

Assessment of the Association Between Post-tonsillectomy Hemorrhage and Weather Conditions

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ABSTRACT: **Background:** The most common complication after tonsillectomy is bleeding. We investigated whether performing the procedure during the summer or the winter affects the bleeding rate. **Objectives:** To investigate whether there is an association between meteorological conditions and the occurrence of post-tonsillectomy hemorrhage (PTH) in the southern Israel Negev region. **Methods:** All patients who underwent tonsillectomy from 2001–2013 at the Soroka Medical Center were included. We collected patient demographic data and indications for surgery. Meteorological data were obtained from a weather station operated by the Israel Ministry of Environmental Protection. **Results:** Of 4438 patients who underwent tonsillectomy, with or without adenoidectomy, 432 (9.73%) experienced hemorrhage. Patients who suffered from PTH were significantly older: median age 9.61 years vs. 4.7 years, $P < 0.0001$. When comparing patients without PTH to those who bled within 0–3 days after surgery, there was a higher risk for bleeding during the warmer seasons: relative risk (RR) 1.38, 95% confidence interval (95%CI) 1.07–1.77, 1.45 (95%CI 1.17–1.80), and 1.62 (95%CI 1.27–2.06) comparing the winter to spring, summer, and fall, respectively. A statistically significant positive association was also found with the average temperature on the day of surgery. Bleeding more than 3 days after surgery was less likely in summer: RR 0.82, 95%CI 0.69–0.97. We found no association with temperature on the day of surgery and PTH after postoperative day 3. **Conclusions:** Seasonality, and to an extent temperature, seem to play only a minor role in PTH.

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KEY WORDS: post-tonsillectomy hemorrhage (PTH), season, surgical complication, tonsillectomy, weather conditions

Tonsillectomy is one of the most commonly performed otolaryngologic procedures [1]. It is most often performed on children and usually in combination with adenoidectomy. Sleep related obstructive breathing disorders and recurrent infections are the most common indications for the procedure [2].

Post-operative bleeding is a serious and sometimes even life-threatening complication [3]. After the amputation of the tonsil, the tonsillar bed, and occasionally the blood vessels in the tonsil fossa, remain exposed to the air. Hemostasis of these vessels is performed during the procedure using one or more methods. However, exposure to air and ingestion of food and liquids can result in re-bleeding. Immediate (primary) bleeding is defined as that occurring within 24 hours after the surgery, whereas delayed (secondary) bleeding occurs 2–14 days later. The incidence of post-tonsillectomy hemorrhage (PTH) is reported to be between 0.1% and 15% [4,5].

Several factors have been shown to be associated with the risk of bleeding: the procedure method, the surgeon's experience, the amount of bleeding, and the patient's blood pressure during the procedure, as well as hematological factors. However, other studies failed to confirm these associations [4].

Several conditions in otorhinolaryngology have been associated with weather conditions. Changes in temperature and humidity were found to be associated with the risk of laryngitis and epistaxis [6,7].

We found six studies evaluating the incidence of PTH with relation to the weather. Three studies from the United Kingdom found three different danger times:

- Warmer weather when the water vapor pressure is high may reduce the incidence of delayed (secondary) post-tonsillectomy hemorrhage [1]
- May, June, and July when bleeding may be higher [8]
- Spring and autumn, compared to summer and winter, when severe bleeding (bleeding that required a second operation) was lower [9]

A study conducted in Croatia did not find a difference in PTH with regard to the season but did show an increase in the

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Table 1. Clinical and demographic data

