Meta-analysis of the effect of warm humidified insufflation on pain after laparoscopy

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CRD summary
This review assessed the impact on pain of using warmed humidified carbon dioxide for insufflation (WHI) in abdominal laparoscopy. The authors concluded that WHI resulted in less postoperative pain compared to standard treatment. The conclusions reflected the results of the review, but were based on a small number of patients from poor-quality trials and may, therefore, be overly strong.

Authors' objectives
To evaluate the effect on postoperative pain of warming and humidifying carbon dioxide insufflation in laparoscopic abdominal procedures in adults.

Searching
The following databases were searched without language restriction from inception to January 2008: The Cochrane Library (including Cochrane Central register of Controlled Trials), MEDLINE/PubMed and EMBASE. Search terms were reported in an online appendix. Abstracts of relevant scientific meetings were handsearched.

Study selection
Randomised controlled trials (RCTs) that compared insufflation with warmed humidified carbon dioxide (WHI) against insufflation with standard cold dry carbon dioxide in adults (age >15 years) undergoing elective laparoscopic abdominal procedures under general anaesthesia were eligible for inclusion if adequate outcome data (defined as pain scores on a visual analogue scale (VAS) and morphine use in the 72 hours following surgery) were reported.

Very limited information on included studies was reported. About half involved laparoscopic gastric bypass surgery. Others involved laparoscopic cholecystectomy, Nissen fundoplication or gynaecological procedures. Some studies employed an external warming device.

Two reviewers independently selected the papers for the review. Disagreements were resolved by consensus or discussion with a third reviewer.

Assessment of study quality
One reviewer who was blinded to publication/affiliation details assessed the studies for validity using the Jadad scale (0 to 5 points based on criteria of randomisation, blinding and handling of withdrawals and dropouts).

Data extraction
Corresponding authors were contacted in order to obtain as much raw data as possible for each study. Data on VAS pain scores and morphine usage were extracted on an intention-to-treat basis and summarised in 2x2 tables. Standard deviations were extracted or calculated from reported data. Data on both outcomes were grouped into time intervals (up to six hours, day 1, day 2 and subsequent intervals). Where multiple values were reported within a time window a mean value was calculated. The authors did not state how many reviewers performed the data extraction.

Methods of synthesis
The studies were combined using a fixed-effect meta-analysis to calculate weighted mean differences (WMDs) or standardised mean differences (SMDs) with 95% confidence intervals (CIs). Statistical heterogeneity was assessed using the $\chi^2$ test. Subgroup analyses were carried out based on whether an external warming device was used, and whether the patient was undergoing gastric bypass surgery.

Results of the review
Seven RCTs (n = 327) were included in the review. Five of these were considered to be of poor quality, based on their score on the Jadad scale.
There was a statistically significant reduction in VAS pain scores in the WHI groups at up to six hours (SMD -0.39, 95% CI: -0.67, -0.11, p = 0.006, five RCTs), on day 1 (p = 0.01) and on day 3 (SMD-0.34, 95% CI: -0.61, -0.07, p < 0.001, six RCTs). Statistically significant heterogeneity was found for the day 1 analysis, which was absent from a subgroup analysis of studies using an external warming device.

Morphine use on day 2 was statistically significantly lower in the WHI groups (SMD -0.48, 95% CI: -0.95, -0.01, p = 0.04, two RCTs), but there was no statistically significant difference for any other time interval. Results of other subgroup analyses were also reported.

Authors’ conclusions
WHI reduced pain after laparoscopy.

CRD commentary
The review question and the inclusion criteria were clear. The authors searched a number of relevant databases and other sources without restriction, thereby reducing the risk of omitting relevant studies or language bias. However, there was no systematic search for unpublished studies, which may have increased the chances of publication bias. The authors reported using rigorous methodology for the selection of studies, but not for other stages of the review process. Very limited details of the included studies were provided. An appropriate validity assessment was conducted, but the results were poorly reported and did not appear to inform the synthesis. The decision to employ meta-analysis appeared appropriate. A reasonable assessment and exploration of heterogeneity was undertaken. The authors’ conclusions were based on the results of the review, but appeared overly strong given the small sample sizes and acknowledged poor quality of the primary studies.

Implications of the review for practice and research
Practice: The authors did not state any implications for practice.

Research: The authors stated that further high quality RCTs of WHI should be undertaken, particularly in laparoscopic colorectal surgery. The effects of WHI on postoperative recovery and fatigue, and on peritoneal inflammation should also be assessed. They also stated that a cost-benefit analysis may be warranted.

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