

# Tonsillectomy for Recurrent Sore Throats in Children: Indications, Outcomes, and Efficacy

James Barraclough, MBChB, MRCS, MMedSci<sup>1</sup>, and Shahram Anari, MD, FRCS<sup>2</sup>

Otolaryngology—  
 Head and Neck Surgery  
 2014, Vol. 150(5) 722–729  
 © American Academy of  
 Otolaryngology—Head and Neck  
 Surgery Foundation 2014  
 Reprints and permission:  
[sagepub.com/journalsPermissions.nav](http://sagepub.com/journalsPermissions.nav)  
 DOI: 10.1177/0194599814522593  
<http://otojournal.org>



No sponsorships or competing interests have been disclosed for this article.

## Abstract

**Objective.** To perform a comprehensive narrative review of the literature to provide a better understanding of the indications, outcomes, and efficacy of tonsillectomy for recurrent sore throats in children. This article explores the reasons why there is a lack of robust clinical evidence for its efficacy despite good evidence of positive reported outcomes from parents of children who undergo the procedure.

**Data Sources.** Articles published between 1960 and July 2013 were searched in PubMed and Cochrane databases.

**Review Methods.** A narrative review method was adopted to provide a comprehensive overview of articles. Only individual, interventional studies on children (0–16 years old) undergoing tonsillectomy or adenotonsillectomy for recurrent sore throats with greater than 1 month of follow-up were included.

**Conclusions.** The inclusion criteria and outcome measures in the studies were varied, but most investigated changes in symptoms related to sore throats or illness episodes. Quality-of-life tools validated for measuring pediatric outcomes were used in a number of more recent studies. None of the outcome measures were specific for recurrent sore throats in children. No qualitative method designed studies were identified.

**Implications for Practice.** The disparity between parental satisfaction rates and published clinical efficacy can be explained by a lack of parent/child outcome measures specific to tonsillectomy for recurrent sore throats. A more parent/child-centered approach may establish what tonsillectomy could offer this group of children.

## Keywords

tonsillectomy, indications, outcome measures, efficacy, quality of life

Received October 20, 2013; revised January 13, 2014; accepted January 15, 2014.

Tonsillectomy has been performed for approximately 2 millennia for a wide range of reasons.<sup>1</sup> Our understanding of the indications, outcomes, and efficacy of tonsillectomy has improved as clinical evidence has emerged. The frequency of performing the procedure has been reduced dramatically over the past 50 years in the United States and the United Kingdom.<sup>1,2</sup> This is probably due to clinical evidence that has emerged,<sup>3</sup> although the consequential implementation of guidelines has not been shown to influence clinicians' practice with regard to tonsillectomy.<sup>4</sup> In the United Kingdom, approximately 75% of tonsillectomies in 0- to 16-year-olds are performed for recurrent sore throats (RSTs), and there is concern that a rise in tonsil-related infection admission rates reflects a reduction in the frequency of tonsillectomy.<sup>2,3,5</sup>

Guidelines in the United States and United Kingdom for tonsillectomy for RSTs in children are based on criteria from the study by Paradise et al in 1984.<sup>6–8</sup> This randomized controlled trial (RCT) set strict inclusion criteria to determine the impact of the procedure on the frequency of postoperative sore throats. It could be argued that the assessment of an individual for tonsillectomy is not as straightforward as counting the number of preoperative sore throat episodes. Children who may benefit from the procedure could be missing out if selection criteria are purely based on the number of episodes. Anecdotally, we have noticed that parental reasons behind seeking tonsillectomy are not limited to the number of sore throat episodes. Their satisfaction with the procedure is due to improvement in a number of additional factors such as education and general well-being. With this in mind, it is our intention to provide a better understanding of the relationship between the indications, outcomes, and efficacy of tonsillectomy for RSTs in children as we believe that they are all

<sup>1</sup>Department of Ear, Nose and Throat Surgery, Queen Elizabeth Hospital Birmingham, Birmingham, UK

<sup>2</sup>Department of Ear, Nose and Throat Surgery, Birmingham Heartlands Hospital, Birmingham, UK

## Corresponding Author:

James Barraclough, Department of Ear, Nose and Throat Surgery, Queen Elizabeth Hospital Birmingham, Mindelsohn Way, Birmingham, B15 2WB, UK.

Email: [mrjamesbarraclough@gmail.com](mailto:mrjamesbarraclough@gmail.com)

closely interrelated. This review will assess the currently available evidence to provide an insight into what is known and where the evidence falls short.

