

# Factors affecting secondary post-tonsillectomy hemorrhage: a case–control study

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## Background:

Tonsillectomy is one of the commonest otolaryngological procedures performed. Multiple reports have demonstrated the safety of ambulatory (outpatient) pediatric Tonsillectomy, however Post-tonsillectomy hemorrhage remains the most serious complication of tonsillectomy.

## Patients and methods:

In this work, we analyzed different parameters including patient's age, gender, type of surgery "Tonsillectomy or Adenotonsillectomy", technique "Cold dissection or Bipolar", evidence of tonsillar bed infection and pre-operative hemoglobin level in two groups of patients indicated for tonsillectomy. One group of 80 patients didn't suffer from posttonsillectomy bleeding as a control group; the other of 20 patients having secondary post-tonsillectomy bleeding.

## Results:

According to our statistical analysis and data, no significant difference between the two groups regarding the occurrence of secondary post-tonsillectomy in the following parameters: patient's age, gender, type of surgery "Tonsillectomy or Adenotonsillectomy" and preoperative hemoglobin level.

## Conclusion:

However there was higher incidence of secondary post tonsillectomy bleeding in patients operated by bipolar scissors. Also evidence of tonsillar bed infection raises the possibility of secondary post-tonsillectomy bleeding occurrence.

## Keywords:

complications, hemorrhage, risk factors, secondary, tonsillectomy

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## Introduction

Tonsillectomy is one of the oldest and most common surgeries carried out by otolaryngologists. Postoperative complications following tonsillectomy are generally rare, with post-tonsillectomy hemorrhage being one of the most common serious complications [1].

Post-tonsillectomy hemorrhage is divided into two types: primary hemorrhages occurring within 24 h and secondary hemorrhages occurring at any point more than 24 h after tonsillectomy [1]. The overall hemorrhage rate is around 4.5% [2], with reported rates of 0.2–2.2% and 0.1–3.5% for primary and secondary hemorrhages, respectively [1]. Primary hemorrhage is generally acknowledged to be caused by inadequate hemostasis during the surgery. Secondary hemorrhage is associated with detachment of the crust from the site of the removed tonsils [3]. The previously reported risk factors for post-tonsillectomy hemorrhage include sex, age, tonsillectomy indication, surgical technique and device, and the skill level of the surgeon [4].

The aim of this study was to evaluate the clinical risk factors for post-tonsillectomy hemorrhage in a single institution.

## Patients and methods

This study was conducted between July 2014 and February 2015. The study included 200 patients who were subjected to tonsillectomy with or without adenoidectomy at the ENT Department, Kasr Al Aini Hospital, Cairo University. Ethical committee approval of the ENT Department, Kasr Al Aini Hospital, Cairo University, was obtained before embarking on the study. I agree to undergo tonsillectomy operation and that my labs and medical data can be used for medical research.

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Patients in whom the indication for tonsillectomy was recurrent attacks of acute tonsillitis (seven or more episodes per year or five or more episodes in 2 successive years) were included in the study. All patients above 3 years of age were selected and there was no upper age limit.

Patients with known coagulation disorder, on anticoagulants, or with cardiovascular disorders, or those undergoing tonsillectomy as a part of palatoplasty for snoring and unilateral tonsillectomy for biopsy to exclude malignancy were excluded.

Patients were allocated into two groups: group A and group B.

Group A included 160 patients who did not suffer from post-tonsillectomy bleeding and served as the control group.

Group B included 40 patients with secondary post-tonsillectomy bleeding.

Every patient was subjected to the following:

- (1) Preoperative evaluation:
  - (a) Careful history taking: full demographic data, full otolaryngologic symptoms, full past history, and full family history.
  - (b) Full otolaryngologic examination.
  - (c) Preoperative complete blood count and coagulation profile.
- (2) Operative evaluation: Technique of tonsillectomy and possible operative complications.
- (3) Follow-up evaluation: All patients were assessed on the first, second, seventh, and 14th day following the operation as follows:
  - (a) History taking for post-tonsillectomy bleeding.
  - (b) Full otolaryngologic examination to detect evidence of infection in the tonsillar bed and the occurrence of post-tonsillectomy bleeding by obtaining a swab of the operative bed for culture and sensitivity.

