Laryngoscope Investigative Otolaryngology
© 2018 The Authors Laryngoscope Investigative Otolaryngology
published by Wiley Periodicals, Inc. on behalf of The Triological Society

Is weight a predictive risk factor of postoperative tonsillectomy bleed?

Allison G. Ordemann, MD; Anna Jade Hartzog, MD; Samantha R. Seals, PhD; Christopher Spankovich, PhD; Scott P. Stringer, MD

Objective: To determine if a correlation exists between weight-for-age percentile and post-tonsillectomy hemorrhage in the pediatric population.

Study Design: Retrospective study.

Methods: 1418 patients under the age of 15 who underwent tonsillectomy with or without adenoidectomy at a tertiary children's hospital between June 2012 and March 2015 were included in this retrospective study. Patient demographic information, operative and postoperative variables, as well as category and day of postoperative tonsillectomy bleed, if one occurred, were recorded. Fisher's exact and ordinal logistic regression analyses were performed on the full cohort.

Results: The overall post-tonsillectomy hemorrhage prevalence was found to be 2.2%, with primary and secondary rates of 0.78% and 1.34%, respectively. Weight-for-age percentile, sex, indication for or method of tonsillectomy, or postoperative use of NSAIDs, antibiotics or narcotics were not significantly associated with post-tonsillectomy hemorrhage. There was a significant relationship between postoperative use of dexamethasone and higher rate of Category 3 post-tonsillectomy hemorrhage ($P = .028$).

Conclusion: The post-tonsillectomy hemorrhage rate in our study is consistent with that cited in the literature. No correlation was demonstrated between weight-for-age percentile and occurrence of post-tonsillectomy hemorrhage. Postoperative administration of dexamethasone was associated with a significant increased rate of post-tonsillectomy hemorrhage requiring surgical intervention, a novel finding.

Key Words: Tonsillectomy, obesity, postoperative, hemorrhage, pediatric.

Level of Evidence: 4

INTRODUCTION

Tonsillectomy is one of the most common surgeries in otolaryngology, roughly half a million performed annually in the United States, with a majority of these surgeries performed on children under 15 years old.[1,2] Indications for tonsillectomy can include tonsillitis, peritonsillar abscess, streptococcal carriage, hemorrhagic tonsillitis, tonsillar asymmetry, and obstructive sleep apnea,[3] with the last accounting for 80% of tonsillectomy indications currently.[4] Despite its common practice, risks are associated with the procedure, including pain, respiratory difficulty, dehydration and bleeding.[5] Post-tonsillectomy hemorrhage (PTH) is one of the most common and concerning risks, accounting for one-third of complications. However, the cited mortality associated with PTH ranges from 16% to 54% in the literature.[6,7] The incidence of PTH, regardless of primary or secondary bleed status, ranges from 0.12% to 18%.[8–22]

There are numerous studies investigating causative relationships between PTH and the use of perioperative steroids, non-steroidal anti-inflammatory drugs (NSAIDS), antibiotics and narcotics, as well as the surgical method, indication, and sex.[8,23–26] However, the literature lacks adequate studies on the relationship of obesity to PTH. Approximately 35% of adults and 17% of children are obese within the United States.[27,28] To the authors' knowledge, there has been only one study, from Austria, researching this association, wherein no association between obesity and PTH was found. However, their study, in a country where only 12% of the adult and 7% of the children populations are obese, included both children and adults.[9]

Obesity is known to result in chronic inflammation. Within the general surgery literature, it has been shown to cause increased rates of surgical complications such as delayed wound healing and infection, leading to higher morbidity and mortality rates.[29] With the

This is an open access article under the terms of the Creative Commons Attribution-NonCommercial-NoDerivs License, which permits use and distribution in any medium, provided the original work is properly cited, the use is non-commercial and no modifications or adaptations are made.

From the Department of Otolaryngology (A.G.O., C.S., S.P.S.), University of Mississippi Medical Center, Jackson, Mississippi, U.S.A., the Department of Anesthesiology (A.J.H.), Vanderbilt University Medical Center, Nashville, Tennessee, U.S.A.; and the Department of Mathematics and Statistics (S.R.S.), University of West Florida, Pensacola, Florida, U.S.A.

