Objectives: To report on our incidence of posttonsillectomy hemorrhage and to define what constituted posttonsillectomy bleeding.

Design: Retrospective study.

Setting: Tertiary care children's hospital and a local satellite facility.

Patients: A series of 1438 consecutive patients who had undergone either tonsillectomy or adenotonsillectomy between January 1, 1999, and December 31, 1999.

Intervention: During this period, parents were instructed to return with their children for clinical evaluation if any blood was seen in the postoperative period.

Main Outcome Measures: Postoperative day of evaluation, age, sex, location of bleeding, management strategy, length of hospital admission, and any bleeding disorders were noted for each patient.

Results: A total of 112 patients underwent evaluation 134 times. Of these patients, 96 required only 1 evaluation and 16 required more than 1 evaluation. All patients who had more than 1 evaluation required intervention. The total number of children requiring intervention for posttonsillectomy hemorrhage was 51 (3.5%) of the 1438 patients. Female patients were more likely than male patients to return for evaluation. Patients who were 12 years and older were the most likely and those 3 years and younger were the least likely to have posttonsillectomy hemorrhage. The most common time from surgery to initial evaluation for hemorrhage was 6 days.

Conclusions: By reviewing our own criteria for defining and recording posttonsillectomy hemorrhage, we conclude that posttonsillectomy hemorrhage is defined differently in the literature. This supports the need for a standard definition to allow for direct comparisons.


Tonsillectomy with and without adenoidectomy is one of the most common surgical procedures performed by otolaryngologists in the United States.1 Recurrent tonsillitis, obstructive sleep apnea, and peritonsillar abscess are the most common indications.2 The most frequent serious complication of tonsillectomy is posttonsillectomy hemorrhage, occurring at a rate between 0.28% and 20%.2-13 This wide range of posttonsillectomy hemorrhage rates reflects the diversity in the otolaryngological community on how to properly define significant posttonsillectomy hemorrhage. In this study, we report a widely inclusive definition of posttonsillectomy hemorrhage. A review of reporting criteria in the literature is described and a plea for consistency in reporting is made for defining significant posttonsillectomy hemorrhage to allow comparisons between medical centers and to allow assessment of one's own performance improvement.

RESULTS

A total of 1438 patients were identified from our computerized billing database. The age distribution of patients was as follows: 317 (22.0%) between 0 and 3 years old, 969 (67.4%) between 4 and 11 years old, and 152 (10.6%) 12 years old or older. The oldest patient to undergo surgery was 20 years old, the youngest 2.5 months. Overall, 706 (49.1%) of the patients were female and 732 (50.9%) were male.

One hundred twelve (7.8%) of the 1438 patients returned for posttonsillectomy hemorrhage evaluation when the caregiver saw blood of any volume. No patients required a blood transfusion. Ninety-six patients were evaluated once for hemorrhage and 16 patients were evaluated...
MATERIALS AND METHODS

A retrospective medical record review was undertaken on a series of 1438 consecutive patients who had undergone either tonsillectomy or adenotonsillectomy between January 1, 1999, and December 31, 1999, at Children’s Hospital Medical Center, University of Cincinnati Medical Center, Cincinnati, Ohio, a tertiary care children’s hospital, or at Children’s Outpatient Services, Mason, Ohio, a local satellite facility. All surgical procedures were performed by 1 of 5 otolaryngology staff (J.P.W., C.M.M., S.R.S., G.O.B., or R.T.C.) or by otolaryngology residents and pediatric otolaryngology fellows under the direct supervision of staff. All surgeons used a similar surgical procedure. Patients received general endotracheal anesthesia with tonsillar exposure provided by a Crowe-Davis mouth gag. Examination for a submucous cleft palate and prominent vessels was undertaken prior to the initiation of surgery. Surgical procedures were then performed using the technique of electrocautery dissection of the tonsils followed by suction electrocautery for adenoid removal and for final hemostatic control of the tonsillar fossa. Prior to anesthetic reversal, all patients received gastric and oropharyngeal suction and the tonsillar fossa and adenoid beds were reexamined for bleeding.

Using hospital and otolaryngology departmental records, all postoperative tonsillectomy hemorrhage incidents were identified. Patient ages, sex, concurrent bleeding disorders, and postoperative day of bleeding evaluation were noted. In addition, the location of hemorrhage from the tonsillar fossa (diffuse, superior pole, middle pole, or inferior pole) was recorded if identified. Location of evaluation (emergency department, inpatient ward, or operating room) and management strategy (no therapy, clot suction, direct pressure, or cautery) were identified. A significant posttonsillectomy hemorrhage was defined as a patient requiring intervention in the form of either direct pressure or cautery regardless of the location of evaluation. Hospital admissions and duration of hospital stays were noted.

