Meta-analysis: antibiotics for prophylaxis against hemodialysis catheter-related infections

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CRD summary
This review concluded that, in adults undergoing haemodialysis, both topical and intraluminal antibiotics reduced the rate of catheter-related bloodstream infections and the need for catheter removal because of complications. This was a well-conducted review and the authors’ conclusions appear reliable.

Authors’ objectives
To determine whether topical or intraluminal antibiotics reduce catheter-related bloodstream infections in adults undergoing haemodialysis.

Searching
MEDLINE, EMBASE and the Cochrane CENTRAL Register were searched up to October 2007; the search terms were reported and no language restrictions were imposed. The reference lists of relevant research and review articles, abstracts of the American Society of Nephrology Annual Meeting (1999 to 2006) and clinical trial registries were reviewed to identify additional studies.

Study selection
Randomised controlled trials (RCTs) in adults receiving long-term haemodialysis using a central venous catheter that compared antibiotics applied topically to the catheter exit site, or instilled intraluminally into the catheter, with another or no antimicrobial treatment were eligible for the review. The primary outcome of the review was the rate of catheter-related bloodstream infection. Most of the participants in the included studies had tunneled or temporary catheters. Where reported, the mean age of the included participants was 55 years and the prevalence of diabetes ranged from 18 to 100%. A wide range of antibiotics was used, the most common being mupirocin ointment and gentamicin.

Two reviewers independently selected studies for inclusion in the review.

Assessment of study quality
Two reviewers independently assessed validity based on allocation concealment, randomisation, blinding, intention-to-treat analysis and loss to follow-up. A Jadad score (0 to 5, where 5 represented the highest quality) was assigned to each study.

Data extraction
Data on events and number of catheter days of treatment in each group were extracted and used to derive a rate ratio (RR) and 95% confidence interval (CI) for each outcome. Authors were contacted for further information if necessary. Two reviewers extracted the data independently and resolved any disagreements by consensus.

Methods of synthesis
The studies were pooled by meta-analysis using fixed-effect models weighted by the inverse variance. The risk of publication bias was assessed for studies of intraluminal antibiotics using funnel plots, the Begg test for asymmetry and the Egger test. Heterogeneity between trials was assessed using the I² statistic. The results for topical and intraluminal antibiotics were analysed separately and the studies were also stratified by individual antibiotic in secondary analyses.

Results of the review
Five RCTs of topical antibiotics (n=630) and 11 of intraluminal antibiotics (n=765) were included.

Nine trials scored 3 or more on the Jadad scale. The mean follow-up ranged from 24 to 414 days.

Compared with controls, topical antibiotics significantly reduced catheter-related bloodstream infections (RR 0.22, 95% CI: 0.12, 0.40), *Staphylococcus aureus* catheter-related bloodstream infection (RR 0.14, 95% CI: 0.06, 0.30), exit-site infection (RR 0.17, 95% CI: 0.08, 0.38), catheter removal for complications (RR 0.36, 95% CI: 0.25, 0.52),
hospitalisation for infection (RR 0.24, 95% CI: 0.12, 0.47) and mortality (RR 0.22, 95% CI: 0.07, 0.74). Intraluminal antibiotics significantly reduced catheter-related bloodstream infection (RR 0.32, 95% CI: 0.22, 0.47) and catheter removal for complications (RR 0.37, 95% CI: 0.23, 0.59).

Sensitivity analyses indicated that using risk ratios instead of rate ratios and removing one heavily weighted trial did not significantly alter the findings. Statistical heterogeneity was not significant for any outcome. There was evidence of publication bias for the studies of intraluminal antibiotics.

Authors' conclusions
Both topical and intraluminal antibiotics reduced the rate of catheter-related bloodstream infections and the need for catheter removal because of complications.

CRD commentary
This review addressed a well-defined question and the inclusion criteria were clear. The authors searched a range of sources without language restrictions and sought both published and unpublished studies. Validity was assessed using standard criteria and two reviewers independently performed the study selection, validity assessment and data extraction processes. Adequate details of the included studies were presented in the paper. The studies were combined by meta-analysis, with topical and intraluminal antibiotics being analysed separately. Statistical heterogeneity was assessed and other differences between the studies were also explored. The risk of publication bias was assessed using a number of standard methods. The authors commented on the limitations of the evidence, such as the relatively short follow-up in most studies and the possibility of publication bias. This was a well-conducted review and the authors' conclusions appear reliable.

Implications of the review for practice and research
Practice: The authors stated that the short-term use of topical or intraluminal antibiotics is supported in adults with catheters who are undergoing haemodialysis.

Research: The authors stated that further research is required to assess the effects of antibiotics on important clinical end points, including mortality; to determine long-term efficacy; and to assess the risk of developing antibiotic resistance.

Funding
Alberta Kidney Disease Network; Kidney Foundation of Canada; Alberta Heritage Foundation for Medical Research; Canadian Institutes for Health Research.

Bibliographic details

Indexing Status
Subject indexing assigned by NLM

MeSH
Administration, Topical; Antibiotic Prophylaxis; Bacteremia /etiology /prevention & control; Catheterization, Central Venous /adverse effects; Catheters, Indwelling /adverse effects; Drug Resistance, Bacterial; Female; Humans; Male; Renal Dialysis /adverse effects /instrumentation

AccessionNumber
12008102550

Date bibliographic record published
09/08/2008
Date abstract record published
03/11/2008

Record Status
This is a critical abstract of a systematic review that meets the criteria for inclusion on DARE. Each critical abstract contains a brief summary of the review methods, results and conclusions followed by a detailed critical assessment on the reliability of the review and the conclusions drawn.