Editor's Note: This Manuscript was accepted for publication on 13 March 2018.

This paper was presented in poster format at the American Society of Pediatric Otolaryngology-Combined Sections Meeting in Chicago, IL on May 20, 2016.

Send correspondence to Allison G. Ordemann, MD, University of Texas Southwestern and Children's Medical Center Dallas, Department of Otolaryngology, Pediatric Otolaryngology Division, 2350 N. Stemmons Freeway, Dallas, TX 75204. Email: Allison.Ordemann@UTSouthwestern.edu

DOI: 10.1002/lio2.155

increasing rate of obesity, in addition to the high number of tonsillectomies performed each year, it is important to study the effects obesity has on post-tonsillectomy complications, including hemorrhage. Our population is an ideal place to study the relationship of obesity and PTH as Mississippi has one of the highest rates of obesity in the nation.[27,28]

Obesity in children is defined as a body mass index (BMI) greater or equal to the 95th percentile for sex and age, while overweight is defined as having a BMI greater or equal to the 85th percentile, but less than the 95th percentile for sex and age.[30] Unfortunately, less than 50% of primary care physicians assess BMI regularly in children, citing time constraints as a main barrier.[31] Weight stratified for age percentiles can be used as a screening tool for childhood obesity in lieu of BMI. Gamliel et al demonstrated that using the 90th and 75th weight-for-age percentile cutoffs for identifying obese and overweight children were highly sensitive, 94.3% and 93.2% respectively, and that these cutoffs corresponded appropriately with BMI in the pediatric population.[30]

This study aims to elucidate if a correlative relationship exists between weight stratified for age and PTH within the pediatric population. Our null hypothesis was that no correlation exists. Secondarily, we sought to identify if any other modifiable factors previously studied in the literature were predictive of PTH, including perioperative NSAID, narcotic, antibiotic, or steroid use, surgical method, tonsil size, sex, age, resident postgraduate year or indication.

MATERIALS AND METHODS

Study Setting and Design

This retrospective study was performed at the University of Mississippi Medical Center (UMMC), a tertiary, academic hospital. The Institutional Review Board at University of Mississippi Medical Center (UMMC) approved this study. For the study, 1418 patients under the age of 15 who underwent tonsillectomy with or without adenoidectomy at UMMC between June 2012 and March 2015 were identified for inclusion. No cases meeting inclusion criteria were excluded from the study.

Study Definitions

The category of bleed was divided into Type 1 (reported bleeding), Type 2 (bleeding requiring ER visit/hospitalization) and Type 3 (bleeding requiring control in the operating room). Bleeds were also recorded as primary bleed (within 24 hours of surgery) or secondary bleed (more than 24 hours after surgery).

Data Collection

Charts were reviewed to collect the following data points for each patient: patient age; sex; primary indication for surgery; weight in kilograms; weight percentile for age in accordance to the Center for Disease Control (CDC) guidelines; operation (tonsillectomy +/- adenoidectomy); method (Bovie electrocautery, Snare, Coblator); Surgeon; Resident postgraduate year; tonsil size; adenoid size; prescribed postoperative narcotics, antibiotics, steroids or Carafate; instructions for use of NSAIDS for postoperative pain control; occurrence of PTH; category and day of PTH occurrence if applicable. Operative charts, discharge instructions, postoperative visits, telephone communications and nursing notes were reviewed to gather the above data.

All chart reviews were performed by two of the authors, a chief otolaryngology resident (AO) and senior medical student (AJH). The chart reviews were performed together and consecutively over a several day time period to counteract fatigue and variability, respectively. All chart review was overseen by AO. Inter-rater variability was not felt to be significant due to the obvious objective variables recorded, the short time course in which the review was performed, as well as the limited number of reviewers.