## Methods

We chose to pursue a narrative overview rather than a formal systematic review, since our objective was to gain an insight into all types of studies relating to children undergoing tonsillectomy for RST. Specific inclusion criteria were used to provide the most objective overview possible. PubMed and Cochrane databases were searched for articles from 1960 to July 20, 2013. The search terms were *tonsil* or *tonsillectomy* or *adenotonsillectomy* with each of the terms *indications* or *outcomes* or *efficacy* or *effectiveness* or *experience* or *satisfaction*. A manual search of reference lists of the main articles was also performed to identify articles that were not found during the literature search. The search included both quantitative (numerical) data and descriptive data from qualitative designed studies that provide an interpretation of personalized accounts from individuals presented in a nonnumerical way.

The criteria used for this review with regard to the participants, interventions, comparisons, outcomes, and study design (PICOS) were as follows:

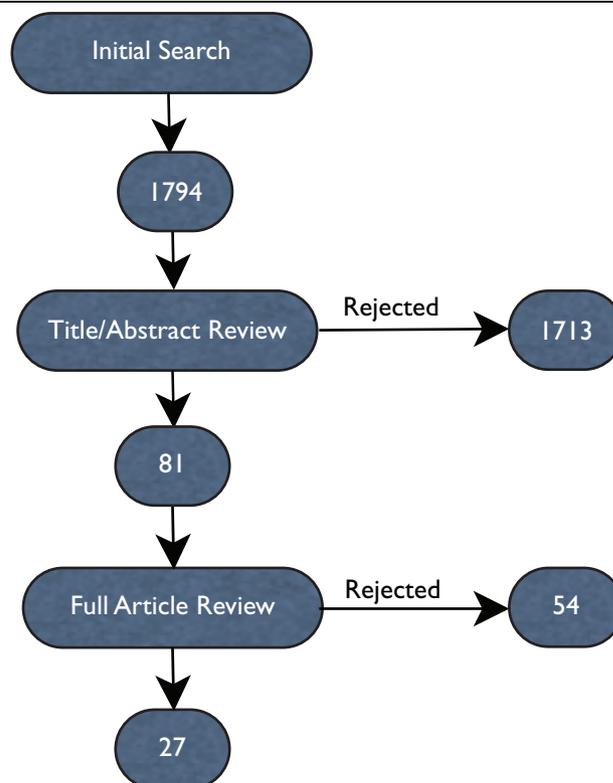
- Participants: Children 16 years and younger who had “recurrent sore throats” as defined in each study.
- Interventions: Tonsillectomy or adenotonsillectomy.
- Comparisons: This would depend on each study design. All comparisons were included to provide the widest possible overview of outcomes.
- Outcomes: All outcomes were included, but follow-up must have been greater than 1 month.
- Study design: Only individual, interventional comparative studies were included. Only English or English-translated articles were included.

## Discussion

The initial search produced 1794 articles. Reading each of the titles or abstracts of these articles excluded a further 1713 articles. The 81 remaining articles were fully reviewed. Fifty-four of these articles were rejected, since they did not fulfill the inclusion criteria: they were studies exclusively on adults, were noninterventional studies, or had a short follow-up period. The remaining 27 articles were included in the final review (see **Figure 1**).

### Randomized Controlled Trials

**Results.** Eleven RCTs met the inclusion criteria for this review (see **Table 1** and Suppl. Table S1, available at [otojournal.org](http://otojournal.org)).<sup>5,6,9-17</sup> Eight studies primarily assessed the efficacy of tonsillectomy (Suppl. Table S1), and 3 studies



**Figure 1.** Flow diagram of article selection.

primarily assessed the cost-effectiveness of the procedure (**Table 1**).

**Inclusion criteria.** The inclusion criteria for all of these studies included symptoms of sore throat, such as different severities, number of days, frequencies, and length of history of sore throat episodes.

