



Increased immediate postoperative hemorrhage in older and obese children after outpatient tonsillectomy



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ABSTRACT

Introduction: Postoperative hemorrhage is one of the serious complications of adenotonsillar surgery. This study seeks to investigate the relationship between post-tonsillectomy/adenotonsillectomy hemorrhage in the pediatric population and obesity, obstructive sleep apnea (OSA), adenotonsillar hypertrophy (ATH), chronic tonsillitis (CT), and peritonsillar abscess (PTA) in the immediate post-operative setting.

Methods: The California Ambulatory Surgery Data for the years 2005–2011 were reviewed. The records of patients aged less than 18 years undergoing tonsillectomy (T) or adenotonsillectomy (AT) were extracted using relevant ICD-9 diagnosis codes. The association between hemorrhage and obesity, OSA, AH, CT, PTA, and patients' demographics among surgeries performed in the outpatient setting was evaluated.

Results: A total of 138,998 procedures, 22,478 Ts and 116,520 ATs, were performed during 2005–2011, of which 3.0% were performed on obese children. Hemorrhage occurred in 156 cases (0.1%), and was associated with an age from 9 to 18 years ($p = 0.01$), and obesity ($p = 0.02$). There was no association between hemorrhage and gender ($p = 0.8$), OSA ($p = 0.6$), ATH ($p = 0.5$), CT ($p = 0.35$), PTA ($p = 0.47$), or T versus AT ($p = 0.3$). Multivariate analysis revealed that hemorrhage was about 2.3 times more likely to occur in obese children (odds ratio [OR] = 2.3; 95% Confidence Interval: 1.1–5.1; $p = 0.03$).

Conclusions: Obesity and older age are associated with an increased risk of immediate post-operative hemorrhage following tonsillectomy with or without adenoidectomy in the outpatient setting. Gender, OSA, ATH, CT, PTA, and T versus AT did not alter the risk of post-operative hemorrhage.

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1. Introduction

Tonsillectomy (T) with or without adenoidectomy (AT) is one of the most frequently performed pediatric procedures with an estimated 583,000 ambulatory surgeries performed on children in the United States in 2006 [1,2]. Postoperative hemorrhage (PTH) is a rare, but serious complication of T. PTH is divided into primary hemorrhage, occurring within 24 h, and secondary hemorrhage, occurring after 24 h, usually between 7 and 10 days postoperatively

[3,4]. The average post-tonsillectomy bleeding rate is about 5% with a maximum expected rate of 14% [5].

T was performed traditionally for chronic tonsillitis (CT) and its infectious complications, including peri-tonsillar abscess (PTA). There have been contrasting reports, with some authors associating these factors with an increased rate of PTH [6] and others finding no relationship [7,8].

Recently, sleep-disordered breathing (SDB) and obstructive sleep apnea (OSA) in children have emerged as primary indications for surgery [9,10]. SDB and OSA are principally attributed to adenotonsillar hypertrophy (ATH) and are associated with increased weight in children, with a prevalence of up to 60% in obese children [10–12]. The prevalence of childhood obesity in the US is nearly 17% and is predicted to double by 2030 [13,14]. Childhood obesity is associated with a higher incidence of peri-operative complications and post-operative respiratory

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complications [15,16], but it is not known if there is an association with increased risk of PTH.

With an increasing number of outpatient tonsillectomies [17], it is important to identify the risk factors for post-tonsillectomy hemorrhage in order to recognize vulnerable patients. This study seeks to investigate the relationship between post-tonsillectomy/adenotonsillectomy hemorrhage in the pediatric population and obesity, OSA, ATH, CT and PTA in the outpatient setting.

2. Material and methods

2.1. Data source

The Office of Statewide Health Planning and Development (OSHPD) collects the California Ambulatory Surgery Data Set from general acute care hospitals and licensed freestanding ambulatory surgery centers in the state of California. The patient data are then de-identified and released annually. The datasets define an ambulatory surgery procedure as “procedures performed on an outpatient basis in general operating rooms, ambulatory surgery rooms, endoscopy units or cardiac catheterization laboratories of a hospital or freestanding ambulatory surgery clinic” [18]. A patient who is admitted as an inpatient after undergoing an ambulatory surgery would not be reported to the OSHPD and would not be included in the California Ambulatory Surgery Data Set [18]. Therefore, the cases captured by these datasets rendered immediate post-operative hemorrhage, such as those occurring in the post-anesthesia care units, which would comprise the majority of primary hemorrhage cases. The datasets include data on demographics, payment source, length of stay, total charges, and assigned diagnosis and procedure codes using the *International Classification of Diseases, 9th edition, Clinical Modification* (ICD-9-CM) codes. Additional information regarding specifics of the datasets can be found at the OSHPD website [18]. Institutional review board approval was not required for our study because the datasets did not include any identifiable patient information, but a data use agreement was signed prior to obtaining the data.