Statistical Analysis

Patient characteristics are shown as median (interquartile range) for continuous variables or n (%) for categorical variables, as the skewedness of the data required nonparametric statistical methods of analysis. Continuous variables are compared using the Wilcoxon two-sample t-test approximation and categorical variables are compared using Fisher's exact test. Unadjusted logistic regressions were used to model the relationship between tonsillectomy bleeds and predictors of interest. *P*-values less than .05 are considered statistically significant. Analyses were conducted using SAS software, Version 9.4 (SAS Institute, Inc., Cary, North Carolina, U.S.A.).

RESULTS

Demographic Information

Table I provides the demographic information of our study population. Sex distribution was fairly equal with a slight male predominance of 53% (748 of 1418). The average age was 5.45 years with a range of 1.26–14.97 years. A majority of the tonsillectomies were performed using Bovie electrocautery (85.4%). Multiple indications were listed for many of the surgeries. Approximately half (50.1%) of the patients received a prescription for postoperative dexamethasone, while three-quarters received a narcotic prescription. A total of six attending surgeons performed tonsillectomies over this time with the majority of cases (82%) performed or overseen by our fellowship trained pediatric otolaryngologists with participation of 27 residents over the time span. There was no significant difference in bleed rate between different levels of post-graduate year or attending.

Post-tonsillectomy Hemorrhage Rates

The overall PTH occurrence was found to be 2.2%, with primary and secondary PTH accounting for 0.78% and 1.34%, respectively. PTH by category was 0.71% (n = 10) for Type 1, 0.71% (n = 10) for Type 2, and 0.78% (n = 11) for Type 3.

Association of Variables with Post-tonsillectomy Hemorrhage

Postoperative dexamethasone use was the only variable that showed a statistically significant relationship with Category 3 PTH ($P = .028$). Category 1 and 2 bleeds did not show a significant relationship with PTH, $P = 0.078$ and $P = .082$, respectively. Overall, patients

TABLE I.
Patient Characteristics

Characteristic		Overall n = 1418	No Bleed n = 1387	Bleed n = 31	*P* value
Age (y)		5.45 (4.1)	5.435 (4.1)	5.84 (3.7)	.483
Sex (F)		670 (47.2%)	656 (47.3%)	14 (45.2%)	.855
Weight-for-age %		75.255 (52.0)	75.57 (51.7)	70.6 (65.4)	.515
Operation	T	194 (13.7%)	185 (13.3%)	9 (29.0%)	.029
	AT	1224 (86.3%)	1202 (86.7%)	22 (71.0%)	
Method	B	1211 (85.4%)	1183 (85.3%)	28 (90.3%)	.876
	S	179 (12.6%)	176 (12.7%)	3 (9.7%)	
	C	24 (1.7%)	24 (1.7%)	0 (0.0%)	
Adenoid Size	1	162 (11.4%)	160 (11.5%)	2 (6.5%)	.881
	2	407 (28.7%)	401 (28.9%)	6 (19.4%)	
	3	407 (28.7%)	398 (28.7%)	9 (29.0%)	
	4	291 (20.5%)	286 (20.6%)	5 (16.1%)	
Tonsil Size	1	92 (6.5%)	90 (6.5%)	2 (6.5%)	.768
	2	285 (20.1%)	279 (20.1%)	6 (19.4%)	
	3	557 (39.3%)	547 (39.4%)	10 (32.3%)	
	4	481 (33.9%)	468 (33.7%)	13 (41.9%)	
Postoperative Meds					
Antibiotics		646 (45.6%)	634 (45.7%)	12 (38.7%)	.471
Narcotics		1076 (75.9%)	1052 (75.8%)	24 (77.4%)	1.000
NSAID		499 (35.2%)	488 (35.2%)	11 (35.5%)	1.000
Steroids		710 (50.1%)	690 (49.7%)	20 (64.5%)	.145
Surgery Indication					
PTA		8 (0.6%)	8 (0.6%)	0 (0.0%)	1.000
Tonsillitis		500 (35.3%)	489 (35.2%)	11 (35.4%)	.550
Hypertrophy		1111 (78.3%)	1088 (78.4%)	23 (74.2%)	.513
OSA		209 (14.7%)	206 (14.9%)	3 (9.7%)	.609
PFAPA		7 (0.5%)	6 (0.4%)	1 (3.2%)	.144
SDB		786 (55.4%)	766 (55.2%)	20 (64.5%)	.363
Tonsil Asymmetric		2 (0.1%)	2 (0.1%)	0 (0.0%)	1.000
Traumatic Laceration		1 (0.1%)	1 (0.1%)	0 (0.0%)	1.000
Surgeon PGY	1	294 (20.7%)	289 (20.8%)	5 (0.19%)	.497
	2	446 (31.5%)	437 (31.5%)	9 (33.3%)	
	3	71 (5.0%)	67 (4.8%)	4 (14.8%)	
	4	220 (15.5%)	216 (15.6%)	4 (14.8%)	
	5	154 (10.9%)	151 (10.9%)	3 (11.1%)	
	Attending	233 (16.4%)	227 (16.4%)	6 (22.2%)	

