Avoidance of Primary Post-tonsillectomy Hemorrhage in a Teaching Program

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Objective: To determine the incidence of primary post-tonsillectomy hemorrhage in a teaching institution by using a uniform technique, including a 3-minute relaxation of retraction before case termination and the use of bismuth subgallate.

Design: Case series.

Setting: Tertiary care academic pediatric center.

Patients: A 7-year retrospective study was performed by using the medical records of 1286 children without a bleeding abnormality who underwent tonsillectomy (with or without adenoidectomy). A uniform technique, proposed to reduce hemorrhage, was used for 705 children and was not used for 581 children.

Results: No episodes of primary hemorrhage (onset ≤ 24 hours after surgery) occurred, and the incidence of delayed hemorrhage (onset > 24 hours after surgery) was 1.1% in the study group. The primary hemorrhage rate of the study group was significantly lower (P = .007) than the rate for the reference group (0.0% vs 1.0%), as was the total hemorrhage rate (1.1% vs 4.1%) and the delayed hemorrhage rate (1.1% vs 3.1%).

Conclusion: A uniform technique including the use of bismuth subgallate and reassessment of the tonsillar fossae after a 3-minute observation period reduces the incidence of primary tonsillar hemorrhage in a teaching institution setting.


Tonsillectomy, with or without adenoidectomy, is the most common major surgical procedure performed by otolaryngologists. Post-tonsillectomy hemorrhage is an important complication, with a potential for morbidity and death. The temporal relationship of the onset of hemorrhage to the procedure defines 2 categories: primary (onset ≤ 24 hours after surgery) and delayed (onset > 24 hours after surgery). At the minimum, a clinically significant post-tonsillectomy hemorrhage requires hospital admission and may cause a return to the operating suite for control of bleeding, with the inherent risk of aspiration during anesthesia induction. A 10-year review of studies including more than 500 patients suggests an incidence of 3.0% for all post-tonsillectomy hemorrhage and only 1.1% for primary hemorrhage.

Studies of potential improvements to the surgical technique and perioperative management for tonsillectomy continue, although there has been no clear decrease in the morbidity of hemorrhage. The use of a mixture of bismuth subgallate and phenylephrine hydrochloride has a reportedly low postoperative bleeding rate. Tonsillectomy by laser and by electrocautery dissection may reduce operative time and blood loss, but the methods do not decrease pain or the postoperative hemorrhage rate. To our knowledge, no study has been conducted of the use of an observation period with oral and palatal retraction relaxed. The observation is performed at the completion of surgery but before termination of the procedure and reversal of anesthesia. The purpose of the present study was to determine the incidence of primary post-tonsillectomy hemorrhage in a teaching institution by using a uniform technique, including a 3-minute relaxation of retraction before case termination and the use of bismuth subgallate.

Results: During the 7-year study period, 2210 children underwent tonsillectomy (with or without adenoidectomy).
MATERIALS AND METHODS

We reviewed the medical records of all children undergoing tonsillectomy (with or without adenoidectomy) at Children’s Hospital of Wisconsin, Milwaukee, from January 1, 1990, through December 31, 1996. The following data were gathered from each record: (1) age and sex of the patient; (2) procedure performed, ie, adenotonsillectomy or tonsillectomy; (3) indication for the operation; (4) presence of a bleeding abnormality as documented by the results of a preoperative coagulation profile; (5) use of bismuth subgallate during surgery; (6) use of the observation period at the completion of the surgery; and (7) documentation of postoperative hemorrhage.

The medical records of patients with a bleeding abnormality were excluded from further analysis. The records of patients who received postoperative care and follow-up from community surgeons outside the Children’s Hospital of Wisconsin campus also were excluded owing to the inability to obtain follow-up information. Postoperative hemorrhages were classified according to the criteria of Handler et al4 as follows: (1) no bleeding; (2) immediate major (≤24 hours, requiring return to the operating room); (3) immediate minor (≤24 hours, requiring hospital admission); (4) delayed major (>24 hours postoperatively, requiring hospital admission); or (5) delayed minor, at home (>24 hours postoperatively, not requiring hospital admission).

All patients of 1 author (S.F.C.) received the uniform surgical technique, including bismuth subgallate and a 3-minute observation period (study group [group 1; n = 705]). Group 1 was compared with all other children undergoing a tonsillectomy with or without adenoidectomy during the 7-year study period who received neither bismuth subgallate nor an observation period (reference group [group 2; n = 581]). Otolaryngology residents, generally in their first year of dedicated training, performed at least 95% of the tonsillectomies in both groups. Full-time and clinical faculty of the Medical College of Wisconsin, Milwaukee, directly observed the residents. Faculty performed the remainder of cases. Medical record data were entered into a computer-based spreadsheet for statistical analysis. Testing by χ² was used to identify statistically significant differences between the groups.

PREOPERATIVE MANAGEMENT

Preoperative coagulation profiles were performed for all patients undergoing tonsillectomy until January 1, 1996. Since then, a hematologic function questionnaire has been used to screen patients. Before beginning the surgical procedure in group 1, an appropriate bolus dose of dexamethasone (0.5 mg/kg, to a maximum of 10 mg) was administered intravenously, and an antibiotic was administered.9,10 Only 21.7% of group 2 received antibiotics, and they did not receive corticosteroids (Table 1).

