Adult tonsillectomy: Risk factors for postoperative complications

Original Article

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Abstract

Objective: This study aimed to evaluate surgical indications and risk factors associated with postoperative complications in tonsillectomy in adults.
Study design: Retrospective observational study of 539 patients who underwent surgery at a tertiary center between 2016 and 2021.
Material and methods: Demographic and clinical data were collected, and the outcomes were defined: post-tonsillectomy hemorrhage; surgical hemostasis in the operating room; emergency department visits for supportive care.
Results: The overall incidence of post-tonsillectomy hemorrhage (PTH) was 16.6% and 13.5% of the patients visited the emergency department for pain control. PTH showed statistically significant associations with both surgeon experience (p=0.008) and patient age (p=0.047). Surgical indication was identified as an independent predictor of pain control (p=0.007).
Conclusion: These factors, namely surgical indication, patient's age and surgeon inexperience, play an important role in preventing post-tonsillectomy complications.

Keywords: tonsillectomy; post-tonsillectomy hemorrhage; adult tonsillectomy; post-operative complications

Introduction

Tonsillectomy is one of the most frequently-performed Otorhinolaryngology surgeries. While tonsillectomy has been widely studied in the pediatric population, there are few studies on the indications and complications of this procedure in adults. Moreover, surgical indications for tonsillectomy differ between the pediatric and adult populations. The most common indications for tonsillectomy are obstructive tonsil hypertrophy in children and chronic (infectious) tonsillitis in adults.[1] Other indications for tonsillectomy in adults include obstructive sleep apnea syndrome, caseous

tonsillitis, and need for anatomical pathology examination.[2] Tonsillectomy is an outpatient surgery, and potential complications associated with this procedure have been described in the literature. Yet, only a few studies have addressed the risk factors for complications of tonsillectomy.[2,3] Approximately 11% of the patients who underwent tonsillectomy visit the emergency department (ED) postoperatively due to uncontrolled pain, nausea, vomiting, and dehydration.[3] Postoperative hemorrhage is one of the most serious complications. It may occur even after careful hemostasis testing, and its incidence in adults (4.5%) is much higher than that in the pediatric population (3 to 5%).[3] In adults, post-tonsillectomy hemorrhage (PTH) can be classified into primary (within 24 hours) and secondary (after 24 hours), with estimated incidence rates of 0.2–2.2% and 0.1–4.0%, respectively.[3-5]

The present study aimed to: (1) characterize the adult population undergoing total tonsillectomy in a tertiary referral hospital, (2) analyze the surgical indications for tonsillectomy, and (3) identify the predictors of postoperative complications in adults.

Materials and Methods

This retrospective observational study included all adult patients who underwent total tonsillectomy at the North Lisbon University Hospital Centre (*Centro Hospitalar Universitário Lisboa Norte* – CHULN) from January 2016 to December 2021. The following demographic and clinical data were collected from their medical records: age, sex, and medical history (including coagulopathies and tobacco smoking); surgical indication; surgical technique; postoperative ED visit, for example, due to uncontrolled pain or bleeding; and need for hemostasis testing under general anesthesia. The comorbidities of the patients were stratified using the Adult Comorbidity Evaluation index (ACE-27), a validated instrument that provides a score ranging from 0 to 3, based on the number and severity of comorbidities: 0 - without comorbidities; 1 – mild comorbidities; 2 – moderate comorbidities; and 3 – severe comorbidities.[7,8] Surgical indications were categorized into infectious etiology, obstructive sleep apnea syndrome (OSAS), caseous tonsillitis, and need for anatomical pathology examination (APE) due to suspicion of neoplasia in patients with tonsillar asymmetry or lesions. All patients underwent total tonsillectomy, whose surgical technique ranged from hot (electrocautery or coblation) to cold dissection, according to the surgeon's preference and experience. Primary outcomes included PTH, need for hemostasis testing in the operating room, and ED visit for intractable pain or other reasons. PTH was divided into primary (< 24 hours) and secondary (> 24 hours) PTH. The data were statistically analyzed by performing descriptive analysis and nonparametric tests, namely the Chi-squared or Fisher's Exact Tests, Spearman's product-moment correlation, and multivariate analysis of variance (MANOVA). Significant parameters in MANOVA were analyzed by the test of between-subject effects and post-hoc tests. All statistical tests were performed by using IBM SPSS Statistics software v.29. Differences were considered significant when the *p*-value was ≤0.05.