To determine statistical significance, χ² analysis was performed. Statistical significance was set at P<.05.

As follows: 13 children between 0 and 3 years old (4.1% of the 0- to 3-year-olds undergoing operation), 78 children between 4 and 11 years old (8.0% of the 4- to 11-year-olds undergoing operation), and 21 children 12 years old and older (13.8% of the ≥12-year-olds undergoing operation). Using χ² analysis, the difference in the percentage of the age groups who presented for evaluation is statistically significant (P=.001). The percentage for the 3 age groups relative to the hemorrhage evaluation cohort of 112 patients is 12% or 13 of the 0- to 3-year-olds; 70% or 78 of the 4- to 11-year-olds; and 19% or 21 of those 12-year-olds and older. Sixty-eight (9.6% of all female patients) of the patients evaluated for bleeding were female, and 44 were male (6.0% of all male patients). The difference in the sex of the patients who presented for evaluation is statistically significant (P<.01). Females made up 61% (68 patients) and males made up 39% (44 patients) of the posttonsillectomy hemorrhage evaluation cohort of 112 patients.

Of 112 patients who presented for postoperative evaluation, 51 (46%) required intervention. Thus, our significant posttonsillectomy bleeding rate was considered to be 51 (3.5%) of the 1438 patients. These children were considered to be our patients who had had an actual posttonsillectomy hemorrhage because they had bleeding to a degree that some form of intervention was deemed necessary. Of the 51 patients, 31 had intervention in the emergency department and 20 had intervention in the operating room. All 16 patients who presented for multiple hemorrhage evaluations required intervention. Six were managed in the emergency department and 10 required intervention in the operating room.

The age distribution of our significant bleeding was as follows: 3 children between 0 and 3 years old (0.9% of the 0- to 3-year-olds who were operated on), 34 children between 4 and 11 years old (3.5% of the 4- to 11-year-olds who were operated on), and 14 children 12 years old and older (9.2% of the ≥12-year-olds who were operated on). The differences between age groups with posttonsillectomy hemorrhage requiring intervention is statistically significant (P<.001). The percentage of significant bleeding for the 3 age groups relative to the hemorrhage evaluation cohort of 112 patients is 3% (3 patients) for those 0 to 3 years old; 30% (34 patients) for those 4 to 11 years old; and 13% (14 patients) for those 12 years old and older. Twenty-nine of the 51 patients with significant bleeding were female (4.1% of all fe-
male patients), and 22 were male (3.0% of all male patients). The differences between the sex of the patients with significant bleeding is not statistically significant ($P = .26$). Of those who had significant bleeding, females make up 57% (29 of the 51 patients) and males 43% (22 of the 51 patients).

For the 61 patients who were evaluated but required no intervention, 32 were discharged home from the hospital after undergoing clinical examination. Twenty-nine patients were admitted to the hospital for observation. If a patient was admitted to the hospital either after intervention or for observation, the average length of stay was 1.2 days.

Three patients with bleeding disorders were identified in this study. Two were diagnosed before surgery as having a nonspecific anticoagulant disorder with prolonged partial thromboplastin time. One patient was diagnosed postoperatively as having a platelet disorder resulting in a prolonged bleeding time.

**COMMENT**

In the last 30 years, a multitude of researchers have investigated the cause, incidence, and management of posttonsillectomy hemorrhage, yielding hemorrhage rates between 0.28% and 20%. Primary hemorrhage is defined as bleeding that occurs in the first 24 postoperative hours. Secondary hemorrhage, or postoperative bleeding after 24 hours, has as its origin the sloughing of eschar, trauma secondary to solid food ingestion, tonsil bed infection, postoperative nonsteroidal anti-inflammatory drug usage, or idiopathic causes. Studies investigating the effect of the age and sex of the patient, indication for surgery, and surgical method have demonstrated variable results, while other factors, including the surgeon’s operative experience, show no effect on hemorrhage rates. Despite this wealth of data, great differences exist in the reported incidence of posttonsillectomy hemorrhage, recommended management, and the very definition of what constitutes significant posttonsillectomy hemorrhage.