### Outcome measures

1. Number/severity of episodes: 7 studies specifically analyzed the number and/or severity of sore throat episodes as the primary outcome measure.<sup>5,6,9,13,15-17</sup>
2. General illness episodes: 4 of the earlier studies were less specific and analyzed generalized illness episodes of the individual children.<sup>10-12,14</sup>
3. Family cost implications: 1 study analyzed the financial implications for the families of the individuals.<sup>16</sup>
4. Quality of life (QoL) assessment tools: 3 studies used validated QoL assessment tools to assess the impact of the procedure on children.<sup>5,15,17</sup> As seen in Supplemental Table S1, the tools were varied and included the PedsQL assessment tool,<sup>17</sup> the TAPQoL (for preschool children), and the TACQoL (for ages 6-11 years) tools.<sup>15</sup>
5. School absence: 4 studies also assessed school days lost.<sup>11-14</sup>

**Table 1.** RCTs: Cost-effectiveness Trials.

Primary Author	Design	Child Age Range, y	No. of Children	Indications	Outcome Measures	Follow-up	Conclusions
Buskens, <sup>16</sup> 2007	Economic evaluation from van Staiij et al <sup>15</sup> RCT	2-8	300	Mild to moderate symptoms of throat infection, upper respiratory tract infections, or adenotonsillar hypertrophy	Cost per episode of fever, throat infection, and upper respiratory tract infection avoided	24 mo	Adenotonsillectomy resulted in a significant increase in costs without realizing significant clinical benefit.
Lock, <sup>17</sup> 2010	RCT with economic analysis comparing surgery with conventional medical treatment plus a parallel nonrandomized study	4-15	268 in RCT and 461 in cohort study	4+ episodes of sore throat within the preceding 2 years or 6+ episodes in the preceding year	Reported episodes of sore throat. Secondary outcomes were sore throat and symptom-free days, GP consultations, sore throat severity, and surgical morbidity. Impact of costs and QoL assessed using PedsQL.	24 mo	Strong preferences for surgery for RCTs. Surgical management produced better outcomes compared with medical management.
Wilson, <sup>5</sup> 2012	Cohort design using data from patients in the RCT and those who declined RCT participation	4-15	268 in RCT and 461 in cohort study	5/+ episodes of sore throat for each of 2 years	Sore throat diaries. Questionnaires at 3, 12, and 24 months on sore throats, school problems, economic data, and PedsQL	24 mo	Tonsillectomy saves up to 8 sore throat episodes at a reasonable cost if performed promptly.

Abbreviations: GP, general practitioner; QoL, quality of life; RCT, randomized controlled trial.

6. Child-reported outcome measures: no RCTs assessed child self-reported outcomes specifically.

4. QoL assessment tools: the effect of tonsillectomy is small on changes in QoL measures.<sup>5,15,17</sup>

5. School absence: these were greatly variable and dependent on the inclusion criteria.<sup>11-14</sup>

#### Summary of findings (based on the outcome measures in the articles)

1. Number/severity of episodes: the number of episodes of sore throats is reduced by tonsillectomy in those severely affected, but only a modest reduction is seen in those moderately affected, and no significant reduction is seen in those with mild symptoms (degree of symptoms as defined in the Paradise study).<sup>6,9,13,15,16</sup>
2. General illness episodes: most symptoms related to the illness episodes improve with tonsillectomy, but sore throat episodes appear to improve the most.<sup>10-12,14</sup>
3. Family cost implications: in children with mild to moderate symptoms, a cost increase is seen with little relevant clinical benefit.<sup>16</sup>

#### Other Quantitative Studies

**Results.** Sixteen studies that met the inclusion criteria for this review were non-RCT quantitative studies (see **Table 2**, **Table 3**, and Suppl. Table S2, available at otojournal.org). Fourteen of these assessed the degree of parental satisfaction and change in children's QoL (**Table 2** and Suppl. Table S2). One study assessed the psychological changes after tonsillectomy, and a further study assessed the effect of tonsillectomy on growth in children (**Table 3**).<sup>18,19</sup>

**Inclusion criteria.** The inclusion criteria and indications for these studies were much less specific. Many studies did not

