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[Intervention Review]

Antibiotics for acute pyelonephritis in children

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Editorial group: Cochrane Renal Group.

Publication status and date: New search for studies and content updated (conclusions changed), published in Issue 7, 2014.

Review content assessed as up-to-date: 10 April 2014.

Citation: Strohmeier Y, Hodson EM, Willis NS, Webster AC, Craig JC. Antibiotics for acute pyelonephritis in children. *Cochrane Database of Systematic Reviews* 2014, Issue 7. Art. No.: CD003772. DOI: 10.1002/14651858.CD003772.pub4.

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ABSTRACT

Background

Urinary tract infection (UTI) is one of the most common bacterial infections in infants. The most severe form of UTI is acute pyelonephritis, which results in significant acute morbidity and may cause permanent kidney damage. There remains uncertainty regarding the optimum antibiotic regimen, route of administration and duration of treatment. This is an update of a review that was first published in 2003 and updated in 2005 and 2007.

Objectives

To evaluate the benefits and harms of antibiotics used to treat children with acute pyelonephritis. The aspects of therapy considered were 1) different antibiotics, 2) different dosing regimens of the same antibiotic, 3) different duration of treatment, and 4) different routes of administration.

Search methods

We searched the Cochrane Renal Group's Specialised Register, CENTRAL, MEDLINE, EMBASE, reference lists of articles and conference proceedings without language restriction to 10 April 2014.

Selection criteria

Randomised and quasi-randomised controlled trials comparing different antibiotic agents, routes, frequencies or durations of therapy in children aged 0 to 18 years with proven UTI and acute pyelonephritis were selected.

Data collection and analysis

Four authors independently assessed study quality and extracted data. Statistical analyses were performed using the random-effects model and the results expressed as risk ratio (RR) for dichotomous outcomes or mean difference (MD) for continuous data with 95% confidence intervals (CI).

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Main results

This updated review included 27 studies (4452 children). This update included evidence from three new studies, and following re-evaluation, a previously excluded study was included because it now met our inclusion criteria.

Risk of bias was assessed as low for sequence generation (12 studies), allocation concealment (six studies), blinding of outcome assessors (17 studies), incomplete outcome reporting (19 studies) and selective outcome reporting (13 studies). No study was blinded for participants or investigators. The 27 included studies evaluated 12 different comparisons. No significant differences were found in duration of fever (2 studies, 808 children: MD 2.05 hours, 95% CI -0.84 to 4.94), persistent UTI at 72 hours after commencing therapy (2 studies, 542 children: RR 1.10, 95% CI 0.07 to 17.41) or persistent kidney damage at six to 12 months (4 studies, 943 children: RR 0.82, 95% CI 0.59 to 1.12) between oral antibiotic therapy (10 to 14 days) and intravenous (IV) therapy (3 days) followed by oral therapy (10 days). Similarly, no significant differences in persistent bacteriuria at the end of treatment (4 studies, 305 children: RR 0.78, 95% CI 0.24 to 2.55) or persistent kidney damage (4 studies, 726 children: RR 1.01, 95% CI 0.80 to 1.29) were found between IV therapy (three to four days) followed by oral therapy and IV therapy (seven to 14 days). No significant differences in efficacy were found between daily and thrice daily administration of aminoglycosides (1 study, 179 children, persistent clinical symptoms at three days: RR 1.98, 95% CI 0.37 to 10.53). Adverse events were mild and uncommon and rarely resulted in discontinuation of treatment.

Authors' conclusions

This updated review increases the body of evidence that oral antibiotics alone are as effective as a short course (three to four days) of IV antibiotics followed by oral therapy for a total treatment duration of 10 to 14 days for the treatment of acute pyelonephritis in children. When IV antibiotics are given, a short course (two to four days) of IV therapy followed by oral therapy is as effective as a longer course (seven to 10 days) of IV therapy. If IV therapy with aminoglycosides is chosen, single daily dosing is safe and effective. Insufficient data are available to extrapolate these findings to children aged less than one month of age or to children with dilating vesicoureteric reflux (grades III-V). Further studies are required to determine the optimal total duration of antibiotic therapy required for acute pyelonephritis.

PLAIN LANGUAGE SUMMARY

Are oral antibiotics as effective as a combination of injected and oral antibiotics for kidney infections in children?

Acute pyelonephritis refers to infection of the kidneys and is the most severe form of urinary tract infection (UTI). Acute pyelonephritis causes high fever, vomiting, stomach pain, irritability and poor feeding in infants.

We wanted to find out if oral antibiotics were as effective as combined oral and injected antibiotics to treat children for kidney infection. This review updates our previous investigations published in 2003, 2005 and 2007. This review included evidence from 27 studies that involved 4452 children. The last literature search date was April 2014. This update included evidence from three new studies and from one study that was previously excluded.

Review results suggested that children aged over one month with acute pyelonephritis can be treated effectively with oral antibiotics (cefixime, cefibuten or amoxicillin/clavulanic acid) or with short courses (two to four days) of intravenous (IV) therapy followed by oral therapy. If IV therapy with aminoglycosides is needed, single daily dosing is safe and effective.