Population characteristics	No bleeding n=4006 (90.27%)	Bleeding n=432 (9.73%)	P value
Age, years, median (min; max)	4.70 (0; 82)	9.61 (0; 58)	< 0.0001
Male gender, n (%)	2283 (57.0)	236 (54.6)	0.3578
Type of locality, n (%)			
Urban	3568 (89.74)	337 (88.08)	0.0143
Rural	312 (7.85)	47 (10.98)	
Temporary Bedouin settlement	96 (2.41)	4 (0.93)	
Ethnicity, n (%)			
Bedouin Arab	1561 (38.9)	127 (29.4)	0.0002
Jewish	884 (22.07)	121 (28.01)	
Unknown	1561 (38.9)	184 (42.59)	
Reason of surgery, n (%)			
Sleep apnea/hypertrophy	3797 (94.78)	421 (97.45)	0.0521
Chronic/acute inflammation	17 (0.42)	1 (0.23)	
Other	192 (4.79)	10 (2.31)	
Season of surgery date, n (%)			
Summer	1258 (31.4)	130 (30.1)	0.6760
Autumn	666 (16.6)	73 (16.9)	
Winter	1340 (33.4)	139 (32.2)	
Spring	742 (18.5)	90 (20.8)	
Average temperature (°C) on the day of the surgery, mean ± SD (number of days)	19.53 ± 5.99 (3661)	19.96 ± 5.93 (396)	0.1663
Maximal temperature (°C) on the day of the surgery, mean ± SD (number of days)	23.20 ± 9.43 (3947)	23.67 ± 9.61 (428)	0.3279
Average relative humidity (%) on the day of the surgery, mean ± SD (number of days)	68.52 ± 15.97 (3657)	68.31 ± 16.37 (395)	0.8018
Maximal relative humidity (%) on the day of the surgery, mean ± SD (number of days)	82.72 ± 27.12 (3948)	82.96 ± 27.17 (428)	0.8625

SD = standard deviation

Table 2. Meteorological data by seasons

Meteorological characteristics	Summer (May 31– September 22) n=1388	Autumn (September 23– December 6) n=739	Winter (December 7– March 30) n=1479	Spring (March 31– May 30) n=832
Average temperature, °C, mean ± SD	25.65 ± 1.67	20.51 ± 3.67	12.94 ± 3.22	20.20 ± 4.14
Maximal temperature, °C, mean ± SD	29.26 ± 8.53	24.31 ± 9.09	15.86 ± 6.74	25.77 ± 5.54
Average relative humidity, %, mean ± SD (n)	70.99 ± 9.45	61.20 ± 16.48	71.35 ± 17.32	66.45 ± 19.08
Maximal relative humidity, %, mean ± SD (n)	87.12 ± 25.3	79.35 ± 30.40	79.74 ± 29.5	84.52 ± 18.63

SD = standard deviation

incidence of immediate (primary) postoperative hemorrhage during cyclonic conditions [4]. Studies from Germany [10] and Australia [11] did not find any association between seasons and the risk for PTH.

The Negev region of Israel is a desert area with unique weather conditions, as rain is scarce and temperatures are high. A meteorological site in Beer Sheva (operated by the Israel Ministry of Environmental Protection) monitors various weather variables. In our study, we investigated the association between weather conditions in the Negev area and the occur-

rence of PTH. Tonsillectomy is usually considered elective surgery, thus we can advise the patient or family of the optimal timing for the procedure.

PATIENTS AND METHODS

STUDY DESIGN

The study was approved by the Soroka Medical Center Bio-medical Ethics Committee (study number 0152-13-SOR).

The study was a population-based retrospective cohort evaluation involving all patients who underwent tonsillectomy, with or without adenoidectomy, from 2001–2013 at the Soroka Medical Center. Soroka is a 1000 bed tertiary referral center, which provides medical care to the majority of patients in southern Israel. As such, almost all patients with PTH (even those undergoing the procedure in private hospitals) in the area are referred to this hospital. Our study included only patients who had their tonsillectomy completed at Soroka, and only the first surgery during the follow-up period.

The method of tonsillectomy was chosen by the treating physician. Between 2001 and 2009 most tonsillectomies were performed using electrocautery with power set at 15 milliwatts or lower (surgeon dependent) and hemostasis was most often accomplished with bipolar electrocautery. Starting in 2009, some surgeons chose to perform subtotal tonsillectomy with a debrider (Medtronic Xomed, USA) and hemostasis with bipolar electrocautery. During the study period, other surgeons performed tonsillectomy exclusively with bipolar electrocautery, which was used both for dissection of the tonsil as well as for hemostasis. Yet other surgeons occasionally used cold dissection of the tonsils with hemostasis using either bipolar electrocautery or suture ligatures. Adenoidectomy was performed in the same manner in all patients using an adenoid curette, and hemostasis was achieved by temporary packing of the nasopharynx.