Day of bleeding episode:

- (1) T0: Day of surgery until midnight.
- (2) T1: Midnight of the day of surgery until next midnight (24 h).
- (3) T2: Second day after surgery from midnight to next midnight.
- (4) T3: Third day after surgery from midnight to next midnight.
- (5) TX . . . T21: 21st day after surgery from midnight to next midnight.

Severity of bleeding episode ([5]):

- (1) Grade A: Anamnesticly recorded blood-tinged sputum.
  - (a) A1: Wound is and stays dry, no coagulum upon inspection.
  - (b) A2: Coagulum upon inspection, dry wound after removal.
- (2) Grade B: Bleeding actively under examination, medical treatment necessary, dry wound afterwards, blood count in normal range, no shock.
- (3) Grade C: Surgical treatment with general anesthesia, blood count still in normal range, no shock.
- (4) Grade D: Dramatic hemorrhage, hemoglobin decreased, blood transfusion required, difficult surgical treatment, intensive care may be necessary.
- (5) Grade E: Exitus due to hemorrhage or hemorrhage-related complications.

#### Statistical analysis

Data were coded and entered using the statistical package SPSS, Version 23.0 (Armonk, NY: IBM Corp.). Data were summarized using mean and SD for quantitative variables and frequencies (number of cases) and relative frequencies (percentages) for categorical variables. Comparisons between groups were made using unpaired *t*-test [6]. For comparing categorical data, the  $\chi^2$ -test was performed. An exact test was used instead when the expected frequency is less than 5 [7]. *P*-values less than 0.05 were considered as statistically significant.

#### Results

The data assessed included age, sex, technique 'cold dissection or bipolar', evidence of tonsillar bed infection, and the day, severity, and management of bleeding if occurred, and preoperative hemoglobin level. The descriptive statistics for both groups are illustrated in Table 1. The statistical differences between the two groups are illustrated in Tables 2 and 3.

#### Demographic data

There were 100 male and 100 female patients between 3 and 20 years of age with a mean age of  $7.3 \pm 4.2$  years. In group A, there were 78 male and 82 female patients. Patients ranged in age between 3 and 20 years, with a mean age of  $7.1 \pm 4.2$  years. However, in group B there were 22 male and 18 female patients. Patients ranged in age between 4 and 20 years, with a mean age of  $8.0 \pm 4.4$  years. No statistically significant difference was found in the ages or sex between the two groups.

**Table 1 Descriptive statistics for patient population (n=200)**

	Frequency [N (%)] (n=200)
Sex	
Male	100 (50.0)
Female	100 (50.0)
Type of surgery	
A-T	162 (81.0)
T	38 (19.0)
Technique of surgery	
Bipolar	108 (54.0)
Cold	92 (46.0)
Secondary post-tonsillectomy bleeding	
Yes	40 (20.0)
No	160 (80.0)
Tonsillar bed infection	
Yes	34 (17.0)
No	166 (83.0)

**Table 2 Statistical analysis for comparison between the two groups**

	Post-tonsillectomy bleeding [N (%)]		P-value
	Group B (present) (n=40)	Group A (absent) (n=160)	
Sex			
Male	22 (55.0)	78 (48.8)	0.480
Female	18 (45.0)	82 (51.3)	
Type of surgery			
A-T	32 (80.0)	130 (81.3)	0.857
T	8 (20.0)	30 (18.8)	
Technique of surgery			
Bipolar	34 (85.0)	74 (46.3)	<b>&lt;0.001</b>
Cold	6 (15.0)	86 (53.8)	
Indications of surgery			
Recurrent acute attack	30 (75.0)	134 (83.8)	0.198
Chronic tonsillitis	10 (25.0)	26 (16.3)	
Tonsillar bed infection			
Yes	34 (85.0)	0 (0.0)	<b>&lt;0.001</b>
No	6 (15.0)	160 (100.0)	

Bold values are statistically significant.

**Table 3 Comparison of age and preoperative hemoglobin level between the two groups**

	Post-tonsillectomy bleeding (mean±SD)		P-value
	Group B (present) (n=40)	Group A (absent) (n=160)	
Age	8.0±4.4	7.1±4.2	0.231
Preoperative hemoglobin%	11.4±1.2	11.9±1.5	0.052

### Type and technique of surgery

About 162 patients underwent adenotonsillectomy and 38 patients underwent tonsillectomies only. Moreover, in about 108 patients, bipolar scissors were used for surgery, whereas in about 91

patients the cold dissection method was the technique.

