Meta-analysis of outcomes of pediatric functional endoscopic sinus surgery
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Authors' objectives
To assess the effectiveness and safety of paediatric functional endoscopic sinus surgery.

Searching
English language studies were sought in MEDLINE (1986 to 1996) by cross-referencing the keywords: 'pediatric', 'sinusitis', 'functional endoscopic sinus surgery', 'endoscopic sinus surgery' and 'FESS'. Bibliographies of all included and excluded studies were scanned. Unpublished data was obtained from a retrospective review of patients under 18 years of age undergoing FESS from 1991 to 1996 at the authors institution.

Study selection
Study designs of evaluations included in the review
Published and unpublished series of children undergoing FESS that scored more than 50 points on defined validity criteria were included. Average length of follow-up was 3.7 years. Eight retrospective and one prospective series were included.

Specific interventions included in the review
Functional endoscopic sinus surgery (FESS) usually consisted of middle meatal antrostomy and anterior ethmoidectomy with some patients requiring complete ethmoidectomy. Other procedures included frontal recess and sphenoid sinusotomy. A second procedure was frequently done, two to three weeks after surgery for removal of splints or biological debris.

Participants included in the review
Children aged from 11 months to 18 years with continued symptoms of chronic sinusitis (nasal obstruction, nasal discharge, cough, headache) despite appropriate medical therapy, and confirmed by abnormal paranasal sinus computed tomography scans were included. Children with underlying medical problems such as cystic fibrosis, immunodeficiencies, and asthma were included in 4 out of 8 published articles.

Outcomes assessed in the review
Positive outcomes assessed included the following: 'improved' defined as met expectations, improved, satisfied, improved quality of life; 'much improved' defined as exceeded expectations, greatly improved, very satisfied, disease free, cure; and 'other' including would recommend FESS to other patients or would allow repeat surgery if needed. Ascertainment of outcome was measured by follow-up care giver questionnaire or telephone survey or chart review.

How were decisions on the relevance of primary studies made?
Listings were reviewed by two authors independently and abstracts considered relevant selected. Methods sections of 23 full-length article were blindly reviewed by one author for inclusion.

Assessment of studies scored on validity criteria. Only studies scoring > 50 points on validity criteria were included.

Assessment of study quality
Identified studies were scored using the following criteria: length of follow-up; retrospective vs prospective; sample size; and separate reporting of outcome for chronically ill patients. A total of 30 points was given to each of the following categories: follow-up; sample size; and addressing underlying disease. The total score possible was 100. The authors do not state how the papers were assessed for validity, or how many of the authors performed the validity assessment.
Data extraction
The authors do not state how the data were extracted for the review, or how many of the authors performed the data extraction.

Methods of synthesis
How were the studies combined?
An overall average positive response rate was calculated.

How were differences between studies investigated?
The chi-squared test and Fishers exact test was used to compare the average positive outcome of the published and the unpublished articles. Sub-group analysis was conducted for children with cystic fibrosis and for studies that had excluded this group of children.

Results of the review
Nine studies, including 8 published (832 children) and 1 unpublished series (50 children), were included (882 children).

The unpublished series excluded children with significant underlying medical diseases and included children with asthma. One prospective series was found.

Positive outcome for FESS: overall combined average for positive outcome = 88.7%. Rates in published series ranged from 77% to 100% with an average of 88.4%; rate in the unpublished series was 92% (95% CI: 81%, 98%). No statistically significant difference was shown between published and unpublished series using chi-squared test (P = 0.38, power = 0.51) or Fishers exact test (P = 0.646, power = 0.12).

Positive outcome in children with cystic fibrosis or immunodeficiency (2 published series): rates reported as 0% and 57%. Reported that these patients required multiple procedures. Studies that excluded children with cystic fibrosis or immunodeficiency (2 published series with 62 children and 1 unpublished series with 50 children): published series rate = 89% and 86%; unpublished series rates = 92%.

Major complications (4 series, 690 children): 4 children (0.6%), including 2 with meningitis. Most studies did not report frequency of complications such as synechia or easily controlled epistaxis. 3 published and the unpublished data reported no major complications. Two studies did not report complications.

No reports of blindness, cerebrospinal fluid leaks or intracranial bleeds were found.

Authors' conclusions
Paediatric functional endoscopic sinus surgery is a safe and effective treatment for chronic sinusitis that is refractory to medical treatment.

CRD commentary
The aims and inclusion criteria were stated. Unpublished data was included though no systematic attempt were made to identify unpublished data. Methods used to assess validity were described.

The discussion included mention of some limitations of the primary studies including retrospective studies, the lack of consistent use of an objective measure of outcome, small sample size, and the lack of differentiation in the series of outcome based on significant underlying disease.

By limiting the literature search to English language studies identified in MEDLINE, other relevant studies may have been omitted. No detail were given of methods used to extract data. Consideration could have been given to including all relevant studies and then assessing the influence of study quality on the outcomes.

Fuller details of the included studies would have been helpful such as methods of evaluation of outcome, drop-out rates,
and methods used to select patients. It was not clear how drop-outs were treated in the analysis. Heterogeneity was not assessed though some investigation of factors that may influence outcome was undertaken. In the unpublished series only 45% of children undergoing FESS were included in the analysis and it is not clear how representative the subjects in other series were of children undergoing this procedure.

Some assessment of how representative the sample is would be helpful in assessing the relevance of the results to all children undergoing this procedure.

**Implications of the review for practice and research**

Practice: Paediatric FESS is an effective and safe procedure.

Research: The authors consider that more long-tem standardised prospective studies are required.

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