Results

In total, 539 adults who underwent total tonsillectomy were included in this study. The mean age was 32 years (18–84 years); most patients were women (58.8%) and had no or mild comorbidities (79.8%). In contrast, 19 individuals (4.1%) presented with moderate-to-severe comorbidities. Only two patients had coagulopathies (factor VII deficiency and Von Willebrand disease), and 28.0% individuals were active smokers (Table 1).

The most common surgical indication was infectious etiology (72.5%), followed by OSAS (15.8%), caseous tonsillitis (6.5%), and APE (5.2%) (Figure 1).

The medical records of some patients lacked data on the surgical technique used for tonsillectomy. In the remaining cases, the most commonly used technique was electrocautery (51.9%), followed by cold dissection (27.1%) and

coblation (20.9%). Regarding the outcomes, the ED visit rate was 13.5% for intractable pain and 7.4% for other reasons (nausea, vomiting, and reduced oral intake). The overall incidence of PTH was 16.6%, with primary hemorrhage accounting for 1.9% and secondary hemorrhage for 14.7%. Among all patients who underwent tonsillectomy, the need for hemostasis testing in the operating room was recorded in 24 cases (4.5%), accounting for 27.1% of the patients with PTH (Figure 2). No other postoperative complications were identified in the medical records.

The Chi-squared test revealed that sex was significantly associated with the ED visit rate, and women visited the ED significantly more frequently than men both for pain ($p<0.001$) and for other reasons ($p=0.046$). The results also showed that the type of PTH was significantly associated with the surgeon's experience; primary hemorrhage occurred more frequently in procedures performed by interns than specialists (3.2% versus 1.3%), whereas secondary hemorrhage occurred more frequently in procedures performed by specialists than in those performed by interns (17.2% versus 8.4%) ($p=0.008$) (Table 2).

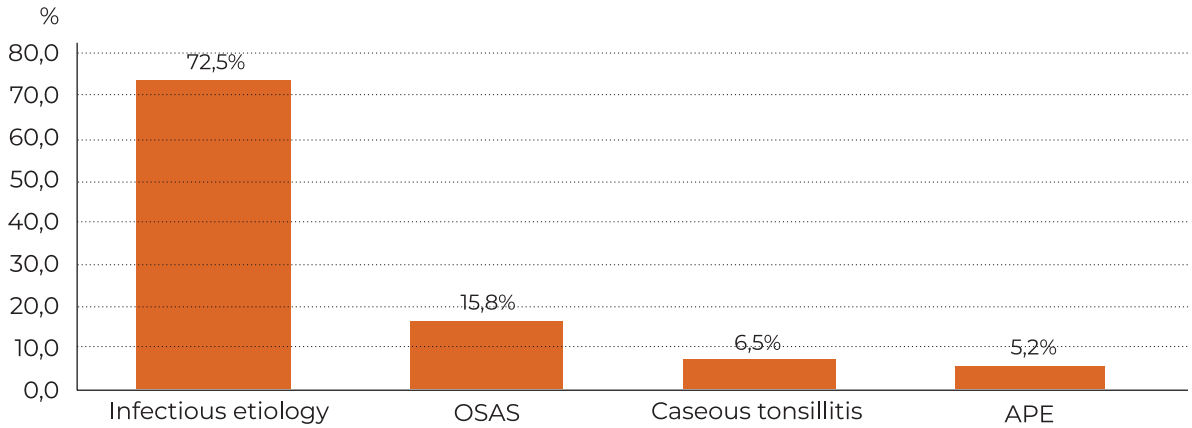
Variables significantly related to each other were identified by using the Spearman's rank correlation coefficient (ρ). The results confirmed the relationship between PTH and surgeon's experience ($p=0.039$) and between