**Table 2.** Non-RCT Quantitative Studies: Validated Questionnaire Studies.

Primary Author	Population (Number)	Child Age Range, y	Indications	Assessment Tools and Timing	Outcome Measures	Conclusion
Goldstein, <sup>26</sup> 2002	Parents of children (64)	2-18	Recurrent tonsillitis and sleep-disordered breathing	OSA-18 and CBCL before surgery and 3 months after surgery	OSA-18 scores and how they correlate with CBCL scores	Behavior and emotional difficulties improve with tonsillectomy.
Goldstein, <sup>23</sup> 2008	Parents of children (38 at 1 year)	2-16	3/+ documented episodes of tonsil infections, 3/+ courses of antibiotics, or 3/+ months of continuous sore throat	CHQ-PF28 (validated) TAHSI preoperatively and 6 and 12 months postoperatively	TAHSI: airway/breathing, infection, health care use, cost of care, eating/swallowing, and behavior CHQ-PF28: questions regarding overall health status	Tonsillectomy improved disease-specific and global quality of life in children with recurrent sore throats.
Hopkins, <sup>27</sup> 2010	Parents of children (126)	1-16	Obstructive symptoms and "Paradise criteria" sore throats	Validation of the 14-item Paediatric Throat Disorders Outcome Test (t14)	Snoring, apnea, visits/phone to GP, antibiotic use, ear/throat infections, mouth/noisy breathing, poor weight gain, problems eating, poor behavior, disturbed sleep, and missing school	Improvement in all parameters and improvement in total scores 6 months postoperatively
Kubba, <sup>28</sup> 2004	Parents of children (670)	1-15	Children having undergone tonsillectomy for unspecified indications or ventilation tube insertion	Questionnaire for parents of children who had undergone tonsillectomy within 5 years	Questions covering overall satisfaction, emotion, physical health, learning and vitality	Overall parental satisfaction
Schwentner, <sup>25</sup> 2008	Parents of children (447)	1-18	Chronic tonsillitis; no other details	Questionnaire for adeno/tonsillectomy within 10 years	Total GCBI total scores and subscales for parents' assessment of physical health, emotion, learning, and vitality	Operation is highly effective. Positive and durable impact on health-related quality of life and other areas not directly associated.

Abbreviations: CBCL, Child Behavior Checklist; CHQ, Child Health Questionnaire; GCBI, Glasgow Children's Benefit Inventory; GP, general practitioner; OSA-18, Obstructive Sleep Apnea-18; RCT, randomized controlled trial; TAHSI, Tonsil and Adenoid Health Status Instrument.

specify the criteria for "chronic tonsillitis" or "recurrent tonsillitis," and a number of studies included children and/or adults with other indications. Only 6 studies evaluated children with sore throats exclusively.<sup>20-25</sup>

**Outcome measures.** All studies used a questionnaire to assess the outcomes in the individuals undergoing tonsillectomy, 5 of which were validated (**Table 2**).<sup>23,25-28</sup>

1. Structured outcome assessment tools: a number of outcome assessments were specifically used for the purposes of each study's design and included the Tonsil and Adenoid Health Status Instrument,<sup>23,27</sup>

Pediatric Throat Disorders Outcome Test or t14,<sup>27</sup> Glasgow Children's Benefit Inventory,<sup>25,28</sup> and Child Behavior Checklist.<sup>26</sup>

2. Generalized satisfaction outcome measures: 5 studies assessed parental overall satisfaction with the outcomes of tonsillectomy for the indications described.<sup>24,29-32</sup> In the work by Robb et al,<sup>24</sup> parental comments provided an insight into how they perceive the effectiveness of the procedure.
3. Child-reported outcome measures: no studies assessed children's views on the effect of the operation on their preoperative problems.

**Table 3.** Non-RCT Quantitative Studies: Nonquestionnaire Studies.

Primary Author	Population (No. of Children)	Child Age Range, y	Indications	Assessment Tools and Timing	Outcome Measures	Conclusion
Camilleri, <sup>19</sup> 1995	Children (204)	3-11	Not mentioned in text of study	Comparing height and weight to controls before and after tonsillectomy 1 year after surgery	Stratified height and weight measurements	Only an increase in weight gain observed postoperatively
Papakostas, <sup>18</sup> 2003	Parents of children (89)	2-16	Not described	Questionnaire based on diagnostic criteria for depression 3 weeks and 3 months postoperatively	Depressed mood; loss of interest, enjoyment, or energy; reduced concentration, attention, self-confidence, and guilt	Depressive symptoms are observed but usually resolve.

#### Summary of findings (based on the outcome measures in the articles)

1. Structured outcome assessment tools: generalized and specific QoL measures improve in most cases.<sup>23,25-28</sup>
2. Generalized satisfaction outcome measures: there is a high rate of satisfaction with the procedure. In the Robb et al<sup>24</sup> study, 45 of 48 parents reported that their child's health improved after the operation. Faulconbridge et al<sup>30</sup> state that 92% of the 2189 patients undergoing tonsillectomy for RSTs felt that their throat was better after the operation, although this included adults. Parental satisfaction was 91% (524/576) postoperatively in the Wolfensberger et al<sup>31</sup> study. All of these studies included patients who had 3 or more episodes of tonsillitis per year.

