European Archives of Oto-Rhino-Laryngology (2019) 276:1211–1219
https://doi.org/10.1007/s00405-019-05334-7

HEAD & NECK

Safety of outpatient admission and comparison of different surgical techniques in adult tonsillectomy

Mehmet Eser Sancaktar[1,3] · Mehmet Çelebi[1,4] · Mahmut Yıldırım[1,5] · Erkan Can[1,6] · Gökhan Akgül[1,7] · İbrahim Ağrı[1,8] · Asude Ünal[1,9] · Fatih Yılmaz[2,10]

Received: 16 November 2018 / Accepted: 5 February 2019 / Published online: 12 February 2019

Abstract

Purpose To investigate the safety of outpatient admission and the effects of surgical technique in tonsillectomy operations of adult patients.

Methods The digital database was scanned for patients aged ≥ 15 years that underwent tonsillectomy in our institution between years 2014 and 2018. Demographic and clinical characteristics, the surgical technique, length of stay (LOS) in hospital, re-admissions after discharge, complications and interventions performed were recorded.

Results A total of 276 patients met the inclusion criteria, comprising 139 (50.4%) females and 137 (49.6%) males with a mean age of 27.17 ± 9.41 years. The most common indication was recurrent tonsillitis ($n = 223$, 80.8%), and surgical techniques used were bipolar scissors (CURIS®, Sutter Medizintechnik, Germany) ($n = 137$, 49.6%), cold dissection ($n = 75$, 27.2%) and/or plasma blade (PEAK Surgical, Medtronic, USA) ($n = 64$, 23.2%). A total of 43 (15.5%) re-admissions from 37 (13.4%) patients were recorded because of bleeding ($n = 33$, 70.2%) and/or odynodysphagia ($n = 13$, 27.7%). Non-surgical interventions were sufficient in 32 (74.4%) cases, while surgical interventions were required in 11 (25.6%) patients. In patients where "hot" techniques (bipolar scissors, plasma blade) were used and in patients with complaints in the first 24 h postoperatively, significantly increased rates of elongated LOS values for more than 1 day were determined ($p < 0.01$, $p < 0.001$).

Conclusions Adult tonsillectomy is a safe surgical procedure with low complication, re-operation and mortality rates. Significantly increased rates of elongated LOS values for more than 1 day and re-admissions after discharge were determined in those patients having complications in the first 24 h postoperatively. Cold dissection seems to be more advisable than hot techniques for outpatient tonsillectomy among adult patients.

Keywords Adult tonsillectomy · Outpatient tonsillectomy · Safe surgery · Surgical technique

✉ Mehmet Eser Sancaktar
eser_sancak@hotmail.com

[1] Department of Otorhinolaryngology-Head and Neck Surgery, Samsun Training and Research Hospital, University of Medical Sciences, Ministry of Health, Samsun, Turkey

[2] Department of Otorhinolaryngology-Head and Neck Surgery, Bozyaka Training and Research Hospital, University of Medical Sciences, Ministry of Health, Izmir, Turkey

[3] Esenevler Mahallesi, Şehit Alaaddin Pergel Caddesi No: 52, A Blok No: 16, Atakum, Samsun, Turkey

[4] Mimar Sinan Mahallesi, 176, Sokak, 1, Blok No: 12, Atakum, Samsun, Turkey

[5] Mimar Sinan Mahallesi, 176, Sokak, 6-A/23, Atakum, Samsun, Turkey

[6] Esenevler Mahallesi, Şehit Alaaddin Pergel Caddesi No: 52, C Blok No: 25, Atakum, Samsun, Turkey

[7] Fevzi Çakmak Mahallesi, Altınyunus Sokak, B 22, İlkadım, Samsun, Turkey

[8] Cumhuriyet Mahallesi, 70, Sokak, No: 10, Atakum, Samsun, Turkey

[9] Denizevleri Mahallesi, Atatürk Bulvarı, B Blok, 118/6, Atakum, Samsun, Turkey

[10] Örnekköy mahallesi, 7600 Sokak, A Blok, No: 82, Karşıyaka, Izmir, Turkey

Introduction

Tonsillectomy (TT) is one of the most frequently performed surgeries in otorhinolaryngology practice [1]. The most promoting factor in increasing the rates of TT performed is the widely accepted focal infection theory based on the belief that it is due to the dissemination of pathogens from the tonsils and/or teeth through the blood circulation causing many post-streptococcal diseases such as rheumatoid fever, endocarditis, myocarditis, pericarditis, nephritis and arthritis [2].

