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Inhaled magnesium sulfate in the treatment of acute asthma

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Update in

Inhaled magnesium sulfate in the treatment of acute asthma.
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Abstract

Background: Asthma exacerbations can be frequent and range in severity from relatively mild to status asthmaticus. The use of magnesium sulfate (MgSO(4)) is one of numerous treatment options available during acute exacerbations. While the efficacy of intravenous MgSO(4) has been demonstrated, little is known of the role of inhaled MgSO(4).

Objectives: To determine the efficacy of inhaled MgSO(4) administered in acute asthma on pulmonary functions and admission rates.

Specific aims: To quantify the effects of inhaled MgSO(4) i) in addition to inhaled β(2)-agonist, ii) in comparison to inhaled β(2)-agonist alone or iii) in addition to combination treatment with inhaled β(2)-agonist and ipratropium bromide.

Search methods: Randomised controlled trials were identified from the Cochrane Airways Group register of trials in September 2012. These trials were supplemented with trials found in the reference list of published studies, studies found using extensive electronic search techniques, as well as a review of the grey literature and conference proceedings.

Selection criteria: Randomised (or pseudo-randomised) controlled trials including adults or children with acute asthma were eligible for inclusion in the review. Studies were included if patients were treated with nebulised MgSO(4) alone or in combination with β(2)-agonist and/or ipratropium bromide and were compared with β(2)-agonist alone or inactive control.

Data collection and analysis: Trial selection, data extraction and risk of bias were assessed independently by two review authors. Efforts were made to collect missing data from authors. Results are presented as standardised mean differences (SMD) for pulmonary function and risk ratios (RR) for hospital admission; both are displayed with their 95% confidence intervals (CI).

Main results: Sixteen trials (21 references) of unclear and high risk of bias were eligible and included 896 patients who were randomised (838 patients completed). Seven of the 16 included studies involved adults exclusively, three included adults and paediatric patients, four studies enrolled paediatric patients and in the remaining two studies the age of participants was not stated.The design, definitions, intervention and outcomes were different in all 16 studies; this heterogeneity made direct comparisons difficult (see additional tables 1-3).The overall risk of bias among the included studies was variable and this is reflected in the 'Summary of findings' table with most outcomes being judged as only moderate or less.Inhaled magnesium sulfate in addition to inhaled β(2)-agonistThere was no statistically significant improvement in pulmonary function when inhaled MgSO(4) and β(2)-agonist was compared with β(2)-agonist alone (SMD 0.23; 95% CI -0.27 to 0.74; three studies, n = 188); however, there was considerable between study heterogeneity. There was no clear advantage in terms of hospital admissions (RR 0.76 95% CI 0.49, 1.16; four studies, n = 249), and there were no serious adverse events reported.Inhaled magnesium sulfate versus inhaled β(2)-agonistThe results of pulmonary function in three studies that compared inhaled MgSO(4) versus β(2)-agonist were too heterogeneous to combine; however, two of the studies found poorer lung function on MgSO(4). There was no significant difference in terms of hospital admissions in a single small study when MgSO(4) was compared to β(2)-agonist (RR 0.53 95% CI 0.05, 5.31; one study, n = 33), and there were no serious adverse events reported.Inhaled magnesium sulfate in addition to inhaled β(2)-agonist and ipratropiumA further comparison has been included in the 2012 update of this review of MgSO(4) given in addition to inhaled ipratropium and β(2)-agonist therapy (as recommended by the GINA guidelines). However, there is not yet enough data for this outcome to come to any definite conclusions, but both small studies in adults with severe asthma exacerbation found improvements in pulmonary function with additional inhaled MgSO(4).

Authors' conclusions: There is currently no good evidence that inhaled MgSO(4) can be used as a substitute for inhaled β(2)-agonists. When used in addition to inhaled β(2)-agonists (with or without inhaled ipratropium), there is currently no overall clear evidence of improved pulmonary function or reduced hospital admissions. However, individual study results from three trials suggest possible improved pulmonary function in those with severe asthma exacerbations (FEV1 less than 50% predicted). Heterogeneity among trials included in this review precludes a more definitive conclusion. Further studies should focus on inhaled MgSO(4) in addition to the current guideline treatment for acute asthma (inhaled β(2) -agonist and ipratropium bromide). As the evidence suggests that the most effective role of nebulised MgSO(4) may be in those with severe acute features and this is where future research should be focused. A set of core outcomes needs to be agreed upon both in adult and paediatric studies to allow improved study comparison in future.

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Blitz M, Blitz S, Beasely R, Diner BM, Hughes R, Knopp JA, Rowe BH.

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