



# Retrospective Analysis of Hemorrhage After Pediatric Tonsillectomy

## Original Investigation

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## Abstract

**Objective:** This study was conducted to retrospectively analyze pediatric tonsillectomy in patients aged <18 years treated over the past five years, focusing on factors such as sex, surgical method, season of occurrence, transfusion requirement, and surgical intervention in patients presenting with post-tonsillectomy hemorrhage.

**Methods:** Tonsillectomies performed in the Otorhinolaryngology Clinic of the Kayseri City Training and Research Hospital between June 2019 and June 2024 were retrospectively analyzed using the hospital information management system. Patients re-admitted for post-tonsillectomy secondary hemorrhage were identified, including those managed conservatively, requiring surgical intervention, and/or needing blood transfusion. Hemorrhage incidents were categorized by season (warm: March-August; cold: September-February), and hemorrhage rates were calculated. Surgical methods and the first surgical techniques in patients presenting with hemorrhage were recorded.

**Results:** In total, 4,994 tonsillectomies had been performed in the study period. Sixty patients (1.20%) were re-admitted and hospitalized due to postoperative hemorrhage, of whom 22 (0.44%) were reoperated and 38 (0.76%) were managed conservatively. Ten patients (0.20%) needed transfusion. Of the patients presenting with hemorrhage, 39 (65%) were admitted during the warm season, and 21 (35%) during the cold season. The cold dissection technique was used in 95.03% of the cases, with a hemorrhage rate of 1.2%.

**Conclusion:** Tonsillectomy is a common procedure worldwide and post-tonsillectomy hemorrhages are a frequent complication. Reducing morbidity and mortality through preventive strategies is crucial. Patients presenting with post-tonsillectomy hemorrhage should be hospitalized, monitored closely, and evaluated with hemogram and coagulation tests to assess hemorrhage volume and transfusion needs.

**Keywords:** Palatine tonsil, pediatrics, postoperative hemorrhage, seasons, tonsillectomy

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## Introduction

Tonsillectomy is the most common surgery performed by otolaryngologists worldwide. In the United States, more than 500,000 children undergo tonsillectomy each year (1). Although these procedures are generally performed as day surgeries, the management of complications varies depending on the case. Hemorrhages following tonsillectomy are classified as early (primary hemorrhages) if they occur within the first 24 hours after surgery and as late (secondary hemorrhages) if they occur after 24 hours. Post-tonsillectomy hemorrhages are typically seen in 2% to 5% of the cases and remain the most common complication, causing concern for patients and their families and often necessitating hospitalization (2-4).

Numerous studies in the literature have examined various factors influencing postoperative hemorrhage after tonsillectomy, but there is still no universally accepted guideline for managing patients with postoperative hemorrhage (5). Depending on the patient's clinical condition, management may involve hospitalization, bedside procedures (chemical or electrocauterization), topical vasoconstriction (such as ice mouthwash with adrenaline), or in some cases, interventions under general anesthesia. The presented study was conducted to retrospectively analyze the incidence and characteristics of pediatric patients who experienced hemorrhage after tonsillectomy.

## Methods

Pediatric patients who underwent tonsillectomy between June 2019 and June 2024 at the, University of Health Sciences Türkiye, Kayseri City Training and Research Hospital were retrospectively studied. Late (secondary) hemorrhage cases were included in the study. The number of hemorrhages, number of reoperated patients, season of occurrence, transfusion requirements, surgical methods used (cold dissection, bipolar electrocauterization, thermal welding), and hemorrhage rates according to surgical methods were analyzed. The season of the occurrence was categorized into two groups: warm season (March to August) and cold season (September to February). Patients with known preoperative or postoperative bleeding disorders or missing data were excluded from the study. Ethics approval was obtained from the Local Ethics Committee of the, University of Health Sciences Türkiye, Kayseri City Training and Research Hospital (decision no: 153, decision date: 30.07.2024). Written informed consent was obtained from patients' parents. Tonsillectomies were performed using cold dissection, bipolar electrocauterization or thermal welding methods.

## Statistical Analysis

Descriptive statistical methods were used to summarize the data. Categorical variables such as sex, surgical technique,

hemorrhage status, and season of operation were presented as frequencies and percentages. Continuous variables including age were expressed as mean values with accompanying ranges. Hemorrhage rates were calculated as proportions relative to the total number of surgeries and were further stratified according to surgical technique and season. These descriptive statistics provided a clear overview of patient demographics, procedural distributions, and hemorrhage patterns.