Chung et al. concluded that adult patients who underwent TT presented less often at healthcare institutions because of acute respiratory tract infections [3].

Among absolute indications for TT are malignancy, severe airway obstruction related to tonsillar hypertrophy, and persistent tonsillar hemorrhage, while relative indications include recurrent acute tonsillitis, chronic tonsillitis, and recurrent peritonsillar abscess [4]. In many centers, TT is performed with the most frequent indication of recurrent tonsillitis [1–4].

Although TT is a simple surgical technique, life-threatening severe complications may take place at the rate of 2–5%. Pain, bleeding, nausea and vomiting are the most common complications, of which bleeding is the most serious [4]. Mortality of TT has been reported in the range of 1/10,000–1/34,000 [5, 6]. The re-operation rates in pediatric patients is 0.5–2.1%, but adult TTs were shown to be having a higher risk (2.2%) in respect of bleeding [6]. According to the 2006 data of the Centers for Disease Control and Prevention in the USA, of the total 737,000 TT procedures, 297,000 were performed in patients aged > 15 years [6].

In the USA, adult TTs are often performed as an outpatient procedure, and there is increasing rates of outpatient surgeries in the pediatric population [7]. In many European countries, including Turkey, TT is an inpatient procedure, justified by the safer control of life-threatening bleeding [8]. Few studies investigated the safety of adult TTs, and most of these studies have been conducted on pediatric populations together with adult populations [6].

Compared to developed countries, outpatient surgeries are applied less often in Turkey. In a national study published in 2016, it was reported that the majority of operations were adenotonsillectomies in over a 2-year period, and of the total 2714 operations, 379 (13.96%) were day cases [9].

The aim of this study was to investigate the complications determined during hospitalization period and the re-admissions after discharge of adult TTs, so to predict the safety of outpatient surgery and to determine the effects of surgical techniques differently from similar studies in literature, thereby providing the first study in Turkey related to adult TTs.

Materials and methods

The study was approved by the Medical Specialist Training Board of our institution (decision no: 95-2018 BADE/9-55). The digital database was scanned using the operation code for "tonsillectomy" to identify patients aged over 15 years between 2014 and 2018. The patient records were retrieved from the archives and the collected data were recorded. Only the records of patients who underwent extracapsular bilateral total palatine TT were included in the study. Exclusion criteria were simultaneous adenoidectomy, the application of ventilation tube, septoplasty, anterior palatoplasty, uvulopalatopharyngoplasty, nasopharynx biopsy, tonsillectomies performed with the indication of malignancy and together with neck dissection, revision TT because of residue, partial TT (tonsillotomy), and procedures such as tonsil shrinkage with radiofrequency.

Demographic data including age and gender were recorded together with any comorbidities of the patients such as asthma, allergies, hypertension, diabetes, known bleeding disorder, smoking and alcohol status and the American Society of Anesthesiologists (ASA) score.

Among the clinical variables, indications were grouped as recurrent tonsillitis, tonsil hypertrophy, recurrent tonsillitis + tonsil hypertrophy and others (tonsillolithiasis, halitosis). The surgical method used as "cold dissection" (CD) or "hot" techniques (HT) (bipolar scissors (BS); CURIS®, Sutter Medizintechnik, Germany, plasma blade (PB); PEAK Surgical, Medtronic, USA), the operating time (min), postoperative length of stay (LOS) in hospital, and complications in the first 24 h postoperatively (odynodysphagia or bleeding) were recorded. It is a routine procedure in our clinic that the patient is hospitalized for at least 1 night following TT. Within this period, evaluation was made on the basis of complaints such as severe pain than expected, bleeding or odynodysphagia that made oral intake difficult requiring medical interventions (analgesic, anti-emetic agents, supplemental oxygen, sedation, intravenous hydration) from the first visit onwards. Evaluation of the re-admission rates was based on the records of patients who presented at the emergency department (ED) within the first 30 days after discharge or admitted directly to the clinic and were treated as inpatients. The routine 1-week follow-up examinations in outpatient setting or the patients making an appointment for the polyclinic were not regarded as re-admissions.

The re-admissions were examined and the day of re-admission, the reason (odynodysphagia, bleeding, other), number of re-admissions, and interventions made (medical or surgical) were recorded. When determining the number of admissions, it was not based on the number of patients but the number of times they re-admitted to the hospital; thus for patients with multiple admissions, each admission

was evaluated as a new case. For patients presenting with multiple complications, each complication was evaluated separately.

