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# Postoperative Complications in Lingual Versus Palatine Tonsillectomies

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**Objective:** The aim of this study was to investigate the risks of lingual tonsillectomy (LT) in a large cohort and compare these risks to those of palatine tonsillectomy (PT).

**Methods:** A retrospective cohort study was conducted using data from the United States collaborative network within TriNetX. The LT group was defined using Current Procedural Terminology (CPT) code 42870 and PT group using CPT codes 42820, 42821, 42825, or 42826. Groups were further subdivided into pediatric and adult populations and matched based on propensity scores within the cohorts. Complications occurring within 14 days of procedure were compared within each cohort.

**Results:** There were 1,357 adult patients (mean age, 42.9 years) and 863 pediatric patients (mean age, 8.1 years). Adults who had LT were more likely to experience postoperative dysphagia (OR = 2.6, $p < 0.001$) and require admission to the hospital (OR = 4.3, $p < 0.001$) or intensive care unit (OR = 6.1, $p < 0.001$). There was no significant difference in bleeding between adult PT and LT groups, occurring at rates of 3.8% and 4.4%, respectively ($p = 0.50$). Pediatric patients who had LT were also more likely to experience postoperative dysphagia (OR = 2.4, $p = 0.017$) and require admission to the hospital (OR = 8.2, $p < 0.001$) or intensive care unit (OR = 2.7, $p = 0.012$). The postoperative bleed rate was 3.2% in the pediatric PT cohort, which was 2.4 times higher compared to those who underwent LT (1.5%, $p = 0.016$).

**Conclusion:** Postoperative complications after lingual tonsillectomy are more common than after palatine tonsillectomy in both adults and children.

**Key Words:** lingual tonsillectomy, post-tonsillectomy bleeding, post-tonsillectomy hemorrhage, tonsillectomy.

**Level of Evidence:** 3

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## INTRODUCTION

Palatine tonsillectomy (PT) and lingual tonsillectomy (LT) are common procedures performed in children and adults. Common surgical indications for PT and LT in children and adults include obstructive sleep apnea, chronic infections, and tonsil hypertrophy.[1] More rarely, these procedures are performed for malignancies such as lymphoma or squamous cell carcinoma.[2] Given the anatomical location of the palatine and lingual tonsils, surgery on these sites carries the risk of adverse effects on swallowing and the possibility of airway compromise. Complications following PT have been well-studied and include postoperative pain, dysphagia, dehydration, and post-tonsillectomy hemorrhage (PTH), all of which may lead to hospital readmission after surgery.[3,4] There are less data regarding adverse events surrounding LT in the literature, given that it is a less frequently performed procedure. However, as the surgical treatment of obstructive sleep apnea becomes more common, LT is a useful tool in the otolaryngology armamentarium to address upper airway obstruction.[5] Cited complications of LT are similar to PT including pain, dysphagia, airway edema, and bleeding.[1,6,7]

To our knowledge, there are no published studies comparing complication rates following PT and LT. Comparing the complications of LT with those of PT, a more familiar procedure to otolaryngologists could shed light on the potential risks of LT as it becomes more commonplace. This study primarily serves to quantify the incidence of postoperative complications after PT and LT and secondarily compare the relative risks of complications between LT and PT in large cohorts of adults and children from a national database.

## MATERIALS AND METHODS

This retrospective cohort study utilized deidentified patient records and was, therefore, exempt from approval by the institutional review board. The data used were collected on June 21, 2023, from the TriNetX United States (US) Collaborative Network, which provides access to electronic medical records from approximately 57 participating health care organizations in the US and 96 million patients dating from 2006. Health care

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organizations included academic medical centers, specialty physician practices, and community hospitals.

For the sake of comprehensiveness, both adult and pediatric cohorts were studied. Utilizing TriNetX's query building interface, the LT cohort was defined with Current Procedural Terminology (CPT) code 42870. The PT cohort was defined with CPT codes 42820 (Tonsillectomy and adenoidectomy; younger than age 12), 42821 (Tonsillectomy and adenoidectomy; age 12 and over), 42825 (Tonsillectomy; primary or secondary; younger than age 12), and 42826 (Tonsillectomy; primary or secondary; age 12 and over). Individuals were excluded from the LT cohort if they received a PT within 14 days after the LT procedure. Likewise, individuals were excluded from the PT cohort if they underwent a LT within 14 days after the PT procedure. These cohorts were further subdivided into pediatric and adult populations by limiting the ages of each cohort to 18 years and younger and 19 years and older, respectively. This yielded four sub-cohorts: pediatric patients who underwent LT, pediatric patients who underwent PT, adults who underwent LT, and adults who underwent PT. Using the propensity score matching within TriNetX, patients within the pediatric and adult groups were matched by age, sex, and race.