#### Qualitative Studies

There were no qualitative designed, descriptive, patient-derived studies that assessed tonsillectomy for recurrent sore throats in children.

#### Current Guidelines

This review provides an overview of where we stand with regard to the current evidence for tonsillectomy for RSTs in children. A range of study designs have been used in an attempt to improve our understanding of the indications, outcomes, and efficacy.

Guidelines for tonsillectomy have been developed from studies that provide the best evidence for its efficacy. The 1984 Paradise et al<sup>6</sup> study provides the clearest evidence of improved outcomes in children fulfilling the specific inclusion criteria for that study: the "Paradise criteria."<sup>8</sup> These

criteria have been used in the United States and United Kingdom to help with surgical decision making for tonsillectomy, since no other robust evidence exists to suggest that children outside of these criteria would benefit sufficiently from the procedure.<sup>7,8</sup> A Cochrane review by Burton and Glasziou<sup>33</sup> agrees that the benefit of tonsillectomy in severely affected children is clear, but they quote a reduction of only 5 sore throat days per year in moderately affected children after the procedure. A further systematic review and meta-analysis suggests that tonsillectomy reduces the incidence of recurrent pharyngitis by approximately 43% and that 11 tonsillectomies would have to be performed to prevent 1 sore throat per month in the first year after tonsillectomy.<sup>34</sup>

#### Parental Preference

Level 1 evidence exists in favor of tonsillectomy for only severely affected children. However, we know from a number of observational studies that overall parental satisfaction following tonsillectomy is high. Studies quote satisfaction levels in excess of 90%, and some studies include children who do not necessarily meet the "Paradise criteria."<sup>24,30-32,35,36</sup>

In addition to this, parents have shown a strong preference for surgical intervention.<sup>37</sup> Lock et al<sup>17</sup> performed a "utility/willingness-to-pay study" and found that parents are willing to pay a high price for a procedure (not specifically tonsillectomy) to improve their child's health if they are suffering. A qualitative study by the same authors as part of their larger trial identified a variation in the impact of RSTs on children and their families.<sup>17,38</sup> A clear demand for tonsillectomy by parents to reduce a child's suffering was evident in a large number of cases in the main study. Despite the risks involved, parents continue to request the procedure. In the study by van Staij et al,<sup>15</sup> 34% of individuals changed from the watchful waiting group to the

treatment group. In the RCT by Lock et al,<sup>17</sup> 36 of 137 patients randomized to medical management changed to the surgical arm, and 9 of the 74 who initially requested medical management in the cohort study also resorted to surgery.

### *The Observed Paradox*

Review of the literature reveals a disparity between the measured efficacy of tonsillectomy and the parental satisfaction rate. Is this because of parental anticipated gains and the placebo effect, or perhaps that aspects important to children and their parents are not being measured? Randomized controlled trials, by their very nature, use specific inclusion criteria and outcome measures. Sore throat episodes were measured in all RCTs identified in this review and are the main focus in evaluating the efficacy of tonsillectomy. However, when parents or carers describe the problem of children's RSTs to clinicians, they describe a collection of symptoms and consequences of the sore throats. The frequency of sore throat episodes is just one of an array of problems reported by the family and possibly the children themselves. It is interesting to note the absence of studies assessing outcomes reported by children themselves for this commonly performed procedure.

The inherent focus in the tonsillectomy RCTs may therefore be their weakness. Strict inclusion criteria and outcome measures will never capture the whole spectrum of cases. This review highlights the attempt by some authors to try to assess other factors that may be affected when a child undergoes the procedure. Nonrandomized quantitative studies are capable of exploring a wider range of issues, and **Table 2**, **Table 3**, and Supplemental Table S2 provide an insight into some of these. The outcomes measured include clinical factors and also social, psychological, educational, and financial issues. These studies are, however, more at risk of bias.

### *Assessment Tools*

A group of outcomes can be measured together using a questionnaire as a QoL assessment tool. Some of the RCTs and a number of the nonrandomized trials have used questionnaires validated for assessment of tonsillectomy. For example, the study by Hopkins et al<sup>27</sup> reporting the 14-item Paediatric Throat Disorders Outcome Test has demonstrated internal consistency, reliability, responsiveness to change, and construct validity. The questions within this tool were agreed on by a panel of experts and modified from the Tonsil and Adenoid Health Status Instrument.<sup>23</sup> Eight questions relate to RSTs, and they cover aspects including frequent medical visits and phone calls, antibiotic use, ear and throat infections, and school absence. In the United Kingdom, patient-reported outcome measures (PROMs), which use a number of QoL outcome tools, have been introduced to assess health care consumer satisfaction rates for certain procedures.<sup>39</sup> These are likely to form a basis for assessment of outcomes for surgical procedures, including tonsillectomy.<sup>40</sup>

