

Post-Tonsillectomy Hemorrhage in Pediatric Patients: Comparison of Age Groups and Surgical Techniques

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Abstract

Objective: Tonsillectomy is a very common operation performed by otolaryngologists. Post-tonsillectomy hemorrhage continues to be a serious complication. The effects of age and surgical technique on this complication are still debated in the literature. The aim of this study was to compare post-tonsillectomy hemorrhage rates among pediatric age groups and different surgical techniques.

Methods: Pediatric patients who underwent tonsillectomy were retrospectively analyzed. Four age groups (0-2 years—infancy; ≥ 3-6 years—early childhood; ≥ 7-10 years—middle childhood; ≥ 11-18 years—adolescence) and 3 surgical techniques (Coblation® intracapsular tonsillectomy, Monopolar diathermy, Cold knife dissection) were compared.

Results: The mean age of 1371 patients included in the study was 5.9 (standard deviation = 3). Postoperative hemorrhage occurred in 3.7% of patients. In the early childhood period, bleeding was not observed in the Coblation® intracapsular tonsillectomy group, while it was 2% in the monopolar diathermy group and 4.2% in the cold knife dissection group ($P = .047$). Coblation® intracapsular tonsillectomy and monopolar diathermy groups were determined to be significantly lower bleeding in pre-adolescence and pre-middle childhood periods, respectively ($P = .046$, $P = .011$). Statistical difference was not found in hemorrhage rates among age groups in patients upon whom cold knife dissection was used ($P = .766$).

Conclusions: Post-tonsillectomy hemorrhage is associated with pediatric age. The combination of cold and hot techniques makes it difficult to compare the 2 techniques. However, partial tonsillectomy using Coblation® causes less bleeding in pre-adolescence terms.

Keywords: Tonsillectomy, postoperative hemorrhage, surgical techniques

INTRODUCTION

Tonsillectomy is a frequent operation performed by otolaryngologists. Although surgical techniques have improved, post-tonsillectomy hemorrhage has still continued as a crucial complication. The rate of post-tonsillectomy hemorrhage reported in the literature is ranging from 1% to 10%.¹⁻³

Post-tonsillectomy hemorrhage is grouped into primary and secondary hemorrhage.⁴ Bleeding within the first 24 hours is defined as primary hemorrhage, whereas bleeding from 24 hours to 2 weeks is defined as secondary hemorrhage.^{5,6}

In traditional techniques of extracapsular tonsillectomy (ET), cold knife dissection and monopolar or bipolar diathermy are used. The tonsil is dissected from the pharyngeal muscle. Trauma to large vessels adjacent to the tonsillar tissue can cause severe hemorrhage.⁷ In electrosurgery, the local temperature rises up to 400-600°C. This causes the intracellular contents to heat and then vaporization of the cell.⁸

Recently, intracapsular tonsillectomy (IT, also known as tonsillotomy) is an alternative to traditional ET because of lesser pain and the risk of postoperative bleeding.⁷ Intracapsular tonsillectomy requires the removal of lymphoid tonsil tissue including crypts and follicles while preserving the tonsillar capsule. In IT, all of the tonsillar tissue is removed while the tonsillar capsule is preserved.

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The use of Coblation®IT has increased in the pediatric population recently. This is linked to a reduced occurrence of bleeding and pain in children.⁹

It is believed by many authors that age is related to the risk of bleeding. In the literature, it has been reported that the rate of bleeding is higher in adult patients.¹⁰ However, the number of studies comparing pediatric age groups among themselves is limited in the literature.

The aim of this study was to compare post-tonsillectomy hemorrhage rates among pediatric age groups and different surgical techniques.

METHODS

We retrospectively analyzed the patients who underwent tonsillectomy in Hacettepe University Department of Otorhinolaryngology between January 2014 and May 2019. Ethics committee approval of the study was obtained from the Ethics Committee of Hacettepe University (GO19/728-18). The informed consent was not obtained as it was a retrospective study.

Patients with coagulopathy and tonsillar malignancy were excluded from the study. We divided patients into 4 groups: 0-2 years—infancy; ≥ 3-6 years—early childhood; ≥ 7-10 years—middle childhood; ≥ 11-18 years—adolescence. Surgery was performed under general anesthesia in all patients.

Surgical Procedure

Three surgical techniques (Coblation®IT, Monopolar diathermy, Cold knife dissection) were applied. Coblation® is “cold” radiofrequency ablation (RFA) apparatus. Radiofrequency current is transmitted through a probe. This probe has the function of saline irrigation and suction. Radiofrequency energy destroys tissues by disrupting intercellular bonds. Tissue fragments are aspirated through the aspiration channel. Tissues are removed at lower temperatures (40-50°C) than electrosurgery in the ablate mode. Bleeding control is achieved in the coagulation mode (50-70°C).⁹

PROcise® EZ View™ wand was used in the Coblation®IT. The radiofrequency generator has been set to “7” for ablation and “3” for coagulation. The tonsillar tissue was removed up to the capsule. Extracapsular tonsillectomy was performed with a tonsil knife in the cold knife technique and with the help of electrocautery in the monopolar diathermy technique. In the cold knife technique, the tonsil and capsule were dissected from surrounding tissue using the knife. Dissection was done from superior to inferior and the inferior pole was cauterized first with bipolar electrocoagulation, and then entire tonsil tissue was amputated using scissors. Hemostasis was ensured using bipolar electrocoagulation. In the monopolar diathermy technique, a standard electrocautery tip was used and the energy generator was set to 20 Watt. The superior pole of the tonsil was retracted medially by grasping the Allis clamp. The tonsil and capsule were dissected from surrounding tissue by incising the anterior tonsillar pillar. Hemostasis was ensured using bipolar electrocoagulation.