In group A, about 130 patients underwent adenotonsillectomy and 30 patients underwent tonsillectomies only, whereas in group B 32 patients underwent adenotonsillectomy and eight patients underwent tonsillectomies only. There was no statistically significant difference in the type of surgery between the two groups.

As regards the technique of surgery, cold dissection was the technique used in 86 patients of group A, whereas bipolar scissors were used in 74 patients. In group B, bipolar scissors were used in 34 patients, whereas the cold dissection technique of surgery was used in only six patients (Fig. 1). A significant statistical difference existed between the two groups ( $P=0.002$ ).

### Preoperative hemoglobin level

The preoperative hemoglobin level ranged between 9.8 and 14.2 g/dl, with a mean of  $11.8\pm 1.0$  g/dl. In group A, the preoperative hemoglobin level ranged between 9.8 and 14.2 g/dl, with a mean of  $11.9\pm 1.0$  g/dl, whereas in group B the preoperative hemoglobin level ranged between 10.1 and 12.9 g/dl, with a mean of  $11.4\pm 1.0$  g/dl. There was no statistically significant difference between the two groups.

### Evidence of tonsillar bed infection

In group A, no patient was associated with tonsillar bed infection '0%', whereas in group B 34 patients of 40 patients were associated with evidence of tonsillar bed infection (Fig. 2). Thus, a highly significant statistical difference existed between the two groups ( $P<0.001$ ).

### Some characteristics of group B patients 'secondary post-tonsillectomy bleeding patients'

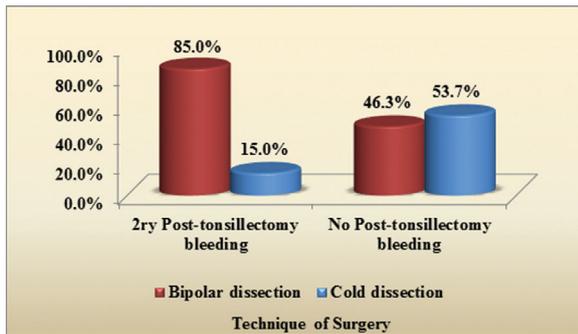
#### Day of bleeding episode

The day of first attack of bleeding ranged from the second day of surgery up to the 16th day, with maximum incidence on the six day (30% of patients).

#### Severity of bleeding episode

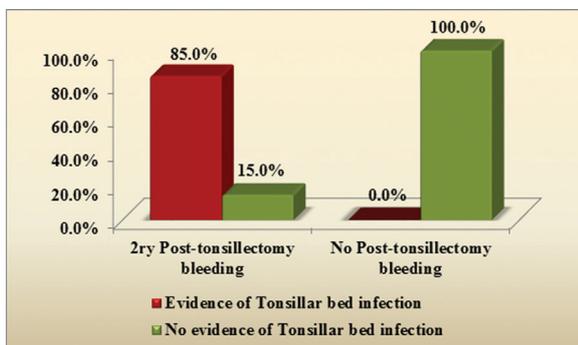
The severity of secondary post-tonsillectomy bleeding episode ranged from A (coagulum upon inspection, dry wound after removal) (about 5% of patients) to D degree of severity (dramatic hemorrhage, decreased hemoglobin, blood transfusion required, difficult surgical treatment, intensive care may be necessary) in about 10% of patients. 85% of patients were in grade B of severity (minimal hemorrhage, stops after noninvasive treatment: e.g.  $H_2O_2$  gargle).

Figure 1



The technique of surgery used in group A 'no post-tonsillectomy bleeding' and group B 'secondary post-tonsillectomy bleeding'.

Figure 2



Evidence of tonsillar bed infection in group A 'no post-tonsillectomy bleeding' and group B 'with secondary post-tonsillectomy bleeding'.

#### Management of the bleeding

About 90% of group B cases needed conservative management without intervention. Only four (10%) cases needed to re-enter the operation theater, and ligation of the bleeder under general anesthesia was performed (Table 4).

## Discussion

Tonsillectomy is among the oldest and most commonly performed procedures in the pediatric population. Approximately 530 000 outpatient pediatric adenotonsillectomies are performed annually in US hospitals [8].

Indications for tonsillectomy have remained constant along with time, including recurrent pharyngotonsillitis, chronic tonsillitis, peritonsillar abscess, streptococcal carriage, hemorrhagic tonsillitis, suspicion of malignancies, and tonsillar hypertrophy causing obstructive sleep disorders [9].