The re-admissions of patients who underwent primary surgery at another centre were not included in the study.

Statistical analysis

Data obtained in the study were analyzed statistically using SPSS vn 23 software. Categorical variables were stated as frequency distribution and numerical variables as mean ± standard deviation (SD) values.

Relationships between two independent categorical variables were examined with the Chi square test and when Chi square test assumptions were not met, Fisher's Exact Chi square test was used in 2 × 2 tables and the Freeman–Halton Fisher's exact Chi square test was used in nxm tables.

Results

Totally 276 patients who met the inclusion criteria were evaluated, comprising 139 (50.4%) females and 137 (49.6%) males with a mean age of 27.17 ± 9.41 years. Indications were determined as recurrent tonsillitis ($n = 223$, 80.8%), recurrent tonsillitis + tonsil hypertrophy ($n = 23$, 8.3%), tonsil hypertrophy ($n = 14$, 5.1%), and other reasons such as tonsillolithiasis and halitosis ($n = 16$, 5.8%). The techniques used in surgery were BS ($n = 137$, 49.6%), CD ($n = 75$, 27.2%), and PB ($n = 64$, 23.2%). Patients were followed up in hospital postoperatively for 1 day ($n = 171$, 62%), 2 days ($n = 61$, 22.1%) or ≥ 3 days ($n = 44$, 15.9%). Other characteristics of the patients are shown in Table 1. Postoperative bleeding was observed in a total of 36 (13%) patients; in the first 24 h while in the inpatient status in 3 (1.08%) patients, and on re-admission after discharge in 33 (11.9%) patients (Figs. 1, 2).

A total of 43 (15.5%) re-admissions were seen in 37 (13.4%) patients after discharge. Four patients were re-admitted twice and one patient for three times. A total of 47 complications were recorded in the 43 re-admissions. Some patients had more than one complaint on admission. Only one patient was re-admitted 1–2 days after discharge with the complaint of severe nausea and bleeding, and following medical support and monitoring for 1 day, he was discharged again. The other re-admissions were at 3–5 days after the first discharge ($n = 15$, 34.9%) and at the 6th day or later ($n = 27$, 62.8%) (Fig. 1).

No patients were re-admitted after 14 days. The reasons for re-admission were bleeding ($n = 33$, 70.2%), odynodysphagia ($n = 13$, 27.7%) and nausea ($n = 1$, 2.1%). There was no significant effects of age, gender, indication, ASA score, comorbidities, surgical technique, operating time or LOS on the frequency and the day of re-admission (Table 2).

When the re-admissions were examined, complications in the first 24 h postoperatively were seen to have a significant effect on the incidence of re-admissions. Postoperative complications in the first 24 h that required interventions were

Table 1 Baseline characteristics of study participants

	$n = 276$	%
Age (years, mean ± SD)	27.17 ± 9.412	
15–21	97	35.1
22–29	88	31.9
≥ 30	91	33.0
Sex		
Female	139	50.4
Male	137	49.6
Indications		
Recurrent tonsillitis (RT)	223	80.8
Tonsil hypertrophy (TH)	14	5.1
RT + TH	23	8.3
Others[a]	16	5.8
Comorbidities[b]		
Yes	58	21.0
No	218	79.0
ASA		
1	216	78.3
2	59	21.4
3	1	0.4
Surgical technique		
Bipolar scissors	137	49.6
Plasma blade	64	23.2
Cold dissection	75	27.2
Operation time (min, mean ± SD)	41.38 ± 13.774	
15–30	92	33.3
31–45	114	41.3
≥ 46	70	25.4
Length of stay (days)		
1	171	62.0
2	61	22.1
≥ 3	44	15.9
Postoperative complaint (≤ 24 h)[c]		
Yes	53	19.2
No	223	80.8

SD standard deviation, *ASA* American Society of Anesthesiologists

[a]Tonsillolithiasis, halitosis, etc.