Quality-of-life assessment tools go some way toward providing a greater depth of measurable outcomes for tonsillectomy. Even though these tools are validated, it could be argued that they assess what clinicians feel to be important, rather than what the families or patients actually experience. Also, none of the tools in this review include opinions and experiences from children themselves. These two observations could mean that important viewpoints are not included in the questionnaires. Although some studies have addressed some issues by employing physician-derived questionnaires, no study has extracted the in-depth opinions of the child or the parent as to how recurrent tonsillitis affects them.

### **Implications for Practice**

Perhaps the measured benefits in the large studies are not measuring the benefits that parents and children themselves observe. Tonsillectomy may have an effect on an individual's overall well-being that is not being properly measured by currently available trials. This issue is raised in both the Burton and Glasziou<sup>33</sup> Cochrane review and a review by Marshall.<sup>41</sup> In most RCTs, outcomes are based on the number of sore throat episodes. A different approach to exploring the tonsillectomy process would be to perform a qualitative study. This would provide a better understanding of what parents and their children experience. The authors of this review believe that this is now needed and are currently undertaking work in an attempt to answer some of these questions.

A qualitative study by Lock et al<sup>17,38</sup> was performed in conjunction with their RCT to examine what families experience when a child has RSTs. They observed a number of themes, including an overriding need to request a tonsillectomy in affected children. Previous personal experiences provided strong influencing factors for parents to request a tonsillectomy. The free text section in the questionnaire from the study by Robb et al<sup>24</sup> provides an insight into the true feelings of parents of children who undergo the procedure. A qualitative study performed after tonsillectomy would further explore these themes.

Current guidelines may not consider the full impact of the disease process on the patient's QoL.<sup>42</sup> A patient/parent-centered approach could help in developing a set of criteria used as indications or outcome measures for tonsillectomy; these patient/parent-driven criteria would be more likely to reflect the observations and anticipated gains of the parents and children involved in the process. There is an increasing requirement for justification of surgical interventions. It is our belief that an increased understanding of their outcomes with the use of subjective methods could be used to develop more valid and reliable objective outcome measures.

### **Conclusion**

There appears to be a difference in parental satisfaction rates and the published clinical outcomes, efficacy, and clinical effectiveness of tonsillectomy for RSTs in children. Some studies in the current literature have provided

an insight into the numerous interactions at play. A new approach may be required to establish what tonsillectomy has to offer this group of children. If the effectiveness of tonsillectomy relates to child/parental satisfaction, their view should form a basis in the selection criteria. Therefore, studies with a child/parent-centered approach are needed to provide a better understanding of this complex process.

### Author Contributions

**James Barraclough**, derived design and concept of manuscript, performed article search, read and reviewed all papers, collected and aligned data groups, continuously revised piece after critical appraisal by second author, approved the final version; **Shahram Anari**, significantly contributed to original idea and focused reading of first author, read many of the original manuscripts and contributed significantly to the data interpretation and discussion, critically appraised the piece throughout the process, approved the final version.

### Disclosures

**Competing interests:** None.

**Sponsorships:** None.

**Funding source:** None.

### Supplemental Material

Additional supporting information may be found at <http://oto.sagepub.com/content/by/supplemental-data>