AT = adenotonsillectomy; B = Bovie; C = Coblator; OSA = Obstructive Sleep Apnea; PFAPA = Periodic Fever, Aphthous Stomatitis, Pharyngitis, Cervical Adenitis; PTA = peritonsillar abscess; SDB = sleep disturbed breathing; S = Snare (cold steel technique); T = Tonsillectomy.

receiving postoperative dexamethasone were 1.8 times more likely to have a tonsil bleed than those not given dexamethasone, but were 10.1 times more likely to have a tonsil bleed requiring surgical intervention (Category 3), as seen in Tables II and III.

Increased weight-for-age percentile was not associated with PTH. This was true whether the weight for age was treated as a continuous variable or categorized in percentile brackets (0–10%, 19–20%, etc.). Overall, the bleed rate was low and there was no significant difference between surgical methods for ratio of bleeds ($P = .657$). Similarly, sex, indication for tonsillectomy, or postoperative use of NSAIDs, antibiotics or narcotics were not significantly associated with post-tonsillectomy hemorrhage, as demonstrated in Table III.

DISCUSSION

As tonsillectomy is one of the most common operative procedures in children in the United States, many studies have examined major complication rates and the presence of causative factors, following tonsillectomy. While much of the data in the literature is conflicting, these studies are important in order to improve the safety of the procedure as well as limit the cost burden of visits associated with these complications.

TABLE II.
Unadjusted Relationships (Logistic Regression).

Characteristic	Odds Ratio (95% CI)	*P* value
Sex	F 0.89 (0.42, 1.92)	.775
Weight for Age	1.00 (0.98, 1.01)	.458
Method (B, S, or C)	B 1.06 (0.06, 18.89)	.773
	S 0.69 (0.03, 15.72)	.687
	C - ref -	- ref -
Postoperative Medications		
Antibiotics	0.59 (0.26, 1.33)	.204
Narcotic use	0.91 (0.38, 2.18)	.838
NSAID use	1.26 (0.58, 2.75)	.553
Steroid use	2.40 (1.04, 5.52)	.039

B = Bovie Electrocautery; C = Coblator; F= Female; S = Snare/Cold steel technique.

Recent studies show the rate of unplanned return visit to the hospital following adenotonsillectomy ranged from 6.3–11.4%,[12,13,32] with PTH accounting for 24.2–37.4% of these visits.[13,14] Curtis et al found the average cost associated with PTH to be $1502.[14] Furthermore, PTH is described as one of the most common complications following tonsillectomy resulting in malpractice claims and death, accounting for 33.7% of claims and 52.4% of deaths in one study.[7] However, a questionnaire from 2013 distributed through the Academy of Otolaryngology–Head and Neck Surgery showed PTH to be the cause of post-tonsillectomy mortality only 16% of the time.[6] Despite the variability, it is important to note the PTH can often be fatal, and thus remains an important topic of study. The overall PTH occurrence in our study was found to be 2.2%, with primary and secondary PTH accounting for 0.78% and 1.34%, respectively. These rates are comparable to that currently described in the literature of 0.2–2.2%, and 0.1–3%, respectively.[2]

After observing several consecutive tonsil bleeds in obese children at the authors' institution, our study aimed to determine if a correlative relationship exists between weight-for-age percentile and PTH. It is the only study in the English literature specifically investigating this association. Weight-for-age percentile was chosen over BMI as the study variable as it has been shown to be a sensitive screening tool for obesity in children that corresponds well with BMI.[30] Furthermore, in our institution, as with most, weight is necessary prior to proceeding with surgery and an accurate measurement is taken on the day of surgery, while height was invariably recorded.