SURGICAL TECHNIQUE

The tonsillectomy in group 1 was performed in a standard fashion. Exposure was achieved by using a mouth gag and nasal catheters. The superior tonsillar pole was grasped by a straight clamp, and the anterior pillar was incised. Scissors dissection was used to identify the tonsillar capsule and remove the superior fibers of the posterior tonsillar pillar. The tonsil was dissected from the fossa and the inferior pole vessels were severed by using a tonsillar snare. The initial hemostasis was achieved by using tonsillar packs dipped in the bismuth subgallate–phenylephrine hydrochloride mixture. Each pack remained in place during sequential tonsillar dissections and achievement of hemostasis. Following normal saline irrigation of each fossa (in sequence with positive endotracheal tube pressure), the judicious use of suction electrocautery provided final hemostasis. All retraction devices were relaxed for exactly 3 minutes. Exposure was reestablished by using the mouth gag and nasal catheter. The fossae were reexamined, and suction cautery was used as needed before anesthesia reversal.

Five of 8 otolaryngologists with patients in group 2 used a similar cold-knife dissection, snare, and suction electrocautery technique. Three surgeons used electrocautery dissection (95 patients [16.4%]).

POSTOPERATIVE MANAGEMENT

All children were observed for a minimum of 20 hours after surgery in a short-stay surgical unit. Intravenous hydration along with appropriate pain and nausea control were provided. Every child underwent a final evaluation during the second postoperative week.

Complications were handled initially through an emergency department visit or a visit to the clinic. Either event created a medical record. In addition, any reports of bleeding at home were entered into the records. Thus, it is unlikely that bleeding events were not detected.

There were no episodes of primary post-tonsillectomy hemorrhage; the 8 delayed post-tonsillectomy hemorrhages (1.1%) included 2 delayed major hemorrhages, 5 delayed minor hemorrhages, and 1 delayed minor hemorrhage that occurred at home.

Comparative data from group 2 are for the tonsillectomies performed without bismuth subgallate and without an observation period in 581 children (282 boys; 299 girls). The ages ranged from 7 months to 18 years (mean, 6.9 years). There were 137 (23.6%) children aged 3 years or younger. The indications were similar to those for group 1 (P = .21) and are given in Table 1.

In group 2, 24 post-tonsillectomy hemorrhages (4.1%) occurred. Six were primary hemorrhages (1.0%): 5 were major, and 1 was minor. Of the 18 delayed hem-
Comment

It is acknowledged generally that primary post-tonsillectomy hemorrhages are due to technical error, whereas delayed hemorrhages relate to postoperative factors. The present case series compared the primary post-tonsillectomy hemorrhage rates of 2 groups, one of which underwent a uniform surgical technique including a 3-minute observation period with retraction relaxed before anesthesia reversal. The retraction devices exert pressure directly, at the superior pole or palatal arch, and indirectly through tension on the muscular-fascial capsule surrounding the tonsil (palatoglossal and palatopharyngeal muscles and, probably, glossopharyngeal muscle and superior constrictor muscle of the pharynx). When the tension of retraction produced by tamponade is released, ineffectively cauterized low-pressure and small-caliber arterial vessels may bleed again. This phenomenon of pressure and tension being exerted on the tonsil capsule is particularly important near the superior pole, where tension is highest and where direct visualization is poorest. Among the primary hemorrhages of group 2, the superior pole was a common site of postoperative bleeding (3/6), compared with the inferior pole (2/6) and the middle fossa (1/6). In the absence of tension and manipulation, vessel spasm also may fade. Areas of bleeding can be identified easily by re-examination.

For both groups in the present study, first-year otolaryngology residents performed most of the tonsillectomies. As such, the residents used a systematic, often step-by-step, approach to the surgery under direct supervision by faculty, along with meticulous attention to hemostasis. The rate of primary post-tonsillectomy hemorrhage (1.0%) for group 2 compares favorably with that found in previous studies (1.1%), which reflects case series of teaching institutions and experienced surgeons.

The routine use of the bismuth subgallate–phenylephrine hydrochloride paste mixture may have contributed to the lower hemorrhage rate in group 1. Bismuth is a relatively insoluble, poorly absorbed heavy metal that is used as a hemostatic agent. The mechanism of action is likely based on acceleration of the intrinsic clotting pathway through the activation of factor XII (Hageman factor). Maniglia et al reported a very low postoperative hemorrhage rate of 0.28% consisting of 2 primary hemorrhages and 2 delayed hemorrhages in 1428 patients. Our retrospective study lacks a true control group to fully assess the independent effect of bismuth subgallate and the observation period on the rates of post-tonsillectomy hemorrhage. It would be of interest to perform a randomized study to evaluate these variables separately.

The results of the present study demonstrate that the use of bismuth subgallate and an observation period lead to a statistically significant reduction in the rate of postoperative hemorrhage, even in a teaching setting.

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REFERENCES


