The role of prophylactic antibiotics in laparoscopic cholecystectomy in preventing postoperative infection: a meta-analysis

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CRD summary
The review concluded that use of prophylactic antibiotics in low risk patients who underwent laparoscopic cholecystectomy did not prevent postoperative infection. The authors' conclusions are likely to be reliable, but publication bias could not be ruled out completely.

Authors' objectives
To assess the effects of antibiotic prophylaxis on the postoperative infection rate in laparoscopic cholecystectomy.

Searching
PubMed, EMBASE, Cochrane Central Register of Controlled Trials (CENTRAL) and Wanfang databases were searched from 1966 to March 2010; limited search terms were reported. Reference lists of retrieved studies were searched.

Study selection
Randomised controlled trials (RCTs) that compared prophylactic antibiotics with placebo or no treatment in low risk patients having laparoscopic cholecystectomy were eligible for the review. Low risk patients were defined as not having evidence of acute cholecystitis or obstructive jaundice, not on long-term corticosteroid or other immnosuppressive agents and with no known infections. All patients needed to have antibiotics within 30 minutes prior to the operation and/or up to three days post operation. Studies had to measure at least one of overall infection rate, superficial wound infections, intra-abdominal infections, distant infections, positive bile cultures and length of hospital stay. Studies were required to have an overall Jadad score of 3 or more.

Prophylactic antibiotics in the included studies included cefazolin, cefuroxime, cefotetan, levofloxacin, ceftriaxone and cefotaxime. Three studies continued antibiotic use at 24 hours post surgery. Studies were in UK, USA, Thailand, Turkey, China, Taiwan and India.

Three reviewers independently selected studies for the review.

Assessment of study quality
Studies were assessed for quality using the Jadad scale of randomisation, double blinding and description of withdrawals/drop-outs. Studies were considered high quality if they had an overall Jadad score of at least 3.

Three reviewers independently assessed studies for quality. Differences were resolved by consensus of four reviewers.

Data extraction
Data were extracted and odds ratios (ORs) were calculated for dichotomous data and mean differences were calculated for continuous data, together with 95% confidence intervals (CIs).

Three reviewers independently extracted data. Differences were resolved by consensus of four reviewers.

Methods of synthesis
Studies were pooled in meta-analyses and summary odds ratios and weighted mean differences (WMDs) with 95% CIs were calculated using fixed-effect and random-effects models. Heterogeneity was assessed $X^2$ and $I^2$. Where no heterogeneity was identified, results were displayed with a fixed-effects model. Publication bias was assessed by inspection of a funnel plot for overall infection rate and Egger’s test.

Results of the review
Twelve RCTs (more than 1,937 participants; one study did not report numbers of participants) were included in the
review. All studies were single centre. Two studies were single blinded and six were double blinded. Jadad scores ranged from 3 to 5.

There was no evidence of significant differences between groups in the rates of overall infection (OR 1.11, 95% CI 0.68 to 1.82, $I^2=0%$; 12 trials), superficial wound infections (OR 1.07, 95% CI 0.59 to 1.94, $I^2=0%$; 12 trials), major infections (OR 2.88, 95% CI 0.3 to 28.09, $I^2=0%$; six trials), distant infections (OR 1.01, 95% CI 0.43 to 2.36, $I^2=0%$; nine trials) and positive bile cultures (OR 0.76, 95% CI 0.54 to 1.08, $I^2=0%$; seven trials). Compared to control, prophylactic antibiotics prior to laparoscopic cholecystectomy were significantly associated with shorter hospital stay (WMD -0.16 days, 95% CI -0.22 to -0.09, $I^2=79%$; three trials).

There was no evidence of significant publication bias.

Authors’ conclusions
Prophylactic antibiotics were not necessary for elective laparoscopic cholecystectomy in low risk patients.

CRD commentary
The review addressed a clear research question supported by appropriate inclusion criteria. Various relevant sources were searched for studies and there were no language restrictions. No explicit attempts were made to identify unpublished studies, so publication bias could not be ruled out. But the funnel plot for overall infection rate and application of Egger's test did not suggest that publication bias was likely. Appropriate methods were used to select studies, extract data and assess studies for quality, which minimised risks of reviewer error and bias. Studies were included only if they had an overall score of 3 or more on the Jadad scale; all studies were considered of adequate quality.

The authors stated that different population groups were included in the studies, but no details of participants were reported other than their low risk status. Synthesis of studies in meta-analyses and assessment of heterogeneity were appropriate. Except for assessment of hospital stay, no heterogeneity was identified in the analyses; use of a fixed-effect model for combining studies was appropriate.

The authors’ conclusions are likely to be reliable, but publication bias could not be ruled out completely.

Implications of the review for practice and research
Practice: The authors stated that surgeons undertaking laparoscopic cholecystectomy must adhere to the operative aseptic technique, aim for shorter operation times, improve operative technique and ease tissue tension in order to reduce the incidence of postoperative infection.

Research: The authors stated that multicenter RCTs were needed and should involve large sample sizes of different population subgroups, especially high risk patients.

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