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Transoral Robotic Surgery in Chronic Lingual Tonsillitis: An Observational Cohort Study

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ABSTRACT

Background: Chronic lingual tonsillitis (CLT) entails persistent inflammation of the lingual tonsils (LT), presenting in recurrent infections, throat discomfort, dyspnea, dysphagia, and LT hypertrophy.

Methods: A retrospective observational study at a nonacademic general hospital described outcomes of CLT patients undergoing base of tongue (BOT) reduction via transoral robotic surgery (TORS). Primary outcomes were changes in patient-reported quality of swallowing and life and were assessed at baseline, 3, 6, and 12 months post-TORS. Secondary outcomes were tonsillitis complaints, LT Friedman grade, and postoperative complications.

Results: Thirty-three patients were included, 5 patients were lost to follow-up at 6 and 12 months. Improved swallowing experience and enhanced quality of life were observed. Tonsillitis scores decreased significantly (mean 7.8 to 1.65 $p < 0.001$). LT Friedman grade reduced, with 69.7% achieving grade 0 at 12-months follow-up. Two patients experienced postoperative bleeding.

Conclusions: TORS appears effective and safe for treating CLT improving swallowing, and overall quality of life for patients and reducing tonsillitis complaints.

1 | Introduction

Chronic lingual tonsillitis (CLT) is a disease characterized by persistent, recurrent inflammation of the lingual tonsils (LT) presenting symptoms such as recurring infections, throat discomfort, dyspnea, in combination with LT hypertrophy. CLT often goes undiagnosed due to its nonspecific symptomology. Hence, the precise prevalence and incidence remain unknown.

Studies reporting CLT correlate the disease to lymphatic hypertrophy of LT tissue, reflux disease due to repeated mucosal insult and upper airway infections [1–4]. Diagnosis usually occurs following referral to otorhinolaryngology department due to symptoms of recurrent throat infections, globus sensation, and dysphagia, with LT hypertrophy detected upon examination.

Treatment protocols for CLT lack standardization, with current approaches mirroring those for palatine tonsillitis, involving antibiotics and anti-acids for pharyngeal reflux. Surgical removal of LT, though effective, historically posed risks such as bleeding from the lingual artery or hypoglossal nerve injury as old methods used cold cutting tools and surgeons had no overall vision of the surgery field. Modern techniques like electrocoagulation or CO2 laser procedure made removal easier, although risk of bleeding remained high. A cadaver study has offered deeper insight into the dorsal branch of the lingual artery, an important landmark when conducting LT surgery, emphasizing the necessity of clear visualization of the operating field [5].

Introduction of transoral robotic surgery (TORS) showed promising results in safely removing LT in obstructive sleep apnea patients [6]. Furthermore, feasibility and efficacy of

TORS to remove LT of CLT patients was investigated and proven as a valid therapeutic option [7, 8]. The quality of life and swallowing was assessed using questionnaires after TORS and showed excellent results. However, baseline measurements of quality of life and swallowing were lacking, leaving a gap in understanding the full scope of the disease's impact and the benefits of TORS.

2 | Objective

To contribute to the literature and address the current gap, we aim to investigate and describe TORS for CLT in a Dutch population analyzing patient reported outcomes with baseline and follow-up assessments to provide a more comprehensive understanding of how this disease affects patient's quality of life and how treatment with TORS influences quality of life. Secondary outcomes involve analysis of LT removal and postoperative complications.

3 | Methods

3.1 | Study Design and Setting

This retrospective observational study investigated patients diagnosed with CLT that underwent TORS of the LT, adhering to the STROBE framework [9] Table A1. Surgery, using da Vinci surgical system, Si (Intuitive Surgical Inc.—Sunnyvale, CA, USA) was performed by two experienced head and neck surgeons at Frisius Medical Center, Leeuwarden, the Netherlands, between October 2018 and October 2021.