Main Points

- The children older than 7 years have a higher risk of bleeding.
- Coblation®IT reduces the risk of post-tonsillectomy hemorrhage.
- Post-tonsillectomy hemorrhage in the adolescence period is usually controlled in the operating room.

Post-tonsillectomy hemorrhage was defined as conditions that stopped in the hospital with simple interventions (cold water gargle, compression) or under general anesthesia.

Statistical Analysis

Categorical variables were shown as percentages and continuous variables as mean and SD. The Chi-square test was used to compare categorical variables. Binary logistic regression analysis was also used. Statistical significance was accepted as $P < .05$. IBM Statistical Package for Social Sciences (SPSS) Statistics version 25.0 software (IBM Corp.; Armonk, NY, USA) was used in the analysis.

RESULTS

One thousand three seventy-one patients were included, of which 803 (58.6%) were boys and 568 (41.4%) were girls. The average age of the patients was 5.9 (SD=3). Of all the patients, 150 (11%) were in the infancy period, 854 (62%) were in the early childhood period, 269 (20%) were in the middle childhood period, 98 (7%) were in the adolescence period and 130 (9.5%) underwent Coblation®IT, 388 (28.3%) underwent monopolar diathermy, and 853 (62.2%) underwent cold knife dissection.

Postoperative hemorrhage occurred in 51 (3.7%) of 1371 patients. Primary hemorrhage occurred in 1 (2%) patient, and secondary hemorrhage occurred in 50 (98%) patients. Post-tonsillectomy hemorrhage rates were 2.7% in the infancy period, 3.2% in the early childhood period, 5.6% in the middle childhood period, 5.1% in the adolescence period and 0.8% in the Coblation®IT group, 4.4% in the monopolar diathermy group, and 3.9% in the cold knife dissection group (Table 1).

Post-tonsillectomy hemorrhage rate was 5.4% in those patients aged 7 or older and 3.1% in those who were under the age of 7 ($P=.052$). Adolescence and middle childhood periods were 0.561 and 0.522 times more risky to bleed than infancy, respectively, but this was not statistically significant ($P=.399$, 95% CI 1.146 to 2.150) ($P=.257$, 95% CI 0.169 to 1.607).

Postoperative hemorrhage averaged 7.37 (SD=3.09) days. Fourteen (1%) patients were reoperated for postoperative hemorrhage. Hemorrhage control was applied in the operating room in 10 of the 14 patients at the first admission. In 4 patients, the bleeding was stopped with a simple intervention (such as tampon application and ice water gargle). However, these patients were reoperated for recurrent hemorrhage: 3 patients 2 days later and 1 patient 3 days later, respectively. Reoperation rates for postoperative hemorrhage were found to be 25% in the infancy period, 22.2% in the early childhood period, 33.3% in the middle childhood period, and 40% in the adolescence period ($P=.84$).

In the early childhood period, postoperative hemorrhage was not observed in the Coblation®IT group, while it was 2% in the monopolar diathermy group and 4.2% in the cold knife dissection group ($P=.047$) (Table 1).

Postoperative hemorrhage was not observed in pre-adolescence patients compared to adolescents upon whom Coblation®IT was used ($P=.046$). Postoperative hemorrhage was observed less commonly in infancy and early childhood patients than in middle childhood and adolescence upon whom monopolar diathermy was used ($P=.011$). Statistical difference was not found in hemorrhage rates among age groups in patients upon whom cold knife dissection was used ($P=.766$) (Table 1).

Table 1. Post-Tonsillectomy Hemorrhage Relationship Between Age Groups and Surgical Techniques

			Infancy (0-2 years)	Early Childhood (≥3-6 years)	Middle Childhood (≥7-11 years)	Adolescence (≥11-18 years)	Total	P
Coblation®IT	PTH	+	0 (0%)	0 (0%)	0 (0%)	1 (16.7%)	1 (0.8%)	.046
		-	25 (100%)	89 (100%)	10 (100%)	5 (83.3%)	129 (99.2%)	
Monopolar diathermy	PTH	+	1 (2.9%)	5 (2%)	8 (10.1%)	3 (10.7%)	17 (4.4%)	.011
		-	34 (97.1%)	241 (98%)	71 (89.9%)	25 (89.3%)	371 (95.6%)	
Cold knife dissection	PTH	+	3 (3.3%)	22 (4.2%)	7 (3.9%)	1 (1.6%)	33 (3.9)	.766
		-	87 (96.7%)	497 (95.8%)	173 (96.1%)	63 (98.4%)	820 (96.1%)	
Total	PTH	+	4 (2.7%)	27 (3.2%)	15 (5.6%)	5 (5.1%)	51 (3.7%)	.226
		-	146 (97.3%)	827 (96.8%)	254 (94.4%)	93 (94.9%)	1320 (96.3%)	
P			.827	.047	.100	.070	.158	

IT, intracapsular tonsillectomy; PTH, post-tonsillectomy hemorrhage.