[b]Comorbidities such as asthma, allergies, hypertension, diabetes, known bleeding disorder, smoking and alcohol status

[c]Severe pain than expected, bleeding or odynodysphagia that made oral intake difficult requiring medical intervention (analgesic, antiemetic agents, supplemental oxygen, sedation, intravenous hydration) from the first visit onwards

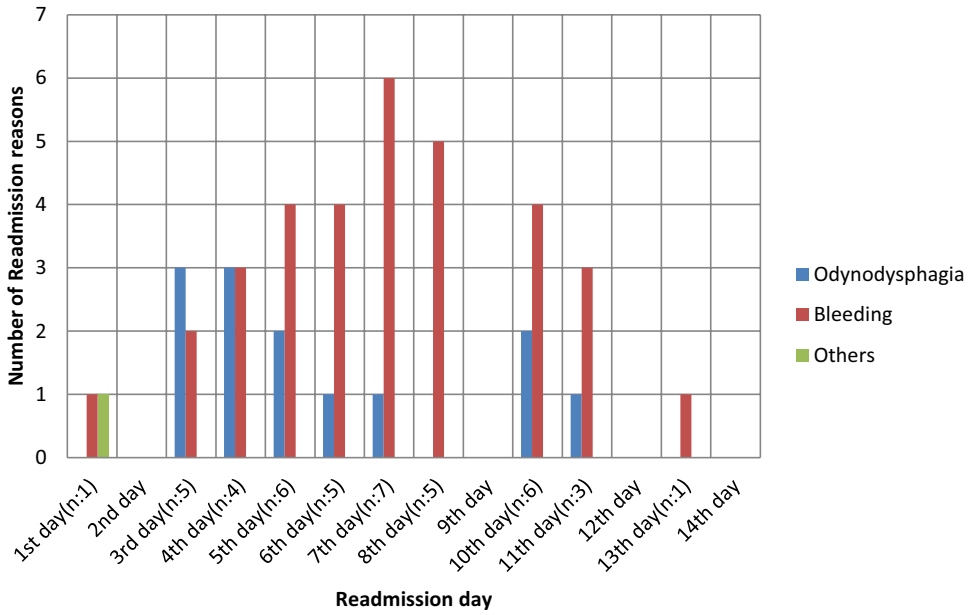

Fig. 1 Re-admission reasons and counts according to days after discharge during outpatient status. "*n*" in parenthesis shows the number of re-admission event. Total number of re-admission is 43 (total $n=43$). Number of re-admission events may not coincide with the number of re-admission reasons, because some patients had more than one re-admission reason

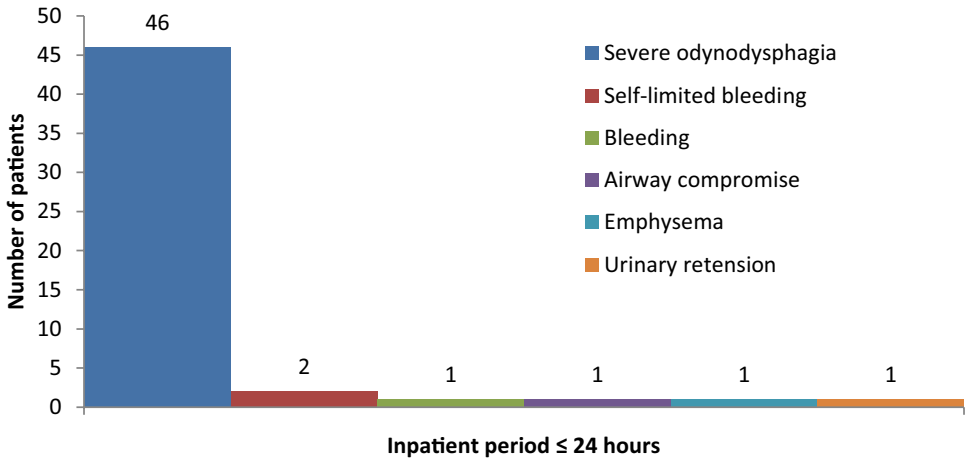

Fig. 2 Postoperative complications during inpatient status within 24 h

determined in 37.2% of patients who were re-admitted and in 15% of those who did not re-admit ($p<0.001$) (Table 2).

Postoperative complications in the first 24 h were seen in 53 (19.2%) patients (Table 1). In 46 (87%) patients, there was odynodysphagia that required medical treatment (Fig. 2). There were also some complications that were rarely seen such as bleeding, airway problems, emphysema and urinary retention. No significant relationship was determined between complications seen in the first 24 h postoperatively and the surgical technique.

No significant relationship was determined between the surgical technique and bleeding or odynodysphagia in patients who were re-admitted (Table 3).

Of the patients who were re-admitted, non-surgical medical support was sufficient in 32 (74.4%) patients and surgical intervention was required in 11 (25.6%) patients. In all of the cases where surgical intervention was required, it was for providing homeostasis during bleeding, and the surgical techniques performed were hot in 72.7%, and cold in 27.3% of the patients (Table 4).

