Antibiotic prophylaxis for shock wave lithotripsy in patients with sterile urine before treatment may be unnecessary: a systematic review and meta-analysis

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CRD summary
The review concluded that prophylactic antibiotics did not improve symptoms and decreased neither the rate of fever and positive urine culture nor the incidence of urinary tract infection after shock wave lithotripsy. Limited reporting of the study quality assessment results coupled with the small number of events reported in the trials make the reliability of the authors’ conclusions uncertain.

Authors' objectives
To evaluate the efficacy of antibiotic prophylaxis for shock wave lithotripsy in patients with proven sterile urine before treatment.

Searching
PubMed, EMBASE and The Cochrane Library were searched to November 2011; search terms were reported. Reference lists and relevant conference proceedings from 2006 to 2011 were searched.

Study selection
Eligible studies were randomised controlled trials that compared antibiotic prophylaxis with placebo or no treatment in patients undergoing shock wave lithotripsy. Adults with renal or ureteral calculi with preoperative sterile urine were eligible. Patients with suspected or evident infection, staghorn or infectious stones, positive urine culture or recurrent or asymptomatic bacteriuria were excluded, as were patients who had inadvertently taken antibiotics post-operatively or patients with a history of antibiotic administration within the last 10 days before shock wave lithotripsy. Relevant outcomes included symptoms, fever, positive urine culture, urinary tract infection and risk factors.

Interventions used included penicillins, quinolone, sulphamethoxazole plus trimethoprim, cephalosporins, nitrofurantoin, aminoglycosides and beta-lactam (more specific details were tabulated in the report). Most comparator groups received no treatment; others received placebo. Most patients were male. Reported mean ages ranged from 32 to 50 years. Most studies did not specify stone location (of those that did, kidney was more common than ureter). Stone size varied. Definitions of positive cultures were generally ≥10⁴ or ≥10⁵ CFU/mL or were not reported. Eight of the nine studies were published before 1998.

Two reviewers independently screened titles and abstracts.

Assessment of study quality
Study quality was evaluated by two reviewers using criteria for generation of randomisation sequence, concealment of allocation, blinding, description of withdrawals and drop-outs and use of intention-to-treat analyses.

Data extraction
Data were extracted to calculate risk ratios with 95% confidence intervals (CI). Data recorded within two weeks after shock wave lithotripsy were considered as short-term and data recorded between two weeks and two months were considered as mid-term.

Two reviewers independently extracted data. Disagreements were resolved by discussion or by a third reviewer.

Methods of synthesis
Meta-analyses were performed to calculate pooled risk ratios with 95% confidence intervals. A random-effects model was used when the presence of heterogeneity was statistically significant (p<0.05) and otherwise a fixed-effect model was used. Heterogeneity was assessed using the I² statistic and X² test. Subgroup analyses were performed based on timing of assessment (short-term/mid-long term). Publication bias was assessed using a funnel plot. Where pooling was not appropriate a narrative was presented.
Results of the review
Nine trials were included (1,364 patients). Few quality assessment results were reported. Two studies were reported as being double-blind. Withdrawal rates ranged from 0% (in four studies) to 17%. The authors reported that there were no significant baseline differences between groups. Follow-up ranged from one to six weeks (six trials) or was not reported (three trials).

There were no significant differences between groups in rate of fever (RR 0.39, 95% CI 0.07 to 2.36; I²=60%; four studies), incidence of positive urine culture (RR 0.77, 95% CI 0.54 to 1.11; I²=30%; nine comparisons, eight of which were for short-term results) and incidence of urinary tract infection (RR 0.54, 95% CI 0.29 to 1.01; I²=0%; seven comparisons, six of which reported short-term results).

For positive urine culture, a subgroup analysis of two studies with some patients with a preoperative ureteral catheter yielded no significant differences. Two of the three studies that reported symptoms found no statistically significant differences and one reported a statistically significant reduction with antibiotics in incidence of urinary frequency and nocturia.

There was no evidence of publication bias.

Authors' conclusions
Prophylactic antibiotics could not improve symptoms and decreased neither the rate of fever and positive urine culture nor the incidence of urinary tract infection after shock wave lithotripsy.

CRD commentary
The review addressed a clear question with reproducible eligibility criteria. Attempts to identify trials used several methods and included attempts to identify unpublished studies. It was unclear whether there were language restrictions. Independent duplicate processes were used to reduce the risks of reviewer error and bias during the review but no details were reported for the full-paper screening process. There was limited reporting of the study quality assessment results, which made it difficult to evaluate the reliability of the individual trial results.

Sufficient study details were provided and appropriate methods were used to pool data and to assess heterogeneity. Possible sources of significant heterogeneity were not investigated further; this may have been due to the p<0.05 cut-off used in the tests for heterogeneity rather than the more generally used p<0.10 cut-off. Only a small number of events contributed to many of the analyses so it was possible that these analyses lacked enough power to detect treatment effects.

Limited reporting of the study quality assessment results coupled with the small number of events reported in the trials make the reliability of the authors’ conclusions uncertain.

Implications of the review for practice and research
Practice: The authors stated that antibiotic prophylaxis was not necessary for shock wave lithotripsy, especially when no or low risk factors were presented.

Research: The authors stated a need for high quality trials to clarify their results, particularly trials on various risk factors.

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