## Results

Paediatric tonsillectomy surgeries were performed in 4,994 patients in the Otorhinolaryngology Clinic of the, University of Health Sciences Türkiye, Kayseri City Training and Research Hospital between June 2019 and June 2024. Of these, 2,179 (43.64%) were female and 2,815 (56.36%) were male. Their mean age was 6.33 years. The average age was 6.52 years in females and 6.18 years in males, with an overall age range of 2 to 17 years. Sixty (1.20%) of the patients who had undergone surgery were readmitted to the clinic and hospitalized because of postoperative hemorrhage. Of these, 22 (0.44%) needed reoperation for hemorrhage control, while 38 (0.76%) were managed conservatively (observation only, topical vasoconstriction, or chemical cauterization with silver nitrate sticks). The data is summarized in Table 1. The most commonly used surgical method was cold dissection (95.03%), followed by bipolar electrocauterization (3.26%) and thermal welding (1.70%). The hemorrhage rate was 1.2% with cold dissection, 1.22% with bipolar electrocautery and 1.17% with thermal welding (Table 2). In addition, 10 of the 60 patients (16.66%) who presented with hemorrhage after tonsillectomy needed transfusion, and all of these patients underwent reoperation for hemorrhage control. In the study, 0.20% of the total patients received a transfusion. A total of 50.84% of the surgeries were performed in the warm season, and 49.15% in the cold season. Among the 60 patients with postoperative hemorrhage, 39 (65%) were admitted during the warm season, and 21 (35%) during the cold season (Table 3). The hemorrhage rate was 1.53% in the warm season and 0.85% in the cold season.

## Discussion

Postoperative hemorrhage is one of the most common complications of tonsillectomy (6). While it can be managed conservatively in some cases, postoperative hemorrhage can also be severe enough to require surgical intervention (7). Numerous studies have investigated the effect of surgical techniques on hemorrhage rates (8-10). For instance, intracapsular tonsillectomy, performed using the coblation technique in a study with 730 patients, has been reported to have a lower hemorrhage rate than traditional extracapsular tonsillectomy, with an estimated rate of 0.28% (11). In another study comparing the cold dissection, thermal welding, and bipolar electrocauterization methods, no significant differences

**Table 1.** Demographic details and hemorrhage rates

Parameter	Count	Percentage (%)
Total tonsillectomies	4,994	-
Sex (female/male)	2,179/2,815	43.64/56.36
Average age (all patients)	6.33	-
Average age (female/male)	6.52/6.18	-
Overall age range (years)	2-17	-
Female/male age range (years)	2-17/2-17	-
Total hemorrhages	60	1.2
Conservative management	38	0.76
Reoperation	22	0.44
Blood transfusion	10	0.20

**Table 2.** Surgical technique and hemorrhagic outcomes

Surgical method	count	Percentage (%)
Cold dissection	4,746	95.03
Thermal welding	85	1.7
Bipolar electrocautery	163	3.26
Surgical method	Hemorrhage cases	Bleeding rate (%)
Cold dissection	57	1.20
Thermal welding	1	1.17
Bipolar electrocautery	2	1.22

**Table 3.** Seasonal distribution of hemorrhage occurrences (warm vs. cold season)

Season	Total surgeries, percentage (%)	Hemorrhage casesv	Hemorrhage rate (%)
Warm season (March-August)	2,539 (50.84)	39	1.53
Cold season (September-February)	2,455 (49.15)	21	0.85

in hemorrhage rates were observed (10). The heterogeneity in study numbers, patient ages, and methodologies has led to differing opinions on which surgical method is the safest. In another study, retrospective data from 15,734 patients obtained from the Swedish National Tonsil Surgery Register were analyzed, demonstrating that tonsillectomy performed using the cold technique with cold hemostasis had the lowest hemorrhage rate compared to all hot techniques in terms of post-tonsillectomy hemorrhage (12).

A national study conducted in England and Northern Ireland with 33,291 individuals demonstrated that the use of hot surgical techniques during both tonsil dissection and hemostasis increased the risk of hemorrhage threefold compared to the cold dissection method. On the other hand, in operations where bipolar or monopolar cautery was used for hemostasis following cold dissection, the risk of hemorrhage was found to be approximately 1.5 times higher compared to cold dissection operations in which sutures or packing were used. The results emphasized the presence of a “dose-response relationship” between cautery use and hemorrhage rate (13).

In our study, while hemorrhage rates were similar in tonsillectomies performed using cold dissection, thermal welding, and bipolar electrocauterization, cold dissection was the most used method. In our clinic, where the cold technique is taught as a basic technique in resident training, the cold dissection method is the most frequently used approach and has the lowest bleeding rates, which is consistent with the literature.

In our retrospective study, post-tonsillectomy hemorrhage rate was 1.20%. In the literature, this rate can be as high

as 12.3%, with 4.2% of these patients needing reoperation for hemorrhage control (14). Hemorrhage rates reported in the literature are heterogeneous. For example, Blakley (15) reported a rate of 5%, while Tolska et al. (16) reported 14.5%. In a study conducted by Çelikal et al. (17), three surgical techniques were compared in pediatric groups (infant, early childhood, preadolescent, and adolescent). In this study the overall hemorrhage rate was found to be 3.7%.