Compared to the patients operated with CD, those who were operated with HTs were determined to have LOS of more than 1 day at a significantly higher rate ($p<0.01$). No difference was determined between the BS and PB in respect of LOS. In the comparison of all three techniques, LOS for 1 day was determined at a statistically significantly higher rate in patients operated with CD ($p<0.05$). Patients with complaints in the first 24 h postoperatively were determined to have a LOS of >1 day at a significantly higher rate than those with no complaints ($p<0.001$) (Table 5).

Table 2 The relationship between baseline characteristics and re-admissions

	Re-admission		No re-admission		χ^2	*p* value
	n	%	*n*	%		
Age (years)						
14–21	15	34.9	85	36.3	5.757	0.056
22–29	20	46.5	70	29.9		
≥ 30	8	18.6	79	33.8		
Indications						
Recurrent tonsillitis (RT)	40	93.0	187	79.9	4.821	0.159
Tonsillar hypertrophy (TH)	0	0.0	13	5.6		
RT + TH	1	2.3	22	9.4		
Others[a]	2	4.7	12	5.1		
Comorbidities[b]						
Yes	7	16.3	49	20.9	0.489	0.484
No	36	83.7	185	79.1		
ASA						
1	35	81.4	184	78.6	0.167	0.682
2	8	18.6	50	21.4		
Surgical technique						
Hot (bipolar scissors + plasma blade)	32	74.4	168	71.8	0.125	0.724
Cold dissection	11	25.6	66	28.2		
Surgical technique (detail)						
Cold dissection	11	25.6	66	28.2	1.964	0.375
Bipolar scissors	25	58.1	111	47.4		
Plasma blade	7	16.3	57	24.4		
Operation time (min)						
15–30	16	37.2	76	32.5	0.367	0.832
31–45	17	39.5	99	42.3		
≥ 46	10	23.3	59	25.2		
Length of stay (days)						
1	23	53.5	151	64.5	3.084	0.214
2	14	32.6	48	20.5		
≥ 3	6	14.0	35	15.0		
Postoperative complaint (≤ 24 h)[c]						
Yes	16	37.2	35	15.0	11.974	**0.001**
No	27	62.8	199	85.0		

Bold value indicate $p < 0.05$ values

χ^2 Pearson's Chi square test, *SD* standard deviation, *ASA* American Society of Anesthesiologists

[a]Tonsillolithiasis, halitosis, etc.

[b]Comorbidities such as asthma, allergies, hypertension, diabetes, known bleeding disorder, smoking and alcohol status

[c]Severe pain than expected, bleeding or odynodysphagia that made oral intake difficult requiring medical intervention (analgesic, anti-emetic agents, supplemental oxygen, sedation, intravenous hydration) from the first visit onwards

Discussion

In the postoperative period of TT, the follow-up of patients in hospital for at least 1 night is a widely accepted practice in Turkey, and is routinely implemented in our clinic. It is generally accepted that there is a higher risk of bleeding in adult TT patients compared to pediatric patients [6]. Just as in Turkey, the procedure of admitting patients on the grounds that postoperative bleeding monitorisation can be implemented more safely is widespread in many European countries [8]. No consensus has been achieved in literature regarding the postoperative LOS. In the USA, adult TTs are often performed as outpatient procedures, and there is increasing rates of application of outpatient procedures in

Table 3 The relationship between re-admission reasons and surgical technique

	Odynodysphagia		Bleeding		χ^2	*p* value
	n	%	*n*	%		
Surgical technique						
Hot (bipolar scissors + plasma blade)	8	80.0	23	71.9	0.260	1.000
Cold dissection	2	20.0	9	28.1		
Surgical technique (detail)						
Cold dissection	2	20.0	9	28.1	4.506	0.120
Bipolar scissors	4	40.0	20	62.5		
Plasma blade	4	40.0	3	9.4		

Table 4 The relationship between surgical technique and bleeding requiring re-surgery

Surgical technique	Bleeding requiring re-surgery	
	n	%
Hot (bipolar scissors + plasma blade)	8	72.7
Cold dissection	3	27.3

the pediatric population [7]. According to the American National Health Statistics Report, a total of 399,000 TTs were performed as day cases in the USA in 2010, of those 102,000 were in the 15–44 years age group and 289,000 patients were younger than 15 years of age [10]. In the current study, the LOS was 1 day in 62.0% of the patients, 2 days in 22.1% and ≥ 3 days in 15.9% of the patients (Table 1). According to these results, LOS of > 1 day was seen in significantly more of the patients operated with HTs compared to those operated with CD ($p < 0.01$). No difference was determined between the BS and PB in respect of LOS. In the comparison of all three techniques, LOS of 1 day or less was determined at a statistically significantly higher rate in patients operated with CD ($p < 0.05$). Patients with complaints in the first 24 h postoperatively were determined with LOS of > 1 day at a significantly higher rate than those with no complaints ($p < 0.001$) (Table 5).