Complications that occurred within 14 days following LT or PT were tabulated within each cohort. Complications analyzed were postoperative bleeding (ICD-10 codes J95.83 and K91.84), dehydration (ICD-10 code E86.0), dysphagia (ICD-10 code R13.10), critical care evaluation and management (CPT code 99291), emergency department (ED) visit (CPT codes 99281 or 99282 or 99283 or 99284 or 99285), and subsequent care requiring inpatient hospital admission (CPT codes 99231 or 99232 or 99233).

Statistical analysis was performed using R version 4.3.1 (R Core Team, Vienna, Austria, 2023). Chi-square tests for independence were used to assess the association of each outcome between cohorts within pediatric and adult groups. Odds ratios (OR) were calculated to determine the magnitude of association within a 95% confidence interval. $p$ values less than 0.05 were considered significant.

## RESULTS

### *Patient Population*

The TriNetX US Collaborative Network contained 85,970,909 adult patients and 16,659,688 pediatric patients on the date it was accessed. The PT cohort searches yielded 81,775 adults and 193,100 children. The LT cohort searches yielded 1397 adults and 863 children. Details regarding the age, gender, and race breakdown of the cohorts before and after propensity score matching can be seen in Tables I and II. After propensity score matching, the cohorts used for statistical comparisons were not significantly different based on the demographic factors.

### *Complications Analyses*

Table III shows a comparison of complications in adult patients after LT and PT. Over 7.0% of adult patients who underwent LT experienced postoperative dysphagia after the procedure, which was more than two times higher than patients who had a PT (7.1% vs. 2.8%, $p < 0.001$). Adult patients after LT were also four times more likely to require admission to the hospital (8.9%

TABLE I.
Propensity Score Matching for Adult Tonsillectomy Cohorts.

| | $N$ | Mean Age (Years, SD) | Gender, $N$ (%) | | Race, $N$ (%) | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| | | | Male | Female | White | Hispanic or Latino | Black or African American | Asian | American Indian or Alaskan Native | Native Hawaiian or other Pacific Islander |
| Before matching | | | | | | | | | | |
| PT | 81,775 | 26.7, 13.6 | 25801 (34.2) | 49674 (65.8) | 47,998 (63.6) | 10,121 (13.4) | 9,865 (13.1) | 1,390 (1.8) | 451 (.6) | 124 (.2) |
| LT | 1,397 | 42.8, 19.3 | 736 (53.6) | 639 (46.4) | 1,057 (76.9) | 104 (7.6) | 143 (10.4) | 21 (1.5) | 10 (.7) | 10 (.7) |
| $p$ value | | <0.001 | <0.001 | <0.001 | <0.001 | <0.001 | 0.004 | 0.390 | 0.537 | <0.001 |
| After matching | | | | | | | | | | |
| PT | 1,375 | 43.0, 19.0 | 737 (53.6) | 736 (53.5) | 1,055 (76.7) | 104 (7.6) | 139 (10.1) | 30 (2.2) | 10 (.7) | 10 (.7) |
| LT | 1,375 | 42.8, 19.3 | 638 (46.4) | 639 (46.5) | 1,057 (77.4) | 104 (7.6) | 143 (10.4) | 21 (1.5) | 10 (.7) | 10 (.7) |
| $p$ value | | 0.882 | 0.970 | 0.970 | 0.928 | 1.00 | 0.802 | 0.203 | 1.00 | 1.00 |

LT = lingual tonsillectomy; PT = palatine tonsillectomy.

