Ventilation tubes after surgery for otitis media with effusion or acute otitis media and swimming: systematic review and meta-analysis

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Authors' objectives
To determine whether swimming using ear protection, swimming without ear protection and not swimming affects the risk of acute otitis media (AOM) in children with ventilation tubes.

Searching
MEDLINE (from 1966 to June 2001), EMBASE (from 1980 to June 2001) and the Cochrane Library (to June 2001) were searched without language restriction. In addition, the reference lists from identified studies were checked. Experts were not contacted and grey literature was not sought. A brief summary of the search strategy was reported in the review.

Study selection
Study designs of evaluations included in the review
Randomised controlled trials (RCTs) and prospective cohort studies were eligible for inclusion. All of the included cohort studies had a control group with treatment predominantly selected by child or parent preference.

Specific interventions included in the review
Studies of swimming or bathing in any setting without ear protection, swimming with ear protection and no swimming were eligible for inclusion. The review assessed the following interventions: swimming without ear protection compared with no swimming; swimming with and without ear protection (swimming cap and/or earplugs); use of ear drops after swimming compared with swimming with ear protection (swimming cap and/or earplugs); and swimming with ear drops compared with no swimming.

Participants included in the review
Studies of children aged 15 years or under with ventilation tubes were eligible for inclusion. The included studies were of children aged from 0 to 15 years who had ventilation tubes of the type (where stated) Richards, Sheehy, T, Shepherd and Shah.

Outcomes assessed in the review
Studies that assessed outcomes after more than 2 months' follow-up were eligible for inclusion. The primary outcome was AOM, which was defined as inflammation of the middle ear possibly accompanied by pain, pyrexia, otorrhoea and hipoacusia. The follow-up in the included studies lasted from more than 2 months to 12 months.

How were decisions on the relevance of primary studies made?
The authors did not state how the papers were selected for the review, or how many reviewers performed the selection.

Assessment of study quality
Validity was assessed using two different methods: the 5-point Jadad scale, which considers randomisation, blinding and withdrawals; and a 0- to 10-point scale developed by the authors. The authors' scale assessed the following: description of study objective; method of selecting the children; power calculations; inclusion and exclusion criteria; random allocation; blinding; definition of the intervention and outcome; intention-to-treat analysis; follow-up and losses to follow-up; and reporting of the results as odds ratio (OR) and 95% confidence intervals (CIs). Two reviewers independently assessed validity. The reviewers were not blinded to journal or author.

Data extraction
Two reviewers independently extracted the data. The reviewers were not blinded to journal or author. The extracted data included study design, characteristics of the participants, intervention and duration of follow-up.

**Methods of synthesis**

How were the studies combined?
Pooled ORs and 95% CIs were calculated for each comparison of interest, using a fixed-effect model where studies were homogeneous and a random-effects model when significant heterogeneity was found. There were insufficient studies to allow an assessment of publication bias using a funnel plot.

How were differences between studies investigated?
Statistical heterogeneity was tested using the Cochran Q statistic. A sensitivity analysis was performed for one comparison with significant heterogeneity: 3 studies scoring less than one on the Jadad quality score were omitted.

**Results of the review**

Eleven studies were included: 2 RCTs (908 children) and 9 prospective cohort studies with a control group (about 940 children).

One RCT described an inadequate method of randomisation and the second RCT gave no details of the randomisation method. The losses to follow-up were considerable (range: 18 to 50%) in 6 studies. None of the studies analysed data on an intention-to-treat basis.

There was no significant difference in AOM between swimming without ear protection and not swimming; the OR (7 studies, 943 children) was 0.78 (95% CI: 0.42, 1.44). Significant statistical heterogeneity was found (P=0.0093). The results were similar after omitting the 3 low-quality studies; the OR was 0.73 (95% CI: 0.31, 1.70).

There was no significant difference in AOM between swimming with and without ear protection (swimming cap and/or earplugs); the OR (4 studies, 233 children) was 0.75 (95% CI: 0.38, 1.48). No significant statistical heterogeneity was found (P=0.26).

There was no difference in AOM between the use of antibiotic ear drops after swimming and swimming with ear protection (swimming cap and/or earplugs); the OR (2 studies, 961 children) was 0.76 (95% CI: 0.56, 1.02). No significant statistical heterogeneity was found (P=0.93).

Swimming plus the use of antibiotics after swimming significantly increased AOM compared with no swimming; the OR (2 studies, 249 children) was 3.14 (95% CI: 1.40, 7.05). No significant statistical heterogeneity was found (P=0.37). Both studies were of a low quality (Jadad score of 0).

**Authors’ conclusions**

There was limited evidence to suggest that swimming does not increase AOM in children with ventilation tubes. The use of ear protection (ear plugs and/or swimming caps) or antibiotic drops after swimming does not reduce AOM, and ear drops may even increase AOM.

**CRD commentary**

The review question was clear in terms of the study design, intervention, participants and outcome. Several relevant sources were searched, the search terms were stated and no language restrictions were applied. However, no attempt was made to locate unpublished studies, thus raising the possibility of publication bias. The methods used to select the studies were not described, so it is not known whether efforts were made to reduce errors and bias. Two reviewers independently assessed validity and extracted the data, which reduces the potential for bias and errors. Validity was assessed using validated criteria and some of the methodological limitations of the studies were discussed in the text. Relevant information on the included studies was tabulated. The data were combined in a meta-analysis and statistical heterogeneity was assessed. Sensitivity analyses were used to explore the influence of study quality on the results. The authors found significant heterogeneity for one comparison (swimming without ear protection versus no swimming).
but did not explore potential reasons for this. Pooling the data for this comparison in a meta-analysis was not appropriate. With this exception, the evidence presented appears to support the authors’ conclusions.

**Implications of the review for practice and research**
Practice: The authors stated that it is not necessary to advise against swimming for children with ventilation tubes.

Research: The authors stated that unbiased RCTs are required to confirm the results of this review.

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