It is generally known that HTs have a higher risk in terms of postoperative secondary bleeding and pain than CD [2, 11]. In that aspect, longer hospitalization periods for patients operated with HTs compared to those operated with CD can be considered to be due to the pain in the postoperative period. According to the current study results, there were significantly more complications in the early postoperative period of patients with LOS of > 1 day ($p < 0.001$) and the majority of these complications (87%) were odynodysphagia. As the majority of patients with odynodysphagia (82%) had been operated with HTs, it may be suggested as the cause of prolonged LOS in HT cases. In a study by Chen et al., threefold higher re-operation rates were reported in patients with LOS of > 1 day compared to those with a stay of 1 day, and it was concluded that the re-operation rate of patients with postoperative complications was fivefold higher [6].

Coordes et al. concluded that reducing the LOS to 2 days did not change the incidence of postoperative bleeding rates compared to those with LOS of ≥ 3 days [12]. In a study by Morris et al. of 2863 TT patients, it was reported that 2700 (92.21%) patients were hospitalized for at least 1 night, and of these only 211 (7.81%) developed postoperative complications, while interventions were required in only 112 (4.15%), and 1 night hospitalization was not necessary in 86% of the patients [1]. In that study, it was concluded that there was no significant difference between the hot or cold techniques in respect of postoperative bleeding rates. In the current study, no statistically significant effect of the surgical techniques was observed on the incidence of pain and bleeding complications of patients who were re-admitted (Table 3), but of the cases with bleeding requiring re-operation the first operation was performed with HTs in 72.7% and with CD in 27.3% (Table 4).

The majority of studies investigating the safety of TTs have been conducted on pediatric populations or on both adult and pediatric populations together [1, 7, 13]. In literature, adult TT has been shown to be a safe procedure and there are a few studies that have advocated that it can be applied as an outpatient procedure [6, 14]. Studies evaluating the safety of outpatient tonsillectomies have focused mostly on postoperative complications (bleeding), LOS, rates of re-admission after discharge and re-operation rates. In a study of Chen et al. which evaluated 5968 adult TTs, the most common indication was recurrent tonsillitis (82.9%), 30-day mortality was 0.03%, the complication rate was 1.2% (predominantly infection), the re-operation rate was 3.2%, and with these results adult TT was concluded as a safe procedure [6]. In the current series, there were no cases of 30-day mortality, the most common indication was recurrent tonsillitis ($n = 223$, 80.8%), there were a total of 43 (15.5%) re-admissions after discharge and bleeding

Table 5 The relationship between baseline characteristics and hospital length of stay

	1 day		> 1 day		χ^2	*p* value
	n	%	*n*	%		
Age (years)						
14–21	67	38.5	33	32.0	1.364	0.505
22–29	53	30.5	37	35.9		
≥ 30	54	31.0	33	32.0		
Indications						
Recurrent tonsillitis (RT)	146	83.9	81	78.6	3.324	0.344
Tonsillar hypertrophy (TH)	6	3.4	7	6.8		
RT + TH	12	6.9	11	10.7		
Others[a]	10	5.7	4	3.9		
Comorbidities[b]						
Yes	30	17.2	26	25.2	2.568	0.109
No	144	82.8	77	74.8		
ASA						
1	141	81.0	78	75.7	1.100	0.294
2	33	19.0	25	24.3		
Surgical technique						
Hot (bipolar scissors + plasma blade)	116	66.7	84	81.6	7.144	**0.008**
Cold dissection	58	33.3	19	18.4		
Surgical technique (detail)						
Cold dissection	58a	33.3	19b	18.4	7.220	**0.027**
Bipolar scissors	78a	44.8	58a	56.3		
Plasma blade	38a	21.8	26a	25.2		
Operation time (min)						
15–30	60	34.5	32	31.1	2.361	0.307
31–45	76	43.7	40	38.8		
≥ 46	38	21.8	31	30.1		
Postoperative complaint (≤ 24 h)[c]						
Yes	2	1.1	49	47.6	92.824	**0.000**
No	172	98.9	54	52.4		

Bold values indicate $p < 0.05$ values

a–b there is differences between two groups, a–a no differences between two groups

[a]Tonsillolithiasis, halitosis, etc.