2.2. Variables and definitions

A number of variables were analyzed for each record including age, gender, obesity status, T versus AT, OSA, ATH, CT, and PTA. Comorbidities were identified by ICD-9 codes, which included obesity (278.0, 278.00, 278.01, 278.01, V77.8), OSA (327.23), ATH (474.1, 474.10, 474.11, 474.12), CT (474.00), and PTA (475).

The California Ambulatory Surgery Datasets from 2005 to 2011 were obtained and merged. The records of patients aged less than 18 years undergoing tonsillectomy (T) or adenotonsillectomy (AT) were extracted using Current Procedural Terminology (CPT) codes 42820, 42821, 42825, and 42826. All patients 18 and older were excluded. Demographics variables collected included age and sex. Postoperative hemorrhage was determined using CPT codes 42960–42962 and 42970–42972. Data differentiating primary versus secondary hemorrhage was not available from the database.

2.3. Statistical analysis

The association between hemorrhage and obesity, OSA, AH, CT, PTA, and patients’ demographics among surgeries performed in the outpatient setting was evaluated. The trends of postoperative hemorrhage and obesity in children undergoing Ts and ATs during the study years were assessed using linear regression analysis. The results of linear regression are reported as *p* values. Univariate analysis was performed using Chi square or Fisher’s exact test where appropriate. Multivariate analysis was performed using logistic regression analysis. In the analysis, each covariate had at least a minimum of 10 events in order to help reduce sparse-data bias [19,20]. The results of the logistic regression analysis are reported as odds ratio with confidence intervals and *p* values. PASW Statistics 18.0 (SPSS, Inc., Chicago, IL) was used for all data analyses. A *p* value of less than 0.05 was considered statistically significant.

3. Results

Between 2005 and 2011, a total of 138,998 outpatient adenotonsillar surgeries were performed in California, including 22,478 tonsillectomies and 116,520 adenotonsillectomies. PTH occurred in 156 cases or 0.1% of outpatient adenotonsillar surgeries performed in the 6-year period. The trends of percentage of Ts and ATs with PTH as well as the incidence of PTH are depicted in Fig. 1. There was no significant change in the incidence of hemorrhage over the studied period (*p* = 0.06).

During the 6-year study period, 3% or 4132 of total adenotonsillar surgeries were performed on obese children. The case-volume of surgeries on obese children increased from 398 in 2005 to 638 in 2011 (*p* < 0.001) as depicted in Fig. 2. The percentage of surgeries performed on obese children increased from 1.9% in 2005 to 3.8% in 2011 (*p* < 0.001).

In the univariate analysis, hemorrhage was more prevalent among children aged 10–17 years at 0.2% compared with children

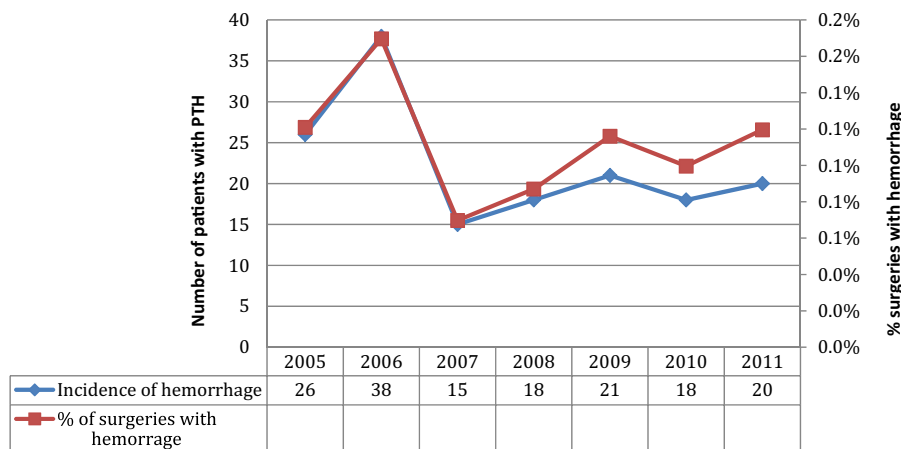


Fig. 1. Trends of postoperative hemorrhage in Ts and ATs performed in the outpatient setting in California from 2005 to 2011.

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