Table 1
Demographic characteristics and comorbidities of the patients

Characteristics	Number	Percentage (%)
Age		
Mean	32	
Interval	18-84	
Sex		
Female	317	58.8%
Male	222	41.2%
Comorbidities (ACE-27 score)		
None or mild (0–1)	430	79.8%
Severe (2–3)	19	4.1%
Coagulopathies	2	0.4%
Tobacco smoking	150	28.0%

ACE-27, Adult Comorbidity Evaluation index-27

Figure 1
Distribution of the indications for tonsillectomy



OSAS, obstructive sleep apnea syndrome; APE, anatomical pathology examination

Figure 2
Distribution of the complications of tonsillectomy. **a)** Frequency of post-tonsillectomy complications. **b)** Frequency of post-tonsillectomy hemorrhage by type of hemorrhage

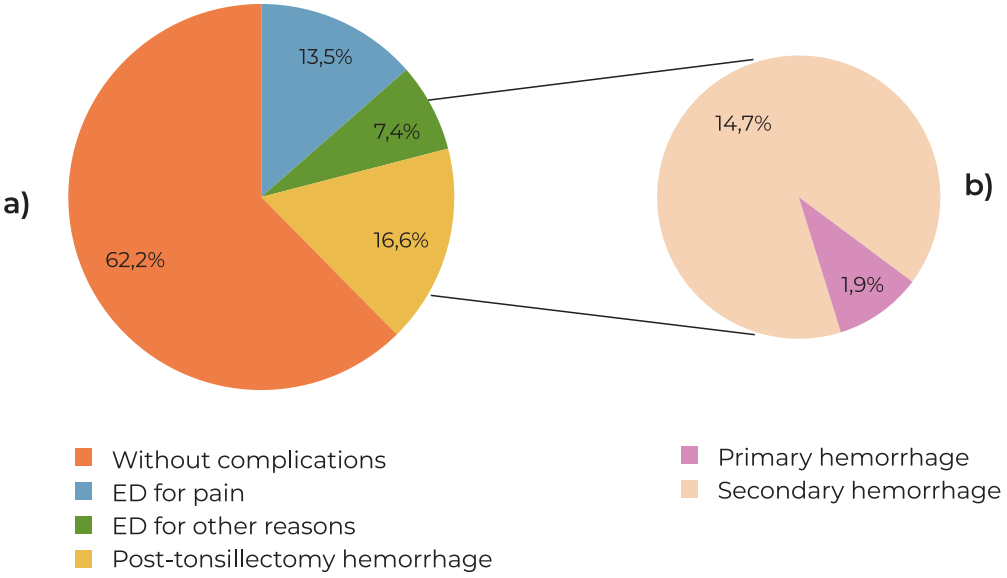


Table 2
Results from the Chi-squared test for the associations between sex and the ED visit rate and between the surgeon's experience and PTH occurrence

Independent variable			Dependent variable							Pearson Chi-squared/ Fisher Exact Test	*p-value*
			ED visit for pain		ED visit for other reasons		PTH				
			Não	Sim	Não	Sim	Não	P	S		
Sex	M	Obs	205	17						11.168	<0.001
		Exp	192	30							
	F	Obs	261	56							
		Exp	274	43							
	M	Obs			211	11				3.342	0.046
		Exp			206	17					
	F	Obs			288	29					
		Exp			294	23					
Surgeon's experience	Esp	Obs					313	5	66	9.017	0.008
		Exp					230	7	56		
	Int	Obs					137	5	13		
		Exp					129	2	23		

The values represent the observed and expected values for ED visit and post-tonsillectomy hemorrhage.
Table 2 outlines the results from the Pearson's product-moment correlation and Chi-Squared (or Fisher's Exact Test when the expected value was <5) tests, with the respective p-value.