[b]Comorbidities such as asthma, allergies, hypertension, diabetes, known bleeding disorder, smoking and alcohol status

[c]Severe pain than expected, bleeding or odynodysphagia that made oral intake difficult requiring medical intervention (analgesic, anti-emetic agents, supplemental oxygen, sedation, intravenous hydration) from the first visit onwards

requiring surgical interventions developed in 11 patients (with a re-operation rate of 3.98%). Torres et al. examined 326 adult TT cases and reported that the most common indication was recurrent tonsillitis (74.85%), with a re-admission rate of 7.66% ($n = 25$), of which 21 (84%) were because of bleeding [4]. The re-operation rate of 3.98% because of bleeding was similar to the rate in that study. In a study by Bhattacharyya and Kepnes, of 7748 adult TT patients, the re-admission rate was found to be 11.3%, and bleeding was the most frequent complication (41.3%) followed by pain (22.1%) [15]. The results of the current study were in accordance with the findings of many previous studies and there was no effect of indication, comorbidities, surgical technique or operating time on the incidence of re-admission [4, 8, 15–19] (Table 2). In literature, the re-admission rates have been reported as approximately 10%, but most of these studies investigated adult and pediatric cases together and in those studies complications, especially bleeding, was reported to increase with age [20–22]. Although this rate (15.5%) seems to be high in the current series, it should be considered that only adult population was investigated in this study. In accordance with similar studies, the majority

of postoperative bleeding cases were determined in the first week [1, 8, 15, 19] (Fig. 1). According to the results of the current study, postoperative bleeding was seen in a total of 36 (13%) cases, in 3 (1.08%) cases in the first 24 h and in 33 (11.9%) cases after discharge (Figs. 1, 2). Only one patient was re-admitted 1–2 days after discharge with the complaint of severe nausea and bleeding, and following medical support and 1 day of monitoring, he was discharged again. The other re-admissions were at 3–5 days after first discharge ($n=15$, 34.9%) and at 6th day or later ($n=27$, 62.8%) (Fig. 1). No patients were re-admitted after 14 days. The reasons for re-admission were bleeding ($n=33$, 70.2%), odynodysphagia ($n=13$, 27.7%) and nausea ($n=1$, 2.1%) (Fig. 1). Complications were seen in the first 24 h postoperatively in 53 (19.2%) patients (Table 1). In 46 (16.6%) of these patients, there were complaints of severe odynodysphagia requiring medical intervention (Fig. 2). Bleeding was seen in 3 (1.08%) patients, which was self-limiting with medical support in two cases and could only be controlled with surgical intervention in one patient.

The results of the current study were obtained based on the data of a national population. There could be different results from differences in applications of different centers and different technical facilities. Our institution is a tertiary level training and research hospital and most of the operations were performed by specialists and residents together. That the data relates to surgeons with different experiences and habits can be considered as a limitation of this study. All the procedures may not have been performed within the same discipline. Another limitation could be that some patients with postoperative complications may have admitted to other centers for socio-economic reasons and therefore their results were not available. Nevertheless, this study can be considered of value as the first study in Turkey to have investigated the safety of outpatient TTs in adult patients.

Conclusions

The results of this study have shown that adult TT is a safe procedure with low rates of complications, re-operation, and mortality. As the vast majority of patients had no complications requiring serious interventions in the first 24 h postoperatively, and most re-admissions were after the 3rd day, the application of adult TT as an outpatient procedure seems to be possible. Patients with complications in the first 24 h had a longer LOS and seem to be candidates for re-admission after discharge, so should therefore be monitored more closely. The CD technique seems to be more advisable than HTs for adult patients undergoing outpatient TT.

Acknowledgements The authors are grateful to Tuğba Altundal and İlker Oral Çırakoğlu for their valuable assistance with the data collection and to the statistician Damla Kirendibi Kökgöz for contributing to the statistical analyses of the study.

Funding The authors have no funding to disclose.

Compliance with ethical standards

Conflict of interest The authors declare that they have no conflict of interest.

Ethical standards This study was a retrospective data analysis study and it did not need informed consent. This retrospective study was performed with the approval of the local ethics committee.

