate, in view of the differences in study design and participant characteristics between studies.

The potential for publication bias, poor design of most of the included studies, and lack of validity assessment, mean that the review's conclusions may not be reliable.

**Implications of the review for practice and research**
**Practice:** The authors stated that their review demonstrated that ethanol locks could prevent catheter-related bloodstream infections, and they should be considered for the treatment of these infections.

**Research:** The authors stated that prospective randomised placebo-controlled trials were needed to confirm the utility of ethanol locks in the prevention and treatment of catheter-related bloodstream infections.

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