TABLE II.
Propensity Score Matching for Pediatric Tonsillectomy Cohorts.

| | N | Mean Age (Years, SD) | Gender, N (%) | | Race, N (%) | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| | | | Male | Female | White | Hispanic or Latino | Black or African American | Asian | American Indian or Alaskan Native | Native Hawaiian or other Pacific Islander |
| Before matching | | | | | | | | | | |
| PT | 193,100 | 5.7, 3.1 | 102,952 (53.3) | 90,102 (46.7) | 118,766 (61.5) | 43,778 (22.7) | 29,841 (15.5) | 3,564 (1.8) | 1,054 (.5) | 422 (.2) |
| LT | 863 | 8.1, 3.7 | 535 (62.0) | 328 (38.0) | 587 (68.0) | 139 (16.1) | 114 (13.2) | 20 (2.3) | 10 (1.2) | 10 (1.2) |
| *p* value | | <0.001 | <0.001 | <0.001 | <0.001 | <0.001 | 0.069 | 0.305 | 0.015 | <0.001 |
| After matching | | | | | | | | | | |
| PT | 863 | 8.1, 3.7 | 535 (62.0) | 328 (38.0) | 587 (68.0) | 139 (16.1) | 114 (13.2) | 20 (2.3) | 10 (1.2) | 10 (1.2) |
| LT | 863 | 8.1, 3.7 | 535 (62.0) | 328 (38.0) | 587 (68.0) | 139 (16.1) | 114 (13.2) | 20 (2.3) | 10 (1.2) | 10 (1.2) |
| *p* value | | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 |

LT = lingual tonsillectomy; PT = palatine tonsillectomy.

vs. 2.3%, $p < 0.001$) and six times more likely to be admitted to the intensive care unit (ICU) (4.3% vs. 0.7%, $p < 0.001$). Postoperative bleeding rates were similar and occurred in 4.1% of the patients who had undergone LT and 4.4% of patients in the PT group ($p = 0.641$). There were comparable rates of postoperative dehydration between the LT and PT groups (2.0% vs. 1.5%, $p = 0.308$). There was also no significant difference in subsequent visits to the ED between the patient groups (8.5% vs. 8.8%, $p = 0.839$).

Table IV shows a comparison of complications in pediatric patients after LT and PT. Pediatric PT had a significantly higher risk of postoperative bleeding compared to LT. The bleed rate was 3.2% after PT and 1.4% after LT ($p = 0.016$). Pediatric patients who underwent LT were eight times more likely to require admission to the hospital (8.8% vs. 1.2%, $p < 0.001$) and nearly three times more likely to require ICU admission (3.0% vs. 1.2%, $p = 0.012$). Patients who had LT experienced postoperative dysphagia more frequently than patients who had PT (2.9% vs. 1.2%, $p = 0.017$). Both groups had similar rates of dehydration (2.5% vs. 2.3%, $p = 0.876$) and subsequent visits to the ED (8.1% for both), with no significant differences noted.

## DISCUSSION

This is the first study to compare rates of postoperative complications after LT and PT in two large cohorts of adult and pediatric patients. LT carries a higher risk of dysphagia and the need for subsequent hospital care in both adults and children, while pediatric PT patients have a higher rate of postoperative bleeding. Overall, these complications are rare, occurring in only a small percentage of these large patient cohorts. The comparison of these procedures may help physicians to counsel patients and understand the relative risks.

The associated risks and potential complications surrounding PT in pediatric and adult patients have been well-studied in the literature. The most serious complication and leading cause of death related to this surgery is postoperative hemorrhage.[8,9] Bhattacharyya and Kepnes examined 7748 adult patients after PT and found that 11% of patients returned to the hospital for care after surgery; most commonly for bleeding, pain, fever, and dehydration.[10] Hoddeson and Gourin analyzed medical records of 361 adult PT patients and similarly found the most common reasons for emergency department visits were bleeding, dehydration, pain, and hypoxemia.[11] They also found that patients who received tonsillectomy for a history of chronic infections were at a higher risk of bleeding (6.0% vs. 4.0%; $p = 0.02$).[11] Hospitalization greater than 24 h occurred in 5% of patients and was more likely in patients presenting with an airway complaint.[11] Although rates vary widely among studies, the postoperative bleeding rate typically falls within 3%–5% of cases post-tonsillectomy.[6,12,13] In our study, 4.4% of adult patients experienced postoperative bleeding following PT, which is within the range of values reported in the literature.