3.2 | Ethical Considerations

The study was registered in the Regionale Toetsingcommisie Patientgebonden Onderzoek (RTPO) research register (case number nWMO2021-0023) and Institutional Review Board of the MCL deemed no ethical approval necessary under Dutch Medical Research Law legislation.

3.3 | Participants

Data, including demographic information, medical history, and preoperative assessment, were collected from electronic patient files. Patients with prominent complaints of recurrent tonsillitis alongside hypertrophy of LT (Friedman grade 3–4) [10] anamnestically diagnosed with CLT without contraindications for surgery (ASA physical status classification score ≤ 3) were included for analysis, baseline ($T=0$) and follow-up were measured after 3 months ($T=1$), 6 months ($T=2$) and 1 year ($T=3$). All patients received comprehensive counseling and provided informed consent.

TORS followed the robotic setting described by O'Malley [11]. Visualization of the BOT region was obtained using high-magnification, three-dimensional endoscope. The volume of the removed LT was measured in milliliters (mL) and pathologic evaluation was conducted postoperatively. Postoperative care included pain management, antibiotics, and immediate transition to full oral intake.

3.4 | Outcomes

Primary outcomes were changes in patient reported outcomes assessed using the validated Dutch version of the MD Anderson dysphagia inventory (MDADI) (score 20 [low functioning] to 100 [high functioning]) [12], in which a 10-point difference between time points was seen as clinically relevant, aligning with the minimal clinically important difference (MCID) of approximately 8.5 points based on distribution-based methods [13]. the European Organization for Research and Treatment of Cancer Quality of Life Questionnaire (EORTC QLQ-C30) (higher scores indicating better functioning and health related quality of life) [14, 15], and the Glasgow Benefit Inventory (GBI) (range − 100 [worst outcome] through 0 [no change] to +100 [best outcome]) [16] and the visual analog scale (VAS) for tonsillitis severity (scale 0 [no complaints] to 10 [many complaints]). The questionnaires were obtained $T=0$ to $T=3$. The GBI was obtained during follow-up.

Secondary outcomes included LT hypertrophy assessment at $T=0$ to $T=3$, surgical complications categorized via Clavien Dindo [17], duration of surgery, hospitalization after TORS, volume of LT in mL, and pathology reports.

We anticipate selection bias since our study only included CLT patients who underwent TORS. Given the relative obscurity of CLT, we lack clarity on its prevalence in the Dutch population and its typical treatment approaches. Study size was based on availability of patient selection. Therefore, no sample size calculations were made.

3.5 | Statistical Methods

All statistical analysis was performed using SPSS IBM statistics processor. Following the assessment of withdrawals and missing data, a description of baseline characteristics including included age, gender, BMI, LT categorized by Friedman, history of smoking, history of reflux and earlier treatment, history of palatine tonsillectomy using means with standard deviations (SD), or medians with interquartile ranges (IQR) depending on whether the continuous variables were normal or non-normally distributed was done. Description of categorical variables was via number and percentages.

A repeated measures ANOVA was conducted to compare the means of paired observations across four time points ($T=0$, $T=1$, $T=2$, and $T=3$). This test was chosen to account for the within-subject dependency of the data and to evaluate whether there were significant differences in scores over time. Pairwise comparisons with Bonferroni correction were performed post hoc to identify specific time points that differed significantly. Assumptions of sphericity were tested using Mauchly's test. In cases where sphericity was violated ($p<0.05$), the Greenhouse–Geisser correction was applied to adjust the degrees of freedom. Descriptive statistics, including means and SDs, were reported for each time point. The statistical significance threshold was set

at a two-sided $p < 0.05$. Categorical variables were tested via Chi square test and association between LT and VAS tonsillitis score over time via Pearson or Spearman rank correlation test. The statistical significance threshold was set at a 2-sided p value of 0.05.