DATA COLLECTED

Using a computerized database, we collected patient demographic data, which included age, gender, ethnicity, and type of locality where patients lived (i.e., urban, rural, temporary Bedouin settlement). Ethnicity and location were defined according to the Central Bureau of Statistics [12].

Day of bleeding was defined according to hospitalization. As a result, an extrapolation was conducted from the day of surgery. PTH is usually divided into immediate (within 24 hours) and delayed (2–14 days). However immediate PTH is quite rare. To get two substantial groups, we divided the cases into two groups: early PTH (≤ 3 days) and late PTH (> 3 days after surgery). Meteorological data (daily mean and maximal temperature, daily mean, and maximal relative humidity) were monitored every 5 minutes at the weather station operated by the Israel Ministry of Environmental Protection.

The seasons were defined by Alpert’s classification [13]: winter is from 7 December until 30 March, spring is from 31 March until 30 May, summer is from 31 May until 22 September, and autumn is from 23 September until 6 December. Temperature was divided into four categories by quartiles.

STATISTICAL ANALYSIS

Statistical data analysis was performed using SAS 9.4 (SAS Institute Inc, Cary, NC, USA). A value of $P < 0.05$ was considered significant. Univariate tests were conducted using independent t -test and analysis of variance (ANOVA) for quantitative variable with normal distribution, Mann–Whitney and Kruskal–Wallis for quantitative variable without normal distribution, and chi-square for categorical variables. Quantitative variables with normal distribution are shown as average and standard deviation, quantitative variable without normal distribution are displayed as median with maximal and minimal values, and categorical variables are presented as proportion.

We used logistic regression models to investigate the association between season and temperature on the day of the surgery with PTH. Models were adjusted for age and settlement classification. The year of surgery and the relative humidity on the day of the surgery were not associated with the outcome and therefore were not included in the final models.

Sub-groups analysis

We repeated the main analyses in a stratified analysis by the timing of the bleeding: patients who bled soon after surgery (days 0–3) and those who bled later.

RESULTS

The study included 4438 patients [Table 1] who underwent tonsillectomy either with or without adenoidectomy, of whom 432 (9.73%) had PTH. Early PTH occurred in 114 patients (2.57%) and late PTH in 318 patients (7.16%). Patients who experienced PTH were significantly older than those without PTH, with a median age of 9.61 years vs. 4.7 years ($P < 0.0001$). Among Bedouin patients living in temporary settlements, there was a significantly lower incidence of PTH ($P = 0.0143$) compared to other demographic groups. Bedouin patients were 29.4% of the patients with PTH compared to 38.9% of those without PTH ($P < 0.0002$).

No difference was found in gender, indication for surgery, season of surgery, average and maximal temperature on the day of the surgery, and average and maximal relative humidity on the day of the surgery.

The climate in southern Israel is relatively hot, with an average temperature of 25.6°C in the summer season, reaching a maximal temperature of 29.3°C. The average temperatures during the fall and the spring seasons are similar. The aver-

age relative humidity is slightly higher during winter (71.35%) compared with the summer (70.99%).

For the patients who did bleed, the weather on the day of bleeding was not different than other postoperative days. Table 3 shows the association between PTH and the season of surgery or the average temperature on the day of the surgery adjusted for age and settlement classification. No associations between PTH and temperature or seasons among all patients were found. Patients living in rural settlements had a higher risk for PTH compared with those living in an urban settlement. However, Bedouin living in temporary settlements had a lower risk for PTH.

The patients were divided into two groups: early and late PTH. When comparing patients without PTH to those who bled within the first 3 days after surgery (early PTH), there was a higher risk for bleeding during the warmer seasons: relative risk (RR), 95% confidence interval ([95%CI] 1.07–1.77), 1.45 (1.17–1.80), and 1.62 (1.27–2.06) comparing the winter to the spring, summer and fall seasons, respectively. Positive significant associations were also found with the average temperature on the day of the surgery. Patients who underwent the procedure when the temperature was 20.5–25°C and above 25°C had a higher risk for PTH: RR 1.74, 95%CI 1.39–1.9 and RR 1.49, 95%CI 1.18–1.87, respectively [Table 4].