### References

- Grob GN. The rise and decline of tonsillectomy in twentieth-century America. *J Hist Med Allied Sci.* 2007;62:383-421.
- Health and Social Care Information Centre. [www.hesonline.nhs.uk](http://www.hesonline.nhs.uk). Accessed March 30, 2013.
- ENT UK. Indications for tonsillectomy: position paper. 2009. [https://entuk.org/docs/prof/position\\_papers/tonsillectomy\\_position\\_paper](https://entuk.org/docs/prof/position_papers/tonsillectomy_position_paper). Accessed March 30, 2013.
- Donaldson LJ, Hayes JH, Barton AG, Howel D, Hawthorne M. Impact of clinical practice guidelines on clinicians' behaviour: tonsillectomy in children. *J Otolaryngol.* 1999;28:24-30.
- Wilson JA, Steen IN, Lock CA, et al. Tonsillectomy: a cost-effective option for childhood sore throat? Further analysis of a randomized controlled trial. *Otolaryngol Head Neck Surg.* 2012;146:122-128.
- Paradise JL, Bluestone CD, Bachman RZ. Efficacy of tonsillectomy for recurrent throat infection in severely affected children: results of parallel randomized and nonrandomized clinical trials. *N Engl J Med.* 1984;310:674-683.
- Randel A. AAO-HNS guidelines for tonsillectomy in children and adolescents. *Am Fam Physician.* 2011;84:566-573.
- Scottish International Guidelines Network. Guideline 117: management of sore throat and indications for tonsillectomy. 2010. [www.sign.ac.uk/pdf/sign117.pdf](http://www.sign.ac.uk/pdf/sign117.pdf). Accessed March 30, 2013.
- Mawson SR, Adlington P, Evans M. A controlled study evaluation of adeno-tonsillectomy in children. *J Laryngol Otol.* 1967;82:777-790.
- Mawson SR, Adlington P, Evans M. A controlled study evaluation of adeno-tonsillectomy in children. *J Laryngol Otol.* 1967;82:963-979.
- McKee WJ. A controlled study of the effects of tonsillectomy and adenoidectomy in children. *Br J Prev Soc Med.* 1963;17:49-69.
- McKee WJ. The part played by adenoidectomy in the combined operation of tonsillectomy with adenoidectomy: second part of a controlled study in children. *Br J Prev Soc Med.* 1963;17:133-140.
- Paradise JL, Bluestone CD, Colborn DK, Bernard BS, Rockette HE, Kurs-Lasky M. Tonsillectomy and adenotonsillectomy for recurrent throat infection in moderately affected children. *Pediatrics.* 2002;110:7-15.
- Roydhouse N. A controlled study of adenotonsillectomy. *Lancet.* 1969;2:931-932.
- van Staaik BK, van den Akker EH, Rovers MM, Hordijk GJ, Hoes AW, Schilder AG. Effectiveness of adenotonsillectomy in children with mild symptoms of throat infections or adenotonsillar hypertrophy: open, randomised controlled trial. *BMJ.* 2004;329:651.
- Buskens E, van Staaik B, van den Akker J, Hoes AW, Schilder AG. Adenotonsillectomy or watchful waiting in patients with mild to moderate symptoms of throat infections or adenotonsillar hypertrophy: a randomized comparison of costs and effects. *Arch Otolaryngol Head Neck.* 2007;133:1083-1088.
- Lock C, Wilson J, Steen N, et al. North of England and Scotland Study of Tonsillectomy and Adeno-tonsillectomy in Children (NESSTAC): a pragmatic randomised controlled trial with a parallel non-randomised preference study. *Health Technol Assess.* 2010;14:1-164, iii-iv.
- Papakostas K, Moraitis D, Lancaster J, McCormick MS. Depressive symptoms in children after tonsillectomy. *Int J Pediatr Otorhinolaryngol.* 2003;67:127-132.
- Camilleri AE, MacKenzie K, Gatehouse S. The effect of recurrent tonsillitis and tonsillectomy on growth in childhood. *Clin Otolaryngol Allied Sci.* 1995;20:153-157.
- Akgun D, Seymour FK, Qayyum A, Crystal R, Frosh A. Assessment of clinical improvement and quality of life before and after tonsillectomy. *J Laryngol Otol.* 2009;123:199-202.
- Conlon BJ, Donnelly MJ, McShane DP. Improvements in health and behaviour following childhood tonsillectomy: a parental perspective at 1 year. *Int J Pediatr Otorhinolaryngol.* 1997;41:155-161.
- Fujihara K, Koltai PJ, Hayashi M, Tamura S, Yamanaka N. Cost-effectiveness of tonsillectomy for recurrent acute tonsillitis (provisional abstract). *Ann Otol Rhinol Laryngol.* 2006;115:365-369.
- Goldstein NA, Stewart MG, Witsell DL, et al. Quality of life after tonsillectomy in children with recurrent tonsillitis. *Otolaryngol Head Neck Surg.* 2008;138(1)(suppl):S9-S16.
- Robb PJ, Gowrinath K, Agyeman K, Joseph J. Paediatric tonsillectomy: parental experience and outcomes. *J Laryngol Otol.* 2009;123:103-107.
- Schwentner I, Schmutzhard J, Schwentner C, Abraham I, Hofer S, Sprinzl GM. The impact of adenotonsillectomy on children's quality of life. *Clin Otolaryngol.* 2008;33:56-59.

