Nanocrystalline silver: a systematic review of randomized trials conducted on burned patients and an evidence-based assessment of potential advantages over older silver formulations


CRD summary
The authors concluded that nanocrystalline silver for burn patients had a significantly stronger antimicrobial activity compared with older formulations, and that it also reduced dressing change frequency, which was probably responsible for decreased pain. The limited search for trials, coupled with the lack of reporting of trial quality, means the reliability of the authors’ conclusions is uncertain.

Authors' objectives
To compare the effectiveness of nanocrystalline silver with older silver formulations for treating burn patients.

Searching
MEDLINE, EMBASE and the Cochrane Library were searched for studies published in English; search terms were reported. No details were given on the search dates used.

Study selection
Randomised controlled trials (RCTs) that compared nanocrystalline silver with silver sulfadiazine or silver nitrate for burn patients were eligible for inclusion. The primary outcome was prevention of infection; secondary outcomes were pain during medications, length of hospitalisation, and costs.

Where stated, mean ages of participant populations ranged from three to 41 years, and total burn surface areas ranged from 6.7 to 15%. Most trials used silver sulfadiazine as a comparator treatment.

The authors did not state how many reviewers selected studies.

Assessment of study quality
The authors reported only that two reviewers independently assessed trial quality. No further details, or results, were provided.

Data extraction
Two reviewers independently extracted data in order to calculate mean differences or odd ratios (ORs), with 95% confidence intervals (CI).

Methods of synthesis
Meta-analyses of pooled odds ratios or standardised mean differences (SMD; Hedges' g) were performed using a fixed-effect model.

Results of the review
Five RCTs were included (n=285 patients). Sample sizes ranged from 28 to 103 participants.

The nanocrystalline silver group had a significantly lower incidence of infections compared with the older formulations group (OR 0.14, 95% CI 0.06 to 0.35). No difference in incidence of infection was seen for the one trial of children.

For the three trials examining pain there was also significant reduction favouring the nanocrystalline silver group (SMD -1.44, 95% CI -1.86 to -1.01). Of the two trials reporting on length of hospitalisation, one showed a significant difference favouring treatment with nanocrystalline silver, and one showed no significant difference between groups.
Cost information
One trial reported average dressing costs of $1,533 (US dollars) and average hospitalisation costs of $27,339 per patient for the silver sulfadiazine group, and $946 (dressings) and US $19,726 (hospitalisation) per patient for the nanocrystalline silver group.

Authors' conclusions
Nanocrystalline silver had a significant stronger antimicrobial activity compared with older formulations; its long lasting properties reduced dressing change frequency and were probably responsible for decreased pain.

CRD commentary
The review addressed a clear question and was supported by appropriate inclusion criteria. Attempts to identify relevant trials were undertaken by searching three databases, but no other methods were reported as being used. Also, the restriction to searching for trials published in English only meant that some relevant trials may have been missed (and the review may have been subject to publication or language bias). Suitable methods (e.g. independent duplicate processes) were employed to reduce the risks of reviewer error and bias during data extraction, but the authors did not report on whether such methods were used to select studies for inclusion.

Trial quality was reported as being assessed, but no results were provided, which made it difficult to assess the strength of the evidence. Sufficient trial details were provided (although individual trial results were only presented on forest plots, without numbers) and appropriate methods were used to pool data. However, although the authors discussed the differences between trials (and performed sensitivity analyses), no formal assessment of statistical heterogeneity was made.

The limited search for trials, coupled with the lack of reporting of trial quality, means the reliability of the authors' conclusions is uncertain.

Implications of the review for practice and research
Practice: The authors stated that, although it was difficult to recommend the use of older silver formulations, the creamy formulation of silver sulfadiazine could be useful to prevent joint retraction and arthritis when early mobilisations of joints are required.

Research: The authors stated a need for studies comparing nanocrystalline silver with non silver-based antiseptic dressings (assessing infection control, pain reduction, promotion of wound healing and toxicity).

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