We chose to use the CDC weight-for-age percentiles in our study and not the World Health Organization (WHO) reference. The decision to do so was based primarily on the current recommendation to use the CDC data for children over the age of 24 months, accounting for 98% of the patients in our study. Furthermore, the WHO curves were created to describe the growth of healthy children under optimal conditions, excluding infants not breastfed for more than 12 months. The CDC data comes from a sample population where only 50% were ever breastfed.[33]According to the most recent breastfeeding data collected by the CDC, approximately 50.5% of Mississippi children are ever breastfed.[34] Therefore, we felt the weight for age percentile would be most accurate using CDC data in our patient population.

Our study did not shown a positive correlation between weight-for-age percentile and occurrence of post-tonsillectomy hemorrhage, similar to the previously mentioned study performed in Austria.[9] However, ours is the first to demonstrate a lack of correlation in a primarily overweight and obese population, with a median weight-for-age percentile of 75.26%. Therefore, our study suggests further precautions in the obese patient population are likely unnecessary, at least in regards to post-tonsillectomy hemorrhage. We also found no statistically significant correlation between PTH with postoperative use of NSAIDs, antibiotics, narcotics; tonsil or adenoid size; indication; method; resident post-graduate year; sex or age. In general, the findings in the literature regarding the causative relationship of these variables with PTH is mixed.

Our study revealed a statistically significant increased risk of Category 3 PTH on multi-variate analysis with postoperative administration of dexamethasone. Routine prescription of a single dose of dexamethasone on postoperative day three following tonsillectomy was started at the author's home institution in 2014 in an effort to reduce postoperative pain and dehydration. Routine prescription of narcotics slowed around the same time in response to the Food and Drug Administration's (FDA) black box warning recommending against the prescription of codeine for the management of post-tonsillectomy pain,

TABLE III.
Unadjusted Relationships (Mulitnomial Logistic Regression).

	Category 1		Category 2		Category 3	
Characteristic	Odds Ratio (95% CI)	*P* value	Odds Ratio (95% CI)	*P* value	Odds Ratio (95% CI)	*P* value
Sex (F)	0.478 (0.123, 1.854)	.286	0.743 (0.209,2.644)	.646	1.950 (0.568, 6.692)	.513
Weight for Age	0.992 (0.973, 1.011)	.417	0.999 (0.979, 1.019)	.903	0.995 (0.977, 1.014)	.605
Postoperative Meds						
Antibiotics	0.509 (0.131 1.977)	.329	0.509 (0.131, 1.977)	.329	1.425 (0.433, 4.692)	.56
Narcotic use	.478 (0.134,1.703)	.255	2.866 (0.362, 22.704)	.319	0.849 (0.224, 3.219)	.81
NSAID use	1.228 (0.345,4.373)	.751	0.790 (0.203, 3.067)	.733	1.053 (0.307, 3.614)	.935
Steroid use	4.041 (.855, 19.095)	.078	0.253 (0.53, 1.0193)	.082	10.101 (1.290, 79.123)	.028

secondary to the danger in patient's deemed "ultra-rapid metabolizers".[35] While 75% of our population received a narcotic prescription, these were skewed toward the beginning of the study period, prior to the FDA warning.