26. Goldstein NA, Fatima M, Campbell TF, Rosenfeld RM. Child behavior and quality of life before and after tonsillectomy and adenoidectomy. *Arch Otolaryngol Head Neck Surg.* 2002;128:770-775.
27. Hopkins C, Fairley J, Yung M, Hore I, Balasubramaniam S, Haggard M. The 14-item Paediatric Throat Disorders Outcome Test: a valid, sensitive, reliable, parent-reported outcome measure for paediatric throat disorders. *J Laryngol Otol.* 2010;124:306-314.
28. Kubba H, Swan IR, Gatehouse S. The Glasgow Children's Benefit Inventory: a new instrument for assessing health-related benefit after an intervention. *Ann Otol Rhinol Laryngol.* 2004;113:980-986.
29. Afolabi OA, Alabi BS, Ologe FE, Dunmade AD, Segun-Busari S. Parental satisfaction with post-adenotonsillectomy in the developing world. *Int J Pediatr Otorhinolaryngol.* 2009;73:1516-1519.
30. Faulconbridge RV, Fowler S, Horrocks J, Topham JH. Comparative audit of tonsillectomy. *Clin Otolaryngol Allied Sci.* 2000;25:110-117.
31. Wolfensberger M, Haury JA, Linder T. Parent satisfaction 1 year after adenotonsillectomy of their children. *Int J Pediatr Otorhinolaryngol.* 2000;56:199-205.
32. Nikakhlagh S, Rahim F, Boostani H, Shirazi S, Saki S. The effect of adenotonsillectomy on quality of life in adults and pediatric patients. *Indian J Otolaryngol Head Neck Surg.* 2012;64:181-183.
33. Burton MJ, Glasziou PP. Tonsillectomy or adeno-tonsillectomy versus non-surgical treatment for chronic/recurrent acute tonsillitis. *Cochrane Database Syst Rev.* 2009;(1):CD001802.
34. Blakley BW, Magit AE. The role of tonsillectomy in reducing recurrent pharyngitis: a systematic review. *Otolaryngol Head Neck Surg.* 2009;140:291-297.
35. Wilson JT, Murray A, MacKenzie K. Prospective study of morbidity after tonsillectomy in children. *Int J Pediatr Otorhinolaryngol.* 2001;58:119-125.
36. Blair RL, McKerrow WS, Carter NW, Fenton A. The Scottish tonsillectomy audit. The Audit Sub-Committee of the Scottish Otolaryngological Society. *J Laryngol Otol Suppl.* 1996;20:1-25.
37. Bond J, Wilson J, Eccles M, et al. Protocol for North of England and Scotland Study of Tonsillectomy and Adeno-Tonsillectomy in Children (NESSTAC): a pragmatic randomised controlled trial comparing surgical intervention with conventional medical treatment in children with recurrent sore throats. *BMC Ear Nose Throat Disord.* 2006;6:13.
38. Lock C, Baker R, Brittain K. 'I've just taken you to see the man with the CD on his head': the experience and management of recurrent sore throat in children. *J Child Health Care.* 2010;14:95-110.
39. Department of Health. Guidance on the routine collection of Patient Reported Outcome Measures (PROMS). 2009. [http://www.dh.gov.uk/en/Publicationsandstatistics/Publications/PublicationsPolicyAndGuidance/DH\\_092647](http://www.dh.gov.uk/en/Publicationsandstatistics/Publications/PublicationsPolicyAndGuidance/DH_092647). Accessed March 30, 2013.
40. Department of Health. Equity and excellence: liberating the NHS. 2010. [http://www.dh.gov.uk/en/Publicationsandstatistics/Publications/PublicationsPolicyAndGuidance/DH\\_117353](http://www.dh.gov.uk/en/Publicationsandstatistics/Publications/PublicationsPolicyAndGuidance/DH_117353). Accessed March 30, 2013.
41. Marshall T. A review of tonsillectomy for recurrent throat infection. *Br J Gen Pract.* 1998;48:1331-1335.
42. Clement WA, Dempster JH. Implementation by Scottish otolaryngologists of the Scottish Intercollegiate Guidelines Network document Management of Sore Throats and the Indications for Tonsillectomy: four years on. *J Laryngol Otol.* 2004;118:357-361.
43. Fox R, Temple M, Owens D, Short A, Tomkinson A. Does tonsillectomy lead to improved outcomes over and above the effect of time? A longitudinal study. *J Laryngol Otol* 2008; 122:1197-1200.