4 | Results

4.1 | Patient Characteristics

A total of 33 patients underwent TORS for CLT of which 5 were also diagnosed with obstructive sleep apnea. At $T = 2$, 5 patients were lost to follow-up. In this cohort the average age was 44 years and most patients were female (81.8%) with a median BMI of 26.0. Complaints were usually a combination of different aspects, with the most prevalent complaint being recurrent infections of LT, followed by globus sensation and pain. Most patients had a LT Friedman score of 4. Detailed patient characteristics were available as seen in Table 1.

TABLE 1 | Patient characteristics of 33 CLT patients undergoing TORS.

	Values
Patient characteristics	***n* = 33**
Age (years), mean (SD)	44.0 (14.9)
Gender, *n* (%)	
Male	6 (18.2)
Female	27 (81.8)
Body mass index (kg/m^2), median (25th—75th)	26.0 (23.4–28.0)
Current smoking, *n* (%)	5 (15.2)
History of smoking, *n* (%)	5 (15.2)
Never smoked, *n* (%)	23 (69.7)
No history of reflux, *n* (%)	21 (63.6)
Reflux requiring medication, *n* (%)	12 (36.4)
Friedman classification lingual tonsils, *n* (%)	
Grade 3	4 (12.1)
Grade 4	29 (87.9)
Presence palatine tonsils, *n* (%)	6 (18.2)
No tonsils	23 (69.7)
Unknown	4 (12.1)
Palatine tonsillectomy in childhood, *n* (%)	6 (18.2)
Unknown	27 (81.8)
Main complaints, *n* (%)	
Infections	17 (51.5)
Pain	14 (42.4)
Dyspnea	12 (36.4)
Globus sensation	15 (45.5)
Dysphagia	2 (6.1)

Abbreviations: CLT: chronic lingual tonsillitis; SD: standard deviation; TORS: Transoral robotic surgery.

4.2 | Outcomes

Quality of life and swallowing measured through MDADI and EORTC QLQ-C30 questionnaire were collected for 32 patients at baseline and $T = 1$, and for 28 patients at $T = 2$ and $T = 3$. Since one patient completed $T = 2$ but not $T = 3$, and another patient did not complete the $T = 3$, we acquired a complete dataset for 26 patients.

4.3 | MDADI

Total scores were significantly increased from mean 78.3 (SD 13.6) to 83.9 (SD 11.4) at $T = 1$ to 87.6 (SD 11.3) at $T = 2$ to 91.0 (SD 8.7), $T = 3$ ($p < 0.001$). The paired analysis revealed no significant differences between baseline, $T = 1$ ($p = 0.41$), and $T = 2$ ($p = 0.06$). However, a significant difference of 12.7 points was observed between $T = 0$ and $T = 3$ ($p = 0.001$). In addition, global scores at $T = 0$ were on average 55.4 (SD 26.1) and were significantly increased to 76.9 (SD 25.7) $T = 1$ ($p = 0.01$) to 84.6 (SD 19.8) at $T = 2$ ($p < 0.001$) to 90.0 (SD 18.1) at $T = 3$ ($p < 0.001$). A difference of 35.6 points between $T = 0$ and $T = 3$ was reported. At $T = 3$ all subdomain scores (global, emotional, functional, and physical) were between 80 and 100. Functional scores did not significantly differ at all time points. A difference of 4.8 points was observed between $T = 0$ and $T = 3$. For more detailed information see Table 2.

4.4 | EORTC QLQ-C30

The overall quality of life score at baseline was 60.3 (SD 22.1) and significantly improved on all time points ($p < 0.001$) with at $T = 1$ to an average of 79.5 (SD 19.9) ($p = 0.002$), at $T = 2$ to an average of 84.3 (SD 10.6) ($p < 0.001$) = to 84.6 (SD 9.9) ($p < 0.001$) at $T = 3$. Almost all subdomain scores (physical, role, emotional, and social) on the EORTC QLQ-C30 showed overall significant improvement ($p < 0.05$), except the cognitive subdomain score which was improved but not significantly ($p = 0.09$). The paired analysis revealed no significant improvement in the physical subdomain score at $T = 3$, despite an increase from an average of 84.6 (SD 17.8) at $T = 0$ to 93.2 (SD 11.9) at $T = 3$ ($p = 0.167$). All means and SDs for subdomain scores are depicted in Table 3.