Multiple reports within the last two decades have demonstrated the safety of ambulatory (outpatient), pediatric tonsillectomy. However, post-tonsillectomy

Table 4 Some characteristics of group B patients

	Frequency [N (%)] (n=40)
Day of bleeding episode	
T2	2 (5.0)
T3	4 (10.0)
T6	12 (30.0)
T7	6 (15.0)
T8	4 (10.0)
T9	2 (5.0)
T10	2 (5.0)
T11	4 (10.0)
T12	2 (5.0)
T16	2 (5.0)
Severity of bleeding episode	
A	2 (5.0)
B	34 (85.0)
D	4 (10.0)
Management of hemorrhage	
Conservative	36 (90.0)
Ligation under GA	4 (10.0)

GA, general anesthesia

hemorrhage remains the most serious complication of tonsillectomy, which may require rehospitalization, as the tonsils are close to major blood vessels [3].

It is commonly accepted that bleeding episodes can be classified into primary hemorrhage, which occurs within the first 24 h of surgery, and secondary hemorrhage, which occurs after the first 24 h of surgery [3].

To reduce the incidence of both intraoperative and postoperative bleeding during and after adenoid/tonsil surgeries, besides the requirement of good surgical skills, most otolaryngologists perform preoperative investigations such as clotting profile, full blood count including hemoglobin level, preoperative grouping, and cross-matching of blood [10].

#### Risk factors for postoperative hemorrhage

In this study, we compared two groups: one group underwent tonsillectomy (with or without adenoidectomy) without secondary bleeding and the other group had secondary post-tonsillectomy bleeding. In addition to the preoperative hemoglobin level, we included the comparison age, sex, technique 'cold dissection or bipolar', evidence of tonsillar bed infection, and the day, severity, and management of bleeding if occurred.

#### Patients' age

The age of patients has consistently been described as being a major risk factor for the occurrence of hemorrhage, with older patients being at higher risk [11].

However, in this study there was no statistically significant difference as regards the patient's age between the two groups.

#### Patients' sex

There is a discrepancy concerning sex as a risk factor for postoperative hemorrhage. Some authors found a positive correlation for male patients being at higher risk [1] and others did not [12].

However, in this study there was no statistically significant difference as regards the patient's sex between the two groups.

#### Operation techniques

In recent years, operation techniques have been investigated in more detail, showing in the literature a statistically significantly higher or lower postoperative hemorrhage rates for certain operation techniques – for example, bipolar diathermy for tonsillectomy shows higher hemorrhage rates compared with cold steel dissection tonsillectomy [13].

In this series, a significant statistical difference existed between the two groups as regards the technique of surgery, supporting that the use of bipolar scissors is associated with a higher incidence of secondary post-tonsillectomy bleeding compared with cold dissection technique.

#### Preoperative hemoglobin level and anemia

WHO defines anemia as an hemoglobin less than 13 g/dl for men and hemoglobin less than 12 g/dl for women. Some observational studies have established the association between preoperative anemia and increased postsurgical complications in patients undergoing surgery [12].

Anemia should no longer be considered an innocent bystander in the perioperative care of our patients. Whether the patient presents with anemia on admission or develops it during the course of hospitalization, it portends a negative outcome. Recent advances in basic science have provided us with a potential future means of biomarker identification of patient-specific thresholds for tolerance of anemia [14].

There were no significant statistical difference as regards the preoperative hemoglobin level in the occurrence of post-tonsillectomy hemorrhage.

#### Postoperative infection of tonsillar fossa

A study from 2007 showed that postoperative infection of the tonsillar fossa is no risk factor for

secondary hemorrhage [15], whereas another study described a positive relationship between pre-operative bacterial colonization of the tonsillar fossa and postoperative hemorrhage, recommending antibiotics [16]. However, prescribed antibiotics did not reduce the risk for post-tonsillectomy hemorrhage in general [17].

In this series a highly significant statistical difference existed as regards the presence of tonsillar bed infection raising the possibility of secondary post-tonsillectomy bleeding.

#### Conclusion

In the present study, we suggest that among all of the assessed risk factors influencing secondary post-tonsillectomy bleeding, only the technique of surgery whether it is bipolar or cold steel tonsillectomy and the presence of tonsillar bed infection are the most significant risk factors.

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Nil.

#### Conflicts of interest

There are no conflicts of interest.

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