The current clinical practice guidelines set forth by the American Academy of Otolaryngology–Head and Neck Surgery in 2011 strongly recommends a single, intraoperative dose of intravenous dexamethasone be given to children undergoing tonsillectomy.[2] Of note, it is common practice in our institution to give a single intraoperative dose of dexamethasone, as recommended by the AAO-HNS. This recommendation was made based on evidence from several randomized controlled trials that have shown a single perioperative dose of dexamethasone serves to significantly lower rates of postoperative nausea and vomiting (PONV), pain and facilitate a quicker return to oral intake, without increasing rates of significant PTH.[36,37] Since the publication of the guideline, Gallagher et al showed support of the guideline in their RCT showing no significantly increased rate of PTH requiring hospitalization or re-operation following a single perioperative dose of dexamethasone in post-tonsillectomy children.[24] To the author's knowledge, no studies exist examining postoperative use of steroids in tonsillectomy, and thus our finding is novel. However, the authors acknowledge that this finding is both incidental and preliminary given the wide confidence interval and highlights the need for further studies on this manner.

In designing our study, inconsistent classification of PTH within the literature was evident with no single accepted method to date. One method categorizes them based on history of bleeding, bleeding requiring direct pressure or electrocautery under local anesthesia, or reoperation under general anesthesia,[10] while another substituted "requiring non-invasive treatment" for historical bleeding as the first category.[38] Others studies used Windfuhr and Seehafer's classification which uses five grades of bleeding: spontaneous cessation, infiltration anesthesia, treatment under general anesthesia, ligature of the external carotid artery, and lethal outcome.[11] Walner and Karas proposed standardization of a very similar five category system ranging from reported bleed to death.[39]

We chose our PTH classification based on several factors. One, we wanted to make sure those with reported bleeds were included, as they are not with every classification system. Two, children do not tolerate direct pressure or electrocautery under local anesthesia like adults, and many of the proposed classification systems are based off of the adult population. Three, we felt it pertinent to separate those requiring re-operation from those requiring hospitalization/ER visit in order to determine a re-operation rate. Our classification most closely resembled that used in the Gallagher et al RCT, except we included ED visits along with hospitalizations in category 2.[24] Future efforts to standardize and gain acceptance of a single PTH classification would help greatly when comparing amongst studies.

There are several limitations in our study. First, the overall low prevalence of tonsil bleeds make it difficult to study. The retrospective nature limited the variables studied, and the ability to control for confounders. For instance, postoperative antibiotic use was prescribed to 45% of patients due to surgeon preference prior to 2014. The authors recognize the use of such is not recommended by the AAO-HNS. Furthermore, recall bias by patients' families may have influenced the number of reported (Type 1) bleeds at postoperative visits or telephone calls. Additionally, there was a significant number of patients who missed their follow-up visit or telephone call, though all were given specific postoperative discharge instructions encouraging them to call with any witnessed bleeding. Therefore, we assume a majority of those missed to follow-up had a normal postoperative course. We can also not control for the possibility that patients presented to another hospital with bleeding; however, as the only academic tertiary care center in the state, these patients are most frequently transferred to our center. Furthermore, we do not know if postoperative medications prescribed were taken as directed, or even filled. Lastly, the decision for reoperation is a subjective one made by the attending surgeon on-call, and therefore unable to be controlled in this study.

CONCLUSIONS

The post-tonsillectomy hemorrhage rate in our study is consistent with that cited in the literature. No correlation was demonstrated between weight-for-age percentile and occurrence of post-tonsillectomy hemorrhage. Postoperative administration of dexamethasone was associated with a significant increased rating of post-tonsillectomy hemorrhage requiring surgical intervention, a novel finding. Future prospective and larger scale multi-institutional studies are necessary to investigate the correlation between PTH and additional postoperative steroid use, in light of our results.