TABLE III.
Postoperative Complications in Adult Lingual Tonsillectomy Compared With Palatine Tonsillectomy.

| Complication | LT *N* (%) | PT *N* (%) | Odds ratio | 95% confidence interval | *p* value[a] |
|---|---|---|---|---|---|
| Postoperative bleeding | 57 (4.1) | 63 (4.4) | 0.901 | 0.613–1.32 | 0.641 |
| Dehydration | 28 (2.0) | 20 (1.5) | 1.41 | 0.761–2.65 | 0.308 |
| Dysphagia | 97 (7.1) | 39 (2.8) | 2.60 | 1.76–3.90 | <0.001[b] |
| ED visits | 117 (8.5) | 121 (8.8) | 0.964 | 0.732–1.27 | 0.839 |
| Initiation of ICU care | 59 (4.3) | 10 (.7) | 6.12 | 3.09–13.5 | <0.001[b] |
| Subsequent hospital admission | 123 (8.9) | 31 (2.3) | 4.26 | 2.83–6.59 | <0.001[b] |

ED = emergency department; ICU = intensive care unit; LT = lingual tonsillectomy; PT = palatine tonsillectomy.
[a]Chi-square tests.
[b]Represents statistical significance.

TABLE IV.
Postoperative Complications in Pediatric Lingual Tonsillectomy Compared With Palatine Tonsillectomy.

| Complication | LT *N* (%) | PT *N* (%) | Odds ratio | 95% confidence interval | *p* value[a] |
|---|---|---|---|---|---|
| Postoperative bleeding | 12 (1.4) | 28 (3.2) | 0.421 | 0.194–0.861 | 0.016[b] |
| Dehydration | 22 (2.5) | 20 (2.3) | 1.10 | 0.569–2.15 | 0.876 |
| Dysphagia | 25 (2.9) | 10 (1.2) | 2.54 | 1.17–5.97 | 0.017[b] |
| ED visits | 70 (8.1) | 70 (8.1) | 1.00 | 0.697–1.44 | 1.00 |
| Initiation of ICU care | 26 (3.0) | 10 (1.2) | 2.65 | 1.23–6.19 | 0.012[b] |
| Subsequent hospital admission | 76 (8.8) | 10 (1.2) | 8.23 | 4.20–18.0 | <0.001[b] |

ED = emergency department; ICU = intensive care unit; LT = lingual tonsillectomy; PT = palatine tonsillectomy.
[a]Chi-square tests.
[b]Represents statistical significance.

PT complications in children are distinct from those seen in adults. A systematic review by Brigger et al. reported approximately 9% of children experienced complications after surgery and 8% sought hospital-based care.[14] Our study similarly found that 8.1% of children are evaluated at an emergency department following PT. A review of over 9000 children undergoing tonsillectomy and adenoidectomy found a readmission rate of 3.6%, which is higher than the 1.2% of PT patients who received subsequent hospital care in our study.[15] This review noted the most common reasons for readmission were dehydration, hemorrhage, and pain.[15] Bleeding and respiratory distress represent the most serious complications following this surgery. Variable rates of hemorrhagic complications are reported in children, ranging from 0.3% to 6.1% in the literature.[16,17] A meta-analysis by Francis et al. found the pooled frequency of PTH rates across all techniques from 87 studies was less than 4%.[18]

Age and indication for the procedure have both been shown to be significant contributors to complications after pediatric tonsillectomy.[19] Airway complications including stridor, laryngeal spasm, and laryngeal edema are significantly more prevalent in children under 1 year of age (OR = 7.5).[19] Children being treated for obstructive sleep apnea are more likely to experience airway-related issues after surgery.[20,21] Pediatric patients are also at high risk of dehydration if fluid intake is reduced due to pain. Dehydration, vomiting, and inadequate pain management have been cited as minor complications in children, occurring at rates around 3%.[14,22] In our cohort, bleeding occurred in 3.8% of pediatric PT patients and dehydration occurred in 2.8% of patients, similar to rates reported in the literature.[21,22] Data regarding rates of dysphagia and initiation of ICU care in pediatric PT patients are lacking within currently published literature.