4.5 | GBI

Twenty-seven patients filled in the GBI on an average of 36 months (SD 8.4) after TORS. Mean total GBI score was 17.7 (SD 14.1). The subdomain score general and physical health were on average 29.3 (SD 15.7) and 19.2 (SD 37.6). The subdomain social support was on average 6.1 (SD 12.4, median 0).

TABLE 2 | MDADI means of total scores and subdomains over time.

MDADI scores					
Scores of subdomains	***T* = 0**	***T* = 1**	***T* = 2**	***T* = 3**	***p***
Total score, mean (SD)	78.3 (13.6)	83.9 (11.4)^{NS}	87.6 (11.3)^{NS}	91.3 (8.7)***	< 0.001
Global	55.4 (26.1)	76.9 (25.7)*	84.6 (19.8)***	90.0 (18.1)***	< 0.001
Emotional	82.0 (14.3)	86.4 (12.0)^{NS}	90.4 (11.9)^{NS}	92.7 (7.6)**	< 0.001
Functional	86.5 (14.5)	90.6 (10.8)^{NS}	94.6 (8.0)^{NS}	91.3 (10.3)^{NS}	0.061
Physical	72.4 (15.8)	78.1 (15.1)^{NS}	81.5 (16.6)^{NS}	89.6 (12.5)***	< 0.001

Note: $T = 0$: baseline; $T = 1$: 3 months follow-up; $T = 2$: 6 months follow-up; $T = 3$: 1 year follow-up; data from 26 patients was analyzed; paired ANOVA was used to calculate p values. NS: not significant, *$p < 0.05$, **$p < 0.01$, ***$p < 0.001$ to indicate significance for pairwise difference to $T = 0$. Global significance level ANOVA is depicted on the right.
Abbreviations: MDADI: MD Anderson dysphagia inventory; SD: standard deviation.

TABLE 3 | EORTC QLQ-C30 means and SD of total scores and subdomains over time.

EORTC QLQ-C30 scores					
	***T* = 0**	***T* = 1**	***T* = 2**	***T* = 3**	***p***
Overall QoL, mean (SD)	60.3 (22.1)	79.5 (19.9)*	84.3 (10.6)**	84.6 (9.9)**	< 0.001
Physical	84.6 (17.8)	91.8 (11.4)^{NS}	95.4 (8.9)*	93.2 (11.9)^{NS}	0.009
Role	67.3 (28.9)	89.7 (20.6)**	96.1 (9.8)***	93.0 (14.3)**	< 0.001
Emotional	69.5 (29.4)	90.4 (11.9)**	91.3 (12.8)**	90.7 (21.4)*	< 0.001
Cognitive	83.3 (22.1)	90.4 (14.3)^{NS}	92.3 (15.8)^{NS}	92.3 (13.5)^{NS}	0.09
Social	75.6 (27.2)	92.1 (15.7)^{NS}	94.9 (11.3)*	95.5 (11.1)*	0.001

Note: $T = 0$: baseline; $T = 1$: 3 months follow-up; $T = 2$: 6 months follow-up; $T = 3$: 1 year follow-up; data from 26 patients was analyzed; paired ANOVA was used to calculate p values. NS: not significant, *$p < 0.05$, **$p < 0.01$, ***$p < 0.001$ to indicate significance for pairwise difference to $T = 0$. Global significance level ANOVA is depicted on the right.
Abbreviations: EORTC QLQ-C30: the European Organization for Research and Treatment of Cancer Quality of Life Questionnaire; SD: standard deviation.