Abbreviations: M: Male; F: Female; Spe: Specialist; Int: Intern; Obs: Observed cases; Exp: Expected cases; P: Primary hemorrhage; S: Secondary hemorrhage; ED: emergency department; PTH: post-tonsillectomy hemorrhage.

ED visit for pain and sex (p<0.001). Furthermore, age was correlated with the comorbidity score (p<0.001), surgical indication (p=0.008), and history of tobacco smoking (p=0.003). In MANOVA, surgical indication (p=0.02) and age (p=0.038) were found to independently affect the study outcomes. The test of between-subject effects demonstrated that the surgical indication had a more significant effect on the ED visit rate for pain (p=0.007), whereas age had a more significant impact on PTH occurrence (p=0.047) (Table 3).

Additionally, post-hoc analysis of the effect of surgical indication on postoperative pain revealed that caseous tonsillitis (p=0.004) had the most effect, followed by infectious etiology (p<0.001) and OSAS (p<0.001) (Table 4). The post-hoc analysis of the effect of age on PTH showed that no age group was more affected than the other. However, younger patients were more prone to bleeding complications, albeit nonsignificantly.

Discussion

In this study, infectious etiology was the most common indication for tonsillectomy in the adult population, in line with the findings in the previous literature.[9-13] Our findings show that caseous tonsillitis is significantly associated with chronic infection and ED visit for postoperative intractable pain. As a possible explanation, recurrent tonsillitis is

Table 3
Results of MANOVA between all independent variables and outcomes defined in this study

Variable	MANOVA test	Value	*p-value*	Between subject-effects	*p-value*
Surgical indication	Roy's Largest Root	1.938	0.02	PTH	0.316
				ED_pain	**0.007**
				ED_others	1.0
				Hemostasis_testing	1.0
Age	Wilks' Lambda	0.206	0.038	**PTH**	**0.047**
				ED_pain	0.273
				ED_others	0.927
				Hemostasis_testing	1.0

Only the results from tests suitable for correctly interpreting the findings are presented in Table 3, after considering the limitations and requirements of each test.

Abbreviations: PTH: Post-tonsillectomy hemorrhage; ED_pain: Emergency department visit for pain; ED_others: Emergency department visit for other reasons; Hemostasis_testing: Need for hemostasis testing in the operating room; MANOVA: multivariate analysis of variance

Table 4
Post-hoc analysis of the effect of surgical indication on ED visit for pain

Surgical indication		Mean difference factor	*p-value*	Confidence interval (95%)
Caseous	Infectious etiology	0.620	0.004	[0.247; 0.994]
	OSAS	0.833	<0.001	[0.419;1.248]
Infectious etiology	Caseous	-0.620	0.004	[-0.994;-0.247]
	OSAS	0.213	0.072	[-0.022; 0.448]
OSAS	Caseous	-0.833	<0.001	[-1.248;-0.419]
	Infectious etiology	-0.213	0.072	[-0.448; 0.022]

The results of the effect of surgical indication on ED visit for pain are presented above because this was the only outcome with significant differences

Abbreviations: ED: emergency department; OSAS: obstructive sleep apnea syndrome.

known to have a higher risk of PTH (association not found in this study) and postoperative pain, owing to increased fibrosis resulting from chronic inflammation.[12,18] Furthermore, patients undergoing tonsillectomy for caseous tonsillitis and without a history of recurrent tonsillitis may be less tolerant to pain and, thus, more prone to visit the ED.

The ED visit rate was positively correlated with the female sex in this study. This result corroborates with the findings of previously published studies. Being a woman was associated with ED visits for intractable pain in a study by Bhattacharyya[14] and strongly associated with post-tonsillectomy ED visits by Patel et al.[3] In the present study, the overall incidence of PTH was 16.6% (slightly above the wide range reported in the literature, from 1.5 to 15%[3]). Most of these patients (14.7%) presented with secondary hemorrhage.