Human and animal rights statement The study has been performed according to the ethical standards of the Helsinki Declaration. We declare that all authors have contributed to it, read and approved the final manuscript for submission.

References

1. Morris S, Hassin E, Borschmann M (2018) Overnight in-hospital observation following tonsillectomy: retrospective study of postoperative intervention. J Laryngol Otol 132(1):46–52
2. Windfuhr JP, Toepfner N, Steffen G et al (2016) Clinical practice guideline: tonsillitis II. Surgical management. Eur Arch Otorhinolaryngol 273(4):989–1009
3. Chung SD, Hung SH, Lin HC et al (2017) Decreased clinic visits for acute respiratory infections following an adult tonsillectomy: a population-based study. Am J Otolaryngol 38(4):488–491
4. Galindo Torres BP, De Miguel García F, Whyte Orozco J (2018) Tonsillectomy in adults: analysis of indications and complications. Auris Nasus Larynx 45(3):517–521
5. Krishna P, Lee D (2001) Post-tonsillectomy bleeding: a meta-analysis. Laryngoscope 111(8):1358–1361
6. Chen MM, Roman SA, Sosa JA et al (2014) Safety of adult tonsillectomy: a population-level analysis of 5968 patients. Otolaryngol Head Neck Surg 140(3):197–202
7. Shay S, Shapiro NL, Bhattacharyya N (2015) Revisit rates and diagnoses following pediatric tonsillectomy in a large multistate population. Laryngoscope 125(2):457–461
8. Mueller J, Boeger D, Buentzel J et al (2015) Population-based analysis of tonsil surgery and postoperative hemorrhage. Eur Arch Otorhinolaryngol 272(12):3769–3777
9. Kurtoğlu G, Erdağ TK (2016) Outpatient surgical practices in otorhinolaryngology. Kulak Burun Bogaz Ihtis Derg 26(2):123–128
10. Hall MJ, Schwartzman A, Zhang J et al (2017) Ambulatory Surgery Data From Hospitals and Ambulatory Surgery Centers: United States, 2010. Natl Health Stat Rep 102:1–15
11. Pinder DK, Wilson H, Hilton MP (2011) Dissection versus diathermy for tonsillectomy. Cochrane Database Syst Rev 3:CD002211
12. Coordes A, Soudry J, Hofmann VM et al (2015) Tonsillectomy in adults: LOS has no influence on the frequency of postoperative hemorrhage. HNO 63(12):841–844, 846–849
13. Ahmad R, Abdullah K, Amin Z et al (2010) Predicting safe tonsillectomy for ambulatory surgery. Auris Nasus Larynx 37(2):185–189
14. Verma A, Al Nabhani S, Al-Khabori M (2007 Dec) Adult tonsillectomy and day care surgery. Indian J Otolaryngol Head Neck Surg 59(4):341–345

15. Bhattacharyya N, Kepnes LJ (2014) Revisits and postoperative hemorrhage after adult tonsillectomy. Laryngoscope 124(7):1554–1556
16. Tolska HK, Takala A, Pitka¨niemi J et al (2013) Post-tonsillectomy haemor- rhage more common than previously described—an institutional chart review. Acta Otolaryngol 133(2):181–186
17. Ovesen T, Kamarauskas A, Hlidarsdottir T et al (2013) Good long-term results after tonsillectomy in ear, nose and throat practices. Dan Med J 60:A4637
18. Karaman M, Tek A, Tuncel A et al (2012) Adult tonsillectomy: relationship between indications and postoperative hemorrhage. Kulak Burun Bogaz Ihtis Derg 22(1):21–25
19. Bhattacharyya N (2001) Evaluation of post-tonsillectomy bleeding in the adult population. Ear Nose Throat J 80(8):544–549
20. Edmonson MB, Eickhoff JC, Zhang C (2015) A population-based study of acute care revisits following tonsillectomy. J Pediatr 166(3):607–612.e5
21. Hallenstål N, Sunnergren O, Ericsson E et al (2017) Tonsil surgery in Sweden 2013–2015. Indications, surgical methods and patient-reported outcomes from the National Tonsil Surgery Register. Acta Otolaryngol 137(10):1096–1103
22. Østvoll E, Sunnergren O, Stalfors J (2018) Increasing readmission rates for hemorrhage after tonsil surgery: a longitudinal (26 years) national study. Otolaryngol Head Neck Surg 158(1):167–176