BIBLIOGRAPHY

1. Cullen KA, Hall MJ, Golosinskiy A. Ambulatory surgery in the United States, 2006. *Natl Health Stat Report* 2009;11:1–25.
2. Baugh RF, Archer SM, Mitchell RB, et al. Clinical practice guideline: tonsillectomy in children. *Otolaryngol Head Neck Surg* 2011;144:S1–30.
3. Darrow DH, Siemens C. Indications for tonsillectomy and adenoidectomy. *Laryngoscope* 2002;112:S6–10.
4. Tonsillectomy Facts in the U*.S.: From ENT Doctors. American Academy of Otolaryngology—Head and Neck Surgery Website. Available at:* http://www.entnet.org/content/tonsillectomy-facts-us-ent-doctors. Accessed August 29, 2015.
5. Tonsillectomy and Adenoids Postop. American Academy of Otolaryngology—Head and Neck Surgery Website. 2015. Available at: http://www.entnet.org/content/tonsillectomy-and-adenoids-postop. Accessed August 29, 2015.
6. Goldman JL, Baugh RF, Davies L, et al. Mortality and major morbidity after tonsillectomy: etiologic factors and strategies for prevention. *Laryngoscope* 2013;123(10):2544–2553.
7. Stevenson AN, Myer CM 3rd, Shuler MD, Singer PS. Complications and legal outcomes of tonsillectomy malpractice claims. *Laryngoscope* 2012; 122(1):71–74.
8. Achar P, Sharma RK, De S, Donne AJ. Does primary indication for tonsillectomy influence post-tonsillectomy hemorrhage rates in children? *Int J Pediatr Otorhinolaryngol* 2015;79(2):246–250.
9. Riechelmann H, Blassnigg EC, Profanter C, Greier K, Kral F, Bender B. No association between obesity and post-tonsillectomy haemorrhage. *J Laryngol Otol* 2014;128(5):463–467.
10. Tolska HK, Takala A, Pitkäniemi J, Jero J. Post-tonsillectomy haemorrhage more common than previously described—an institutional chart review. *Acta Otolaryngol* 2013;133(2):181–186.