Hemostasis testing under general anesthesia was required in only 4.5% cases. This percentage was much lower than the values reported in previous studies, such as 22.2% by Gonçalves et al. and 59.5% by Patel et al.[3,10] Age independently affected the two outcomes, namely PTH and ED visit for intractable pain, as previously reported in the literature.[4,9,11] The test for between-subjects effects demonstrated that age had a more significant effect on PTH occurrence, but post-hoc analysis did not identify the most affected age group. Nevertheless, the patients showed a tendency to develop hemorrhagic complications at a younger age, albeit nonsignificantly. Therefore, age, more specifically a younger age, may be a determinant of PTH occurrence.

In relation to the other predisposing factors for hemorrhage, Seyhun et al. reported that PTH was positively associated with tobacco smoking,[19] but this association is not supported by the results of the present study. Notwithstanding this contradiction, age was significantly associated with other variables, namely tobacco smoking, comorbidity score, and surgical indication. This result may be related to the most frequent type of diseases in each age group, particularly the increased incidence of comorbidities or need for APE in older age-groups, although further research is required to clarify this relationship.

The relationship between the surgeon's experience and PTH lacks consensus in the literature. Some studies have suggested that the risk of PTH increases with the surgeon's inexperience,[15] whereas other studies have revealed that there is no such association between these two variables.[16] In the present study, we found that the surgeon's experience is significantly associated with the type of PTH, underscoring the relationship between primary hemorrhage and surgeon's inexperience, whereas secondary hemorrhage occurred more frequently in surgeries performed by experienced surgeons. These findings agree with the results of some studies conducted in the pediatric population.[17] However, other studies have reported higher incidence rates of secondary hemorrhage in surgeries performed by interns than in those performed by specialists (10% versus 3.3%).[20]

Broadly speaking, primary hemorrhage is correlated with the surgical technique, while secondary hemorrhage usually derives from surgical wound healing. In this context, our findings highlight the importance of surgical training and supervision of interns. Our results can contribute to identifying the predictive factors for surgical complications, which can help in implementing preventive measures.

The present study stands out for including a large and representative sample of adults. This sample enabled us to perform multifactorial analyses and non-parametric tests, which are not always possible in equivalent observational studies. However, some limitations inherent to the methodology must be addressed. For instance, this retrospective study was conducted in a single medical center. Moreover, the limited data available in the medical records prevented us from assessing the effect of the surgical technique on the occurrence of complications.

Three other findings are also worth highlighting, namely the heterogeneity of surgical indications, the variety of surgical

techniques, and the fact that the surgeries were performed by different surgeons. These differences may have introduced bias in the results of this study. Therefore, prospective studies with more homogeneous groups are required to confirm the associations found in this study and identify other predictive factors for postoperative complications of tonsillectomy.

Conclusion

In this study, intractable postoperative pain was correlated with the female sex and independently associated with the surgical indication of tonsillectomy. The surgeon's inexperience affected the occurrence of primary hemorrhage, whereas secondary hemorrhage was more frequent in surgeries performed by experienced surgeons. These factors should be further analyzed for preventing the complications of tonsillectomy and ensuring an uneventful postoperative period.

Conflito de Interesses

Os autores declaram que não têm qualquer conflito de interesse relativo a este artigo.

Confidencialidade dos dados

Os autores declaram que seguiram os protocolos do seu trabalho na publicação dos dados de pacientes.

Conflicts of Interest

The authors declare that there is no conflict of interests regarding the publication of this paper.

Data Confidentiality

The authors declare having followed the protocols in use at their working center regarding patients' data publication.

Protection of humans and animals

The authors declare that the procedures were followed according to the regulations established by the Clinical Research and Ethics Committee and to the 2013 Helsinki Declaration of the World Medical Association.

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Availability of scientific data

There are no datasets available, publicly related to this work.

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