Table 3. Association of seasons (model A), average temperature (model B), and post-tonsillectomy hemorrhage; showing the results of logistic regression models for the association of average temperature and season at the day of the surgery. Models were performed separately and were adjusted for age and settlement classification

Risk factors	Relative risk	95% confidence interval	P value
Model A			
Age at surgery, years	1.04	1.03–1.05	< 0.0001
Type of locality			
Urban	Reference group		
Rural	1.42	1.02–1.97	0.0083
Bedouin Arab temporary settlement	0.40	0.15–0.11	0.0388
Season			
Summer	Reference group		
Spring	1.27	0.95–1.70	0.1114
Autumn	1.05	0.77–1.44	0.7571
Winter	1.05	0.81–1.36	0.6765
Model B			
Age at surgery	1.03	1.03–1.04	< 0.0001
Type of locality			
Urban	Reference group		
Rural	1.35	1.11–1.65	0.0028
Bedouin Arab temporary settlement	0.43	0.22–0.83	0.0125
Average temperature			
Q1 (< 14°C)	Reference group		
Q2 (14–20.5°C)	1.17	0.99–1.39	0.0751
Q3 (20.5–25°C)	1.13	0.95–1.35	0.1764
Q4 (> 25°C)	1.16	0.98–1.38	0.0799

Table 4. The association between post-tonsillectomy hemorrhage and the season of surgery or the average temperature at the day of the surgery, stratified by the timing of the bleeding

Risk factors	Relative risk	95% confidence interval	P value
Among patients who bled 0-3 days after surgery			
Season			
Winter	Reference group		
Spring	1.38	1.07-1.77	0.0107
Summer	1.45	1.17-1.80	< 0.0001
Autumn	1.62	1.27-2.06	< 0.0001
Average temperature			
Q1 (< 14°C)	Reference group		
Q2 (14-20.5°C)	1.24	0.97-1.59	0.0747
Q3 (20.5-25°C)	1.74	1.39-2.19	< 0.0001
Q4 (> 25°C)	1.49	1.18-1.87	< 0.0001
Among patients who bled >3 days after surgery			
Season			
Winter	Reference group		
Spring	1.14	0.95-1.37	0.1467
Summer	0.82	0.69-0.97	0.0025
Autumn	0.84	0.69-1.03	0.1074
Average temperature			
Q1 (< 14°C)	Reference group		
Q2 (14-20.5°C)	1.15	0.96-1.38	0.1147
Q3 (20.5-25°C)	0.97	0.79-1.18	0.7730
Q4 (> 25°C)	1.08	0.90-1.30	0.3664

An association between PTH and meteorological factors was not found among patients who bled more than 3 days after surgery (late PTH). However, there was slightly less bleeding after 3 days in patients who underwent surgery during the summer season, RR 0.82, 95%CI 0.69-0.97.

DISCUSSION

This study assessed the influence of meteorological factors on the incidence of PTH. The study aimed to determine whether there is an optimal time (in terms of season) for performing this elective procedure. The main finding of the study was that overall seasons and weather conditions do not have a major effect on the incidence of PTH. More specifically, bleeding incidence during the first 3 days after surgery was higher during the warmer months [Table 3] while the bleeding incidence after the third postoperative day was a bit lower (in the same warmer conditions).

The study showed a higher incidence of PTH (9.73%) than previous studies (0.1-9.3%) [4], although some studies demonstrated an even higher incidence (15%) [5]. Some studies that showed a low incidence of bleeding included only cases that required additional treatments, such as surgery. In addition, often if there is minor bleeding, the patient may not come to the attention of the surgeon. However, our study included all cases of bleeding, even those that were treated conservatively. Since all patients who have their procedure at the Soroka Medical Center are strongly advised to return to the hospital, even for

the simplest case of bleeding, we believe that the vast majority of patients with PTH returned to the hospital. Furthermore, Soroka Medical Center is a major medical center in the Negev area and nearly every patient with bleeding will be referred to this facility. Based on this data, we believe that our study reflects an accurate incidence of PTH in southern Israel.