Öcal et al. (18) reported a 3.4% secondary hemorrhage rate following tonsillectomy in pediatric patients. The variability in these rates can be attributed to several factors. There is no consensus in the literature on which findings should be classified as post-tonsillectomy hemorrhage. In our clinic, we recommend hospital admission if blood is observed even in saliva. Although Walner and Karas (19) proposed a classification system for hemorrhage after tonsillectomy, no universally accepted system currently exists. The significant differences in reported rates could result from variations in the criteria used to define hemorrhage. For instance, Windfuhr et al. (20) considered only hemorrhages requiring surgical intervention as post-tonsillectomy hemorrhages in both pediatric and adult groups, reporting a rate of 5.2%. Conversely, hemorrhage rates in the pediatric age group are generally lower than those in adults (21). Another factor contributing to the heterogeneity in hemorrhage rates is the surgeon's level of experience. Studies indicate an inverse relationship between surgical experience and post-tonsillectomy hemorrhage rates (22,23). For example, a study by Kim et al. (21) showed that postoperative hemorrhage rates were lower for surgeries performed by specialists than for those performed by residents.

Mortality rates after tonsillectomy vary between studies. In general, the mortality rate after pediatric tonsillectomy is quite low, with rates ranging from 1/500,000 to 7/100,000 reported in the literature (24,25). In our retrospective study, no major mortal complications were seen among the 4,994 patients. Additionally, 50.84% of tonsillectomies were performed in the warm season and 49.15% in the cold season. The hemorrhage rate was 1.53% in the warm season and 0.85% in the cold season. Seasonal factors are deemed to influence tonsillectomy hemorrhage rates, as some studies have reported higher rates during the winter months (26). Conversely, other studies have shown higher hemorrhage rates in both winter and summer months, suggesting a bimodal pattern (27). These findings indicate that seasonal infections and weather conditions can increase the risk of hemorrhage after tonsillectomy. For instance, the higher prevalence of upper respiratory tract infections during winter months can increase the risk of tonsil tissue infection and subsequent postoperative hemorrhage.

The management of tonsillectomy hemorrhage typically begins with conservative measures, but severe cases can necessitate surgical intervention or blood transfusion. The study conducted in England and Northern Ireland highlighted that approximately 1.3% of patients experienced complications that necessitated blood transfusion (13). In our study, 0.20% of the patients received transfusion, and all of them needed hemorrhage control under operating theater conditions. The decision to transfuse is influenced by factors such as the volume of blood loss and the patient's hemodynamic status, with timely transfusion being potentially life-saving in cases of significant blood loss (28).

Our study has some limitations. These include its retrospective design, the reliance on data from a single tertiary care hospital, and the unbalanced distribution of surgical methods. Additionally, the impact of seasonal variations and the surgeons' experience levels on hemorrhage rates could not be analyzed in detail.

## Conclusion

In this study, we retrospectively analyzed hemorrhage following pediatric tonsillectomy, examining the effects of factors such as the surgical methods used and the season in which the surgery was done. Our findings showed that the hemorrhage rate was higher in tonsillectomies performed in the warm season, and the hemorrhage rates were similar across the different surgical techniques. When patients were classified according to the surgical methods, statistical comparison was not performed due to the unequal distribution of patients between the groups. Among the surgical techniques, cold dissection was the most commonly used method.

Patients presenting with hemorrhage after tonsillectomy should be hospitalized, transfusion preparations should be made as necessary, and vital signs should be closely monitored. However, multicenter prospective studies are required to further evaluate factors such as seasonal variations due to geographical differences and the influence of the surgeon's experience level, and the impact of surgical techniques on hemorrhage rates.

## Ethics

**Ethics Approval:** Ethics approval was obtained from the Local Ethics Committee of the, University of Health Sciences Türkiye, Kayseri City Training and Research Hospital (decision no: 153, decision date: 30.07.2024).

**Informed Consent:** Written informed consent was obtained from patients' parents.

## Footnotes

## Authorship Contributions

Surgical and Medical Practices: N.Ü., E.H.B., S.B.Ç., Y.K., A.K., M.Y., İ.Ö., A.B., Concept: N.Ü., İ.Ö., Design: N.Ü., E.H.B., Data Collection and/or Processing: N.Ü., E.H.B., Analysis and/or Interpretation: Y.K., Literature Search: N.Ü., E.H.B., Writing: N.Ü., E.H.B., S.B.Ç., Y.K., A.K., M.Y., İ.Ö., A.B.

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## Main Points

- Post-tonsillectomy hemorrhage rates were higher during the warm season (1.53%).
- Hemorrhage rates were similar across different surgical techniques; however, cold dissection was the most commonly used and considered the safest method.
- Patients with post-tonsillectomy hemorrhage should be closely monitored with surgical intervention and blood transfusion applied when necessary, emphasizing the need for standardized management protocols and consideration of seasonal factors.

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