How a study defines posttonsillectomy hemorrhage directly affects the recorded incidence rate. For example, several early posttonsillectomy bleeding studies noted incidence rates of 0.46%, 0.8%, and 1% following cold knife tonsillectomies with study inclusion criteria primarily based on the need for operative therapy. Maniglia et al reported a hemorrhage rate of 0.28%, with 2 primary and 2 secondary hemorrhages, in a study of 1428 cases of cold knife tonsillectomies with bismuth subgallate hemostasis. Study inclusion required “significant bleeding” defined as hemorrhage requiring emergency department or operating room intervention for control. In comparison, in a study of 1445 cold knife tonsillectomies, Handler et al reported a postoperative hemorrhage rate of 2.62%. This value reflects the inclusion of not only operative candidates but also primary and secondary hemorrhages that required only hospital admission and observation and those reported by parents at clinic follow-up appointments. Using the criteria of Maniglia et al, Handler et al would have a hemorrhage rate of only 1.03%. In a similar study using the criteria of Handler et al, Conley and Ellison reported hemorrhage rates of 1.1% (n=705) and 4.1% (n=581), or 2.5% total, in a cohort of 1286 patients undergoing standardized cold knife tonsillectomies comparing the utility with and without a 3-minute retraction relaxation and bismuth subgallate intraoperatively for bleeding control. Their total rate would be only 1.4% by the criteria of Weimert et al. Gabalski et al retrospectively reviewed the medical records of 534 patients by examining the time course of postoperative hemorrhage and reported a hemorrhage rate of 0.37% using reporting criteria similar to Maniglia et al. Szeremeta et al who reviewed 2431 electrocautery dissection tonsillectomies reported a hemorrhage rate of 1.2%; it was 0.58% if only operative candidates were counted. Irani and Berkowitz, in a review of posttonsillectomy hemorrhage studies included only patients requiring hospital admission for bleeding, resulting in only 163 patients in the 12 years reviewed. Their 13% rate of major interventions (operative control or transfusion) cannot be compared with the studies by Kristensen and Tveteras, Conley and Ellison, Maniglia et al, Handler et al, or Weimert et al because a total case number is not provided. These examples illustrate how different authors use variations in the definition of “significant” posttonsillectomy hemorrhage as functions of the goals of their individual studies, all producing results that are not directly comparable.

Despite the acceptance of electrocautery for the control of postoperative bleeding, few studies have examined the effect of electrocautery dissection on postoperative tonsillectomy hemorrhage. The prospective study of Weimert et al compared cold knife and electrocautery dissection tonsillectomies and concluded that electrocautery dissection was more rapid, decreased blood loss, and significantly decreased primary hemorrhage rates, the most frequent cause of posttonsillectomy mortality. Weimert et al reported a postoperative hemorrhage rate of 1.2% for electrocautery dissection. Szremeta et al in a retrospective comparison of cold knife and electrocautery dissection techniques, found hemorrhage rates of 3.9% and 2.9%, respectively, excluding patients with a history of peritonsillar abscess, which dramatically increased cold knife tonsillectomy hemorrhage rates. All patients in our study underwent electrocautery dissection and suction electrocautery for hemostasis.

In this study, we defined evaluation for posttonsillectomy hemorrhage as any bleeding incident that results in clinical evaluation of the patient, whether in the clinic, emergency department, or operating room. This inclusive definition allows all subclassifications of hemorrhages to be compared from a known baseline. Like Handler et al, we include all bleedings reported by parents and hospital staff, regardless of examination findings or eventual management and, thus, can assess all bleeding incidents whether managed without intervention or hospital admission, hospital admission for 23-hour observation, emergency department intervention, or operative evaluation and intervention. It is important to include patients with benign examination and those
patients who require neither hospital admission nor inter-
vention because of these incidents, while not emer-
gency situations, are stressful for the affected child and
family and require a considerable commitment of time
and resources from the medical system. Parents in our
practice are informed to return to the emergency depart-
ment for any postoperative hemorrhage, the severity of
which cannot be determined without clinical evalu-
ation. Not only those patients who are seen with frank hem-
orrhage, but also those who report blood-tined spu-
tum and vomitus should be included for these are among
the more common posttonsillectomy hemorrhage pre-
sentations. Overall, our study produced a total postton-
sillectomy hemorrhage evaluation rate of 7.8%. Our pri-
mary hemorrhage evaluation rate, or evaluation rate for
bleeding within the first 24 hours after surgery, was 0.6%,
which is comparable to previously quoted rates of 0.14% to
1.5%.4,5,8,10

Thirty-two patients (28.6%) of those who pre-
sented for evaluation required no intervention or hospi-
tal admission; 29 patients (25.9%) were managed with
hospital admission and observation; 31 patients (27.7%)
received intervention in the emergency department; and
20 patients (17.9%) required return to the operating room
definitive treatment. Operative intervention was de-
finite in all but 1 of the total of 20 patients requiring
surgical control; the 1 patient who returned for further
evaluation required no intervention. If reporting only
those patients requiring intervention in any clinical lo-
cation, our significant bleeding rate is 3.5%.