11. Windfuhr J, Seehafer M. Classification of haemorrhage following tonsillectomy. *J Laryngol Otol* 2001;115(6):457–461.
12. Majholm B, Engbæk J, Bartholdy J, et al. Is day surgery safe? A Danish multicenter study of morbidity after 57,709 day surgery procedures. *Acta Anaesthesiol Scand* 2012;56(3):323–331.
13. Duval M, Wilkes J, Korgenski K, Srivastava R, Meier J. Causes, costs, and risk factors for unplanned return visits after adenotonsillectomy in children. *Int J Pediatr Otorhinolaryngol* 2015;79(10):1640–1646.
14. Curtis JL, Harvey DB, Willie S, et al. Causes and costs for ED visits after pediatric adenotonsillectomy. *Otolaryngol Head Neck Surg* 2015;152(4): 691–696.
15. Betancourt AR, López C, Zerpa V, Carrasco M, Dalmau J. Does surgical technique influence post-tonsillectomy haemorrhage? Our experience. *Acta Otorrinolaringol Esp* 2015;66(4):218–223.
16. Söderman AC, Odhagen E, Ericsson E, et al. Post-tonsillectomy haemorrhage rates are related to technique for dissection and for haemostasis. An analysis of 15734 patients in the National Tonsil Surgery Register in Sweden. *Clin Otolaryngol* 2015;40(3):248–254.
17. D'Souza JN, Schmidt RJ, Xie L, Adelman JP, Nardone HC. Postoperative nonsteroidal anti-inflammatory drugs and risk of bleeding in pediatric intracapsular tonsillectomy. *Int J Pediatr Otorhinolaryngol* 2015;79(9): 1472–1476.
18. Lowe D, van der Meulen J, National Prospective Tonsillectomy Audit. Tonsillectomy technique as a risk factor for postoperative haemorrhage. *Lancet* 2004;364(9435):697–702.
19. Hessén Söderman AC, Ericsson E, Hemlin C, et al. Reduced risk of primary postoperative hemorrhage after tonsil surgery in Sweden: results from the National Tonsil Surgery Register in Sweden covering more than 10 years and 54,696 operations. *Laryngoscope* 2011;121(11):2322–2326.
20. Attner P, Haraldsson PO, Hemlin C, Hessén Soderman AC. A 4-year consecutive study of post-tonsillectomy haemorrhage. *ORL J Otorhinolaryngol Relat Spec* 2009;71(5):273–278.
21. Arora R, Saraiya S, Niu X, Thomas RL, Kannikeswaran N. Post tonsillectomy hemorrhage: who needs intervention? *Int J Pediatr Otorhinolaryngol* 2015;79(2):165–169.
22. Mueller J, Boeger D, Buentzel J, et al. Population-based analysis of tonsil surgery and postoperative hemorrhage. *Eur Arch Otorhinolaryngol* 2015;272(12):3769–3777.
23. Dhiwakar M, Clement WA, Supriya M, McKerrow W. Antibiotics to reduce post-tonsillectomy morbidity. *Cochrane Database Syst Rev* 2012;12: CD005607.
24. Gallagher TQ, Hill C, Ojha S, et al. Perioperative dexamethasone administration and risk of bleeding following tonsillectomy in children: a randomized controlled trial. *JAMA* 2012;308(12):1221–1226.
25. Lowe D, Cromwell DA, Lewsey JD, et al. Diathermy power settings as a risk factor for hemorrhage after tonsillectomy. *Otolaryngol Head Neck Surg* 2009;140(1):23–28.
26. Windfuhr JP, Chen YS, Remmert S. Hemorrhage following tonsillectomy and adenoidectomy in 15,218 patients. *Otolaryngol Head Neck Surg* 2005;132(2):281–286.
27. Adult Obesity Facts. Centers for Disease Control and Prevention Website. Available at: http://www.cdc.gov/obesity/data/adult.html. Updated September 15, 2015. Accessed August 15, 2015.
28. Childhood Obesity Facts. Centers for Disease Control and Prevention. Available at: http://www.cdc.gov/obesity/data/childhood.html. Updated June 19, 2015. Accessed August 12, 2015.
29. Doyle SL, Lysaght J, Reynolds JV. Obesity and post-operative complications in patients undergoing non-bariatric surgery. *Obes Rev* 2010;11(12):875–886.
30. Gamliel A, Ziv-Baran T, Siegel RM, Fogelman Y, Dubnov-Raz G. Using weight-for-age percentiles to screen for overweight and obese children and adolescents. *Prev Med* 2015;81:174–179.
31. Huang TT, Borowshi LA, Liu B, et al. Pediatricians' and family physicians' weight-related care of children in the U.S. *Am J Prev Med* 2011;41(1):24–32.
32. Mahant S, Keren R, Localio R, et al. Variation in quality of tonsillectomy perioperative care and revisit rates in children's hospitals. *Pediatrics* 2014;133(2):280–288.
33. Grummer-Strawn LM, Reinold C, Krebs NF; Centers for Disease Control and Prevention (CDC). Use of World Health Organization and CDC growth charts for children aged 0–59 months in the United States. *MMWR Recomm Rep* 2010;59(RR-9):1–15.
34. Breastfeeding Report Card. Centers for Disease Control and Prevention. July 2013. Available at: http://www.cdc.gov/breastfeeding/pdf/2013breastfeedingreportcard.pdf. Accessed August 15, 2015.
35. Post-surgery Codeine Puts Kids at Risk. U.S. Food and Drug Administration. February 2013. Available at: http://www.fda.gov/downloads/ForConsumers/ConsumerUpdates/UCM315528.pdf. Accessed August 16, 2015.
36. Steward DL, Welge JA, Myer CM. Steroids for improving recovery following tonsillectomy in children. *Cochrane Database Syst Rev* 2003;(1): CD003997.
37. Afman CE, Welge JA, Steward DL. Steroids for post-tonsillectomy pain reduction: meta-analysis of randomized controlled trials. *Otolaryngol Head Neck Surg* 2006;134(2):181–186.
38. Ikoma R, Sakane S, Niwa K, Kanetaka S, Kawano T, Oridate N. Risk factors for post-tonsillectomy hemorrhage. *Auris Nasus Larynx* 2014;41(4): 376–379.
39. Walner DL, Karas A. Standardization of reporting post-tonsillectomy bleeding. *Ann Otol Rhinol Laryngol* 2013;122(4):277–282.