The median age was higher among patients with PTH. This correlates with previous studies that have demonstrated a higher incidence of post tonsillectomy bleeding among adults when compared with children [5].

The main indication for surgery in our study was sleep related obstructive breathing disorder or tonsillar enlargement (95%). The literature shows that these indications account for approximately 90% of children younger than 3 years of age and 70% in older children [14]. It has been shown that surgery performed due to recurrent infections has a higher incidence of PTH compared to that performed for sleep-related obstructive breathing disorder or tonsillar enlargement [15]. In the current study this parameter could not be assessed since there was a very low incidence of tonsillectomy due to recurrent tonsillitis or peritonsillar abscess. In addition, many patients undergoing surgery because of recurrent tonsillitis do not meet the strict criteria of recurrent tonsillitis [16], making it even more difficult to separate the recurrent tonsillitis patients.

When comparing the living conditions of patients, we found that patients living in rural areas had a higher risk for PTH compared to those living in urban areas, whereas Bedouin patients living in temporary settlements had a lower risk. This finding might be a result of the fact that parents of children living in temporary settlements may seek medical treatment only in severe cases of PTH, perhaps due to difficulties in transportation. As such, this aspect may be a confounding factor. Our recommendation to every parent or caregiver is to return for evaluation in every case of PTH, even if only a small drop of blood is noticed. We assumed that those with easy access to the hospital would return for every such incidence, whereas we surmised that Bedouin living in isolated and often temporary settlements and without easy access to the hospital would likely only return for more serious instances of bleeding. Based on these two assumptions, we believe we can estimate the true overall PTH rate (even simple PTH) for non-Bedouin. However we may never know the true overall PTH rate for Bedouin patients if our assumption regarding return to hospital for bleeding is correct.

Our study's hypothesis was that high average temperature and lower relative humidity would pose a risk factor for PTH. Our study found that this combination of weather conditions existed in the spring and fall, as shown in Table 2. Analysis of the entire study population revealed no associations between PTH and temperature. However, when we divided the patients into groups, we found that in the first 3 days after surgery the patients who underwent surgery in the warmer seasons (sum-

mer, spring, and autumn), or when the temperature was high (> 20°C), had a higher incidence of PTH. Interestingly, we found that surgery during autumn was associated with the highest relative risk of 1.62. Furthermore, surgery performed when the temperature was in Q3 (20.5–25°C) was associated with the highest relative risk of 1.74. These findings suggest that the greatest risk for PTH is not during extreme temperatures but during more moderate weather conditions throughout the year. It seems that temperature alone cannot explain the difference in PTH incidence. We found that humidity was lowest in the autumn, suggesting that maybe a combination of temperature and humidity influenced the incidence of PTH.

No associations with the weather conditions were found among patients who bled, starting postoperative day 4. Perhaps late bleeding is not influenced by meteorological factors at the time of the procedure, but by other influences such as those noted in previous studies, or by the meteorological conditions closer to the time of the bleeding. Our study results demonstrated a more complex association with season and temperature than we expected. Apparently only a combination of several factors, and perhaps additional ones that were not included in this study, determine the risk for bleeding.

This study has several limitations. Some patients have access to climate control in their homes while others do not, a difference that this study did not consider. While those living without climate control are likely to be more exposed to extreme temperatures, those with climate control may be in conditions of lower humidity as most of the climate control devices used in Israel tend to dry the air on both heating and cooling settings. We found that Bedouin living in rural areas, who probably have the least climate control and possibly exposure to higher temperature and higher humidity, had a lower bleeding rate. They may also have a lower compliance rate in returning to the hospital in the event of simple bleeding episodes. An additional limitation to the study is that we did not test the association between the type of surgery and PTH. Bleeding after subtotal tonsillectomy is very rare and therefore should not influence the incidence of PTH, whereas it is possible that the different surgical techniques used for total tonsil excision (monopolar or bipolar diathermy or cold tonsillectomy) could affect the results. However, our surgeons did not exhibit a preference for a specific tonsillectomy technique during different seasons or weather conditions, rather they tended to use the same technique throughout the year for all cases they performed. Further study comparing each method used for tonsillectomy individually with the weather conditions may be needed to determine whether a given method of tonsillectomy has a higher risk of PTH in different seasons.