Recurrent tonsillar tissue occurred in 3 patients who underwent Coblation®IT. The patients were reoperated after 24 months, 15 months, and 9 months, respectively.

DISCUSSION

Tonsillectomy is a very common operation performed by otolaryngologists. Postoperative hemorrhage is of great importance as it causes significant morbidity and rarely mortality.

Our bleeding rate after tonsillectomy was 3.7%, and primary and secondary bleeding rates were 0.07 (1/1371) and 3.6% (50/1371), respectively. These values are similar to the literature.

Patient age has been identified as a risk factor.¹¹ Tomkinson et al¹² reported that the hemorrhage rate suddenly changed in the early teenage years. Patients 12 years and older had 1.5 times more severe primary hemorrhage ($P < .05$) and 3.3 times more severe secondary hemorrhage ($P < .0001$) than patients under 12 years of age. Spector et al¹³ found that older children were more prone to hemorrhage after surgery. Hemorrhage risk increased 1.1 times for each age increase ($P < .05$). Children aged 11 and older bore the risk of hemorrhage twice as much as younger children ($P < .05$).

In our study, post-tonsillectomy hemorrhage was less in infancy (2.7%) and early childhood (3.2%) periods than in middle childhood (5.6%) and adolescence (5.1%) periods (Table 1). The bleeding rate was higher in those patients aged 7 or older compared to those who were under the age of 7 ($P = .052$). It is thought that the pediatric developmental stage is an important factor affecting bleeding.

When the differences between the techniques of post-tonsillectomy hemorrhage are evaluated, Subasi et al¹⁴ reported that the post-tonsillectomy hemorrhage rate was found to be 4% in the cold dissection group and 4.2% in the coblation group ($P = .97$). Omrani et al¹⁵ reported that primary and secondary hemorrhage rates were found to be 4.26% and 10.64% in the cold dissection group and 2.12% and 2.12% in the coblation group, respectively ($P > .05$). Belloso et al¹⁶ reported that the secondary hemorrhage rate was found as 0.95% in the coblation group and 4.77% in the blunt dissection with bipolar diathermy hemostasis group ($P = .001$). Kujawski et al reported that primary post-tonsillectomy hemorrhage was not observed in patients in the study in which bipolar dissection and cold

dissection techniques were used. Secondary post-tonsillectomy hemorrhage was found in 5.5% of patients. The hemorrhage rate in patients under 7 years of age was found to be 1.3% in the bipolar dissection and 2.5% in the cold dissection.¹⁶

In the current study, the rate of reoperation for hemorrhage was 1% (14/1371). Monopolar diathermy was carried out in 7 of these patients and cold knife dissection in the other 7. The least common technique of post-tonsillectomy hemorrhage was the Coblation®IT. However, there was no statistically significant ($P = .158$). Especially, Coblation®IT and monopolar diathermy were superior in terms of post-tonsillectomy hemorrhage in pre-adolescence and pre-middle childhood, respectively. In Coblation®IT, lower temperature used by more experienced surgeons and cold knife dissection in initial surgical learning may have contributed to less bleeding.

Koltai et al¹⁷ reported that post-tonsillectomy hemorrhage was found in 6 patients (3.7% or 6/162) who underwent standard tonsillectomy and 1 patient (0.7% or 1/150) who underwent partial IT (with microdebrider) ($P = .13$). Tipirneni et al reported that post-tonsillectomy hemorrhage was found in 2.87% (or 5/174) of those who underwent traditional tonsillectomy, whereas no bleeding was observed in partial IT (with microdebrider).¹⁸ In partial tonsillectomy, the extent of bleeding depends not only on the surgical instrument used but also on the preservation of the capsule. It is thought the main effect of Coblation® is to facilitate partial tonsillectomy.

CONCLUSION

Post-tonsillectomy hemorrhage is associated with the pediatric development stage. Especially, more caution should be exercised in patients over 7 years of age.

Unfortunately, surgical techniques are difficult to standardize. The combination of cold dissection and bipolar coagulation makes it difficult to compare cold and hot techniques. However, the use of Coblation®IT pre-adolescence can be advantageous in terms of post-tonsillectomy hemorrhage. Also, it should be kept in mind the possibility of relapse after IT.

Ethics Committee Approval: This study was approved by Ethics Committee of Hacettepe University (Date: April 3, 2019, Number: GO19/728-18).

Informed Consent: Written informed consent was obtained from the patients who agreed to take part in the study.

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