Existing research on LT in pediatric patients suggests that it is a generally safe procedure with overall low complication and adverse event rates, comparable to those of adenotonsillectomy.[6,7] A meta-analysis by Rivero and Durr reported an overall complication rate of 10.6% among 132 pediatric patients undergoing a LT, with the most common adverse events being postoperative bleeding (3.8%) or a pulmonary event such as pneumonia or postoperative airway edema (3%).[23] Other less common adverse events included readmission, voice change, or dysphagia, which occurred in 5 patients.[23] Similarly, a meta-analysis by Kang et al. reported low rates of complications among 73 pediatric LT patients; postoperative tongue base edema and airway obstruction occurred in 4%, while postoperative bleeding and pneumonia each occurred in 1.4%.[24] Persistent postoperative airway obstruction due to tongue base edema is certainly a unique and important risk following LT. Abdel-Aziz et al. also reported this complication, with hypoxemia requiring

hospital admission occurring in 3 of 16 patients (18.8%).[25] A retrospective review by Williamson et al. included a sub-cohort of 101 patients who underwent LT and found an overall complication rate of 5.9% with 5% having postoperative bleeding and 1% having a postoperative infection.[26]

There are limited data on LT complications in adults. A study by Mure et al. looked at a small cohort of 11 adult patients who underwent LT for OSA and reported no complications.[27] The methods of the study state that all patients were kept in the hospital postoperatively until the resumption of oral feeding and pain relief without intravenous analgesics; the mean hospital stay was 3.1 ± 1.5 days.[27] Another study by Merna et al. reviewed the National Readmission Database and included 410 adult and 201 pediatric patients who had LT. Overall reasons for readmission included bleeding in 1.9%, dysphagia in 1.7%, fever, nausea, vomiting or diarrhea in 1.6%, acute pain in 1.6%, and airway obstruction in 1.4%.[6] Adult patients had a higher rate of readmission at 10.2% (range 5.8%–17.4%) compared with pediatric patients at 4.1% (range 1.5%–10.7%).[6] More research is needed to gain a comprehensive understanding of the complication rates for adult patients undergoing LT. Of note, transoral robotic surgery (TORS) for tongue base reduction has become a popular treatment for obstructive sleep apnea. A meta-analysis investigating TORS and coblation surgery found a 21.3% complication rate in TORS, with transient dysphagia being the most common complication (7.2%), followed by bleeding (4.2%), and minor complications such postoperative pharyngeal edema (1%).[28] A complication rate of 8.4% was observed in coblation procedures, with most common being bleeding (2.6%) followed by postoperative edema (2.2%) and globus (1.1%).[28] Another review of 285 patients undergoing lingual tonsil and tongue base surgery with TORS found no complications specifically related to use of the robotic system, and none of the complications were life threatening.[29]

### *Limitations*

The TriNetX database does not provide information regarding indication for the procedure or operative technique used, and therefore, the association of these factors with the findings could not be assessed. Literature is mixed surrounding the impact of surgical technique on palatine tonsillectomy postoperative bleeding. A meta-analysis of randomized controlled trials and a review of 897 patients found no relationship between surgical instrument used and the incidence or severity of postoperative hemorrhage.[30,31] However, another meta-analysis investigating five tonsillectomy techniques found intracapsular coblations to be associated with the lowest risk of hemorrhage, while the highest risk was associated with bipolar diathermy.[32] There is limited literature comparing surgical techniques in lingual tonsillectomy, and it remains unclear if any technique is associated with a higher or lower incidence of complications.[24] It is possible that different techniques among groups may have impacted results. Furthermore, this database relies on CPT and ICD-10 codes rather than direct patient observation. It is possible patients who experienced complications but did not seek medical care were not captured in this dataset. Moreover, hospital admission is often planned after lingual tonsillectomy.[27] The CPT codes that were used to investigate subsequent hospital care and ICU care are not often utilized for planned postoperative hospital care, and it is not possible to distinguish whether these codes were used for planned postoperative care or unplanned readmission. Increases in subsequent hospital care in LT may be merely due to planned postoperative admission. Finally, comorbidities were not explored and may be related to prevalence of complications.

## CONCLUSION

LT in both adult and pediatric patients is associated with higher rates of postoperative dysphagia and admission to the hospital or ICU, but there is no statistical difference between rates of dehydration or ED visits in either age group. Pediatric PT is associated with a higher postoperative bleeding rate compared with LT, but bleeding rates are not significantly different between these procedures in adults. This information can aid in patient counseling and postoperative planning. Further research should be conducted investigating the cause of prolonged hospital admission in those receiving LT compared with PT.

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