This study also identified hemorrhage rates and man-
agement issues in patients who presented with multiple
bleeding episodes. Sixteen of the 112 patients had more than
1 evaluation for hemorrhage; 11 had 2 episodes, 4 had 3,
and 1 had 4. All eventually required emergency depart-
ment (6 patients) or operative (10 patients) intervention.
Thus, it is reasonable to return to the operating room for
evaluation and intervention on the second presentation. A
return to the operating room also can be justified if the pa-
tient is too uncooperative to allow a thorough examina-
tion in the emergency department.4 No prior studies of mul-
tiple bleedings could be identified for comparison.

A significantly greater number of female patients
(9.6%) presented for hemorrhage evaluation compared with
males (6.0%). However, although the percentage of fe-
male patients with significant bleeding events was higher
than that of males (4.1%-3.0%, respectively), this differ-
ce is not statistically significant. This value contradicts
the findings of Kristensen and Tveteras5 that males have
a greater hemorrhage rate but agrees with the study find-
ings of Cressman and Myer2 in a survey of pediatric otol-
aryngology fellowship programs in determining the need
for hospital admission. If only a stable eschar is seen on
examination, without clot or active bleeding, and the pa-
tient is hemodynamically stable with an otherwise nor-
mal recovery course, then discharge home is accept-
able. Clot requiring suctioning, frank bleeding or oozing
requiring emergency department or operative intervent-
ion, or a history of dehydration or poor recovery neces-
itates hospital admission. Clot suctioning, silver ni-
trate cautery, or direct pressure hemorrhage control in
the emergency department generally requires hospital ob-
serveration, although the clinical situation determines when
discharge is appropriate. This time course often applies
to operative candidates as well.

Traditionally, diagnosis of a bleeding disorder has
been a relative contraindication for tonsillectomy. The
use of electrocautery and laser tonsillectomy has begun
to challenge this position.4,11 Our institution does not rou-
tinely conduct preoperative coagulation studies on pa-
tients without a personal or family history of bleeding
problems. Of the 112 patients who presented with hem-
orrhage, 2 received a preoperative hematologic diagno-
sis of a nonspecific anticoagulant characterized by a pro-
longed partial thromboplastin time; one required direct
pressure in the emergency department for hemostasis and
the other was evaluated and discharged home. Both pa-
tients had a family history of bleeding disorders. A third
patient was found to have a prolonged bleeding time in
posthemorrhage coagulation studies. Hematologic evalu-
ation diagnosed a non–von Willebrand platelet disorder
with normal prothrombin time, partial thromboplastin

time, and fibrinogen level. This patient had 2 bleeding
episodes—the first required silver nitrate cautery in the
emergency department on postoperative day 7 and the
second on postoperative day 9 required silver nitrate caut-
ery followed by definitive operative electrocautery. There-
fore, 3 (0.2%) of the 1438 patients undergoing either ton-
sillectomy or adenotonsillectomy or 3 (2.7%) of the 112
patients who returned for hemorrhage evaluations had a
bleeding disorder. Two of the 3 patients had family his-
tories that would warrant preoperative evaluation. This

We recommend adhering to the strategy eluci-
dated by Cressman and Myer2 in a survey of pediatric otol-
aryngology fellowship programs in determining the need
for hospital admission. If only a stable eschar is seen on
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to operative candidates as well.
illustrates the lack of cost-effectiveness for screening all patients undergoing tonsillectomy or adenotonsillectomy preoperatively with laboratory studies to ascertain the existence of bleeding disorders.

CONCLUSIONS

We have presented criteria for reporting posttonsillectomy hemorrhage rates that are inclusive of all hemorrhage evaluations, whether or not there is a final diagnosis of actual or significant bleeding. Knowing the number of patients who are evaluated but do not require intervention places the actual hemorrhage rate in perspective compared with the incidence of patient presentations for evaluation. This definition provides a baseline against which actual hemorrhage rates and intervention modalities can be compared between researchers.

All patients who report any bleeding after tonsillectomy should return for clinical evaluation. A patient who requires intervention with direct pressure or electrocautery in the clinic, emergency room, or operating room should be recorded as having a significant posttonsillectomy hemorrhage. Patients who are female and/or 12 years old and older are the most likely to be evaluated for posttonsillectomy bleeding. Patients 12 years old and older, regardless of the sex, are the most likely to have significant posttonsillectomy bleeding. Admission to the hospital for observation is suggested and evaluation in the operating room may be warranted when patients present more than once for evaluation of posttonsillectomy hemorrhage.

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