Growth and growth biomarker changes after adenotonsillectomy: systematic review and meta-analysis

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CRD summary
The authors concluded that standardised height, weight, insulin growth factor-1 and insulin growth factor binding protein-3 significantly increased following adenotonsillectomy. In light of the unclear quality of the included studies and the presence of statistical heterogeneity and the small numbers available for meta-analysis, the reliability of the authors' conclusions is unclear.

Authors' objectives
To assess the impact of adenotonsillectomy on growth and growth biomarker changes in non-obese children with sleep disordered breathing.

Searching
MEDLINE, ERIC and unspecified Cochrane Reviews databases were searched from January 1980 to November 2007 for articles published in English or with English abstracts. Search terms were reported.

Study selection
Studies that evaluated the impact of tonsillectomy, adenoidectomy or both combined on height, weight, insulin-like growth factor-1 (IGF-1) and IGF-binding protein-3 (IGFBP3) in healthy children (birth to 18 years) who underwent surgery for recurrent infection or sleep disordered breathing were eligible for inclusion. Studies needed to provide height and/or weight data as z scores, age and sex adjusted weight-for-height or height-for-age centiles, raw data or percentage increased or decreased raw or z score changes in serum levels of IGF-1 or IGFBP-3. Studies were excluded if they included children with conditions that affect growth or obese children or if they specifically excluded children with sleep disordered breathing. Case studies were excluded.

Included studies evaluated the impact of tonsillectomy, adenoidectomy or adenotonsillectomy in children aged from five months to 15.8 years recruited from otorhinolaryngology or sleep centre services. Sleep disordered breathing was an inclusion criteria in most included studies. In seven studies, there was evidence of growth failure in participants at baseline. Follow-up ranged from one month to three years.

The authors did not state how studies were selected for the review.

Assessment of study quality
The authors did not state that they assessed the validity of the included studies.

Data extraction
Standardised mean differences (SMD) with 95% confidence intervals (CI) were calculated for each outcome. For growth parameters where centiles were used, centiles were extracted and converted into z scores by assuming a t distribution. Two reviewers independently extracted data. Differences were resolved through discussion and consultation with a third reviewer.

Methods of synthesis
Studies were included for meta-analysis only if they provided before and after z scores or centiles and standard deviations of differences. Pooled SMDs with 95% CI were calculated using a fixed-effect model. The weight for each study was calculated as the reciprocal of the variance of the SMD. Statistical heterogeneity was calculated using the $I^2$ statistic.

Results of the review
Twenty studies were included for review (n=886) of which 13 were included in the meta-analyses. Sample sizes ranged
from 14 to 204 participants.

Following surgery, height (SMD 0.34, 95% CI 0.20 to 0.47; 10 studies, n=363) and weight (SMD 0.57, 95% CI 0.44 to 0.70; 11 studies, n=390) significantly increased compared to pre-surgery levels. IGF-1 (SMD 0.53, 95% CI 0.33 to 0.73; seven studies, n=216) and IGFBP-3 (SMD 0.59, 95% CI 0.34 to 0.83; four studies, n=117) significantly increased following surgery compared to pre-surgery levels. There was evidence of statistical heterogeneity for the outcome of height ($I^2=46.6\%$) but not for any other outcomes.

**Authors' conclusions**

Standardised height, weight, IGF-1 and IGFBP-3 significantly increased following adenotonsillectomy.

**CRD commentary**

The review addressed a clear question. Inclusion criteria for intervention, participants and outcomes were well defined. Inclusion criteria for studies were broad. Three relevant databases were searched. The search was restricted to English-language studies and it appeared that no attempts were made to identify unpublished articles, so language and publication biases could not be ruled out. Suitable steps were taken in the data extraction process to minimise risks of reviewer error and bias; it was unclear whether similar steps were taken in the study selection process. It appeared that no validity assessment was carried out and so it was not possible to determine the quality of the included studies. However, all of the included studies were of weaker methodological design. Suitable methods were used to combine studies. Statistical heterogeneity was assessed and evidence of it was found for one outcome. In light of the unclear quality of the included studies and presence of statistical heterogeneity and the small numbers available for meta-analysis, the reliability of the authors' conclusions is unclear.

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

**Practice:** The authors stated that primary care and specialist health providers should consider the possibility of sleep disordered breathing when screening, treating and referring children with growth failure.

**Research:** The authors stated that further research was needed to assess IGF changes before and after adenotonsillectomy stratified by height, weight, growth hormone sufficiency and other factors affecting growth.

**Funding**

Not stated.

**Bibliographic details**

Bonuck KA, Freeman K, Henderson J. Growth and growth biomarker changes after adenotonsillectomy: systematic review and meta-analysis. Archives of Disease in Childhood 2009; 94(2): 83-91

**PubMedID**

18684748

**DOI**

10.1136/adc.2008.141192

**Original Paper URL**

http://adc.bmj.com/content/94/2/83.abstract

**Indexing Status**

Subject indexing assigned by NLM

**MeSH**

Adenoidectomy /rehabilitation; Adenoids /pathology; Adolescent; Anthropometry; Body Height; Child; Child, Preschool; Female; Growth; Growth Disorders /etiology; Humans; Hyperplasia /complications /surgery; Infant; Insulin-Like Growth Factor Binding Protein 3; Insulin-Like Growth Factor Binding Proteins /blood; Insulin-Like Growth
Factor I /metabolism; Male; Palatine Tonsil /pathology; Sleep Apnea, Obstructive /complications /surgery; Tonsillectomy /rehabilitation; Weight Gain

AccessionNumber
12009103661

Date bibliographic record published
20/05/2009

Date abstract record published
15/09/2010

Record Status
This is a critical abstract of a systematic review that meets the criteria for inclusion on DARE. Each critical abstract contains a brief summary of the review methods, results and conclusions followed by a detailed critical assessment on the reliability of the review and the conclusions drawn.