CONCLUSIONS

It appears that seasonality, and to an extent temperature, play only a minor role in the incidence of PTH in southern Israel.

The study does show differences between PTH occurring during the first 3 postoperative days, which showed an association with the weather on the day of surgery, versus PTH that occurred afterwards, which did not. Since the differences are minimal at best, it seems that factors other than season or weather should be the driving force for deciding the timing of surgery.

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References

1. Lee MSW, Montague ML, Hussain SSM. The influence of weather on the frequency of secondary post-tonsillectomy haemorrhage. *J of Laryngol Otol* 2005; 119: 894-8.
2. Lescanne E, Chiron B, Constant I, et al. Pediatric tonsillectomy: clinical practice guidelines. *Eur Ann Otorhinolaryngol Head Neck Dis* 2012; 129: 264-71.
3. Cohen JE, Gomori JM, Itshayek E. Endovascular treatment of tonsillar artery pseudoaneurysm causing recurrent hemorrhages after tonsillectomy. *IMAJ* 2015; 17 (7): 453-4.
4. Racic G, Kurtovic D, Colocic Z, Dogas Z, Kardum G, Roje Z. Influence of meteorological conditions on post-tonsillectomy haemorrhage. *J of Laryngol Otol* 2008; 112: 1330-4.
5. Sarny S, Ossimitz G, Habermann W, Stammberger H. Hemorrhage following tonsil surgery: a multicenter prospective study. *Laryngoscope* 2011; 121 (12): 2553-60.
6. Danielides V, Nousia CS, Patrikakos G, et al. Effect of meteorological parameters on acute laryngitis in adults. *Acta Otolaryngol* 2002; 122: 655-60.
7. Danielides V, Kontogiannis N, Bartzokas A, Lolis CJ, Skevas A. The influence of meteorological factors on the frequency of epistaxis. *Clin Otolaryngol* 2002; 27: 84-8.
8. Roberts C, Jayaramachandran S, Rainet C.H. A prospective study of factors which may predispose to post-operative tonsillar fossa haemorrhage. *Clin Otolaryngol* 1992; 17: 13-17.
9. Chadha NK. Tonsillectomy return-to-theatre rates demonstrate a monthly and seasonal variation: an analysis of 256,799 patients. *J of Laryngol Otol* 2007; 121: 1088-93.
10. Schrock A, Send T, Heukamp L, Gerstner A.O, Bootz F, Jakob M. The role of histology and other risk factors for post-tonsillectomy haemorrhage. *Eur Arch Otorhinolaryngol* 2009; 266: 1983-7.
11. Cadd B, Rogers M, Patel H, Crossland G. (Ton)silly seasons? Do atmospheric conditions actually affect post-tonsillectomy secondary haemorrhage rates? *J Laryngol Otol* 2015; 129 (7): 702-5.
12. Central Bureau of Statistics. http://gis.cbs.gov.il/Yeshevuvim_allyears/ [Accessed 11 March 2015] [Hebrew].
13. Alpert P, Osetinsky I, Ziv B, Shafir H. A new seasons definition based on classified daily synoptic systems: an example for the Eastern Mediterranean. *Int J Climatol* 2004; 24: 1013-21.
14. Parker NP, Walner DL. Trends in the indications for pediatric tonsillectomy or adenotonsillectomy. *Int J Pediatr Otorhinolaryngol* 2011; 75 (2): 282-5.
15. Windfuhr JP, Chen YS. Incidence of post-tonsillectomy hemorrhage in children and adults: a study of 4,848 patients. *Ear Nose Throat J* 2002; 81 (9): 626-8.
16. Katzenell U, Bakshi E, Ashkenazi I, Bar-Dayan Y, Yeheskeli E, Eviatar E. A retrospective study of the eligibility for tonsillectomy. *IMAJ* 2010; 12 (11): 681-3.