Systematic review of middle ear implants: do they improve hearing as much as conventional hearing aids?
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CRD summary
The review concluded that although development of middle ear implants was in its infancy, early reports indicated that selected patients gained good benefit from middle ear implants; more data was needed. The review had some methodological problems, which together with the poor quality of data, limit the reliability of the authors’ conclusions.

Authors' objectives
To determine whether middle ear implants improved hearing as much as conventional hearing aids in adult patients with purely sensorineural hearing loss.

Searching
MEDLINE, EMBASE, DARE, HTA, NHS EED, PsycINFO, CINAHL, NICE, NIHR, HTA database, Database of Promoting Health Effectiveness Reviews, NGC and The Cochrane Library were searched from inception/1950 to July 2009 for articles in any language. Search terms were reported. Reference lists of included articles were searched.

Study selection
Randomised controlled trials (RCTs), cohort studies and case-control studies of middle ear implants versus conventional hearing aids in adult patients (>18 years) with purely sensorineural hearing loss were eligible for inclusion. The relevant outcome was hearing, assessed through pure tone audiograph, speech in quiet and speech in noise.

The included studies considered primarily electromagnetic middle ear implants versus mostly the patient’s own conventional hearing aids. Outcome measures included residual hearing, functional gain, speech perception in quiet, speech perception in noise and various patient-reported outcome measures (PROM) questionnaires. The time patients had worn hearing aids before the study varied from weeks to years.

Two reviewers independently performed study selection. Disagreements were resolved by consensus.

Assessment of study quality
Quality was assessed on the basis of whether studies were prospective, ethical approval was gained, eligibility criteria were specified, power calculations were used, appropriate controls were used, appropriate outcomes measures used, confounding factors reported and controlled for, missing data accounted for and appropriate analysis made.

The authors did not state how many reviewers performed quality assessment.

Data extraction
Data on residual hearing, functional gain, speech perception in quiet and noise and PROMs were extracted using a standardised format.

The authors did not state how many reviewers were involved in data extraction.

Methods of synthesis
A narrative synthesis with studies grouped by outcomes.

Results of the review
Seventeen studies were included in the review: seven prospective cohort studies and 10 retrospective studies (n=643 patients). Study sample sizes ranged from five to 282 patients. Follow-up, where reported, ranged from 1.5 to 36
months. The quality of the included studies was poor to moderate: no studies used a power calculation, many studies had missing data and confounding factors were rarely reported.

Compared with conventional hearing aids, patients treated with middle ear implants had similar residual hearing, mixed results for functional gain and mixed results for speech perception in quiet and noise. PROM outcomes were generally better with middle ear implants compared with conventional hearing aids. Complications with middle ear implants (seven studies) were generally minor, although two studies reported a 15% revision rate.

Authors' conclusions
Although the development of middle ear implants is in its infancy, early reports indicate that selected patients gain good benefit from middle ear implants, but more data is needed.

CRD commentary
Inclusion criteria for the review were broadly defined. Several relevant data sources were searched, without language restrictions. Publication bias was not assessed and could not be ruled out. Attempts were made to reduce the risk of reviewer error and bias during study selection; it was unclear whether such attempts were made for quality assessment and data extraction. Quality assessment indicated the generally poor quality of the included studies (acknowledged by the authors). A narrative synthesis was presented. Studies were grouped by outcome and a limited summary of results was presented.

The review had some methodological problems, which together with the poor-quality data limit the reliability of the authors' conclusions.

Implications of the review for practice and research

Practice: The authors did not state any implications for practice.

Research: The authors stated that longer term cohort studies of five to 10 years were needed. All studies should report on a minimum of functional gain, speech perceptions in noise and quiet, complications and validated PROM measures. As middle ear implants become more established, prospective randomised controlled trials to compare different types of middle ear implants were need.

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