At baseline, VAS scores were collected for all patients. The number of patients at each time point was 32 at $T = 1$, 28 at $T = 2$, and 23 at $T = 3$. Following TORS the VAS tonsillitis score was decreased from a mean of 7.8 (SD 1.0) to 2.2 (SD 1.5), $T = 0$ to $T = 1$, to 2.0 (SD 1.4) at $T = 2$, to 1.7 (SD 0.8) at $T = 3$ ($p < 0.001$).

The Friedman grade of LT was reduced from grade 3 (12.1%) or grade 4 (87.9%) to either grade 2, 1, or 0. At $T = 3$ 69.7% of the cohort exhibited a grade of 0, while 15.2% had a grade of 1 LT. The observed differences over time were statistically significant ($p < 0.001$). The association between Friedman score of LT and VAS tonsillitis score was significant across all time points ($p < 0.001$). However, this significance was not observed at the individual time points.

No postoperative complications were observed in 93.9% of the patients ($n = 31$). Two patients suffered from complications, which were self-limiting bleeding and classified as Clavien Dindo grade 1. The mean operating time was 50 min (SD 39) and patients were on average hospitalized for 3.5 days (SD 1.3). Total volume in mL of the BOT reduction was on average 14.4 mL (SD 6.20). All patients transitioned to a full oral intake with dietary restrictions to cold and soft food immediately after surgery. Pain management was initiated with a patient-controlled analgesia (PCA) pump postoperatively, and upon discharge, patients were prescribed oral paracetamol, diclofenac, and oxycodone for continued pain control.

The pathology report confirmed that in all cases the tissue removed was classified as nonmalignant tonsillar tissue. Twenty-four cases showed lymphoidic hyperplasia of which 12 were classified as follicular hyperplasia. In three cases, there was also an active inflammation present, and in three cases additional chronic inflammation. Of the nine other cases without lymphoid hyperplasia, two cases showed an active inflammation and in one case a chronic inflammation. In six cases, only reactive tonsillar tissue was found.

5 | Discussion

This study demonstrates a positive change in patient reported outcomes after TORS in CLT patients, with MDADI scores improving over time, reaching normal swallowing scores (range 80–100). Additionally, EORTC-QLQ30 overall quality of life and subdomain scores increased over time after TORS, and reduced complaints of tonsillitis and effectively removal of LT was reported.

In our study, the majority of participants were female, which aligns with the findings of Di Luca et al. [7], suggesting that

the disease predominantly affects women. The most common complaint in our study was recurrent throat infections, with the subsequent most frequent complaint being globus sensation. Notably, globus sensation alone is not considered an indication for surgery at our center. Instead, patients must present with other complaints, such as recurrent infections and/or dysphagia, to be eligible for surgery. The mention of globus sensation logically follows from the underlying issue, as recurrent throat infections can lead to lymphocytic hyperplasia. Given that palatine tonsils were absent in 69.7% of patients, it is plausible that the complaints of recurrent throat infections originated from the LT.

Dysphagia is a symptom of CLT, but may not always be the primary concern for patients, as reported by our study. Interestingly, our baseline MDADI scores showed a sign of patients experiencing impaired swallowing with a score < 80 and was improved post-TORS, indicating reported enhanced swallowing function. Subdomain analysis revealed a significant impact on quality of life improving from 55.4 to 90.0. A difference of 34.6 points. This indicates that CLT patients experienced impaired swallowing before TORS, which significantly improved post-removal of LT. In addition, physical subdomain was at 72.4 and was improved after TORS to 89.6, indicating that physical consequences of dysphagia such as weight loss and nutritional impact were improved. Emotional scores and functional scores remained within normal ranges. This contrast between global and physical versus emotional and functional subdomains shows dysphagia's impact on overall quality of life rather than daily activities and emotions. In light of the MCID, which defines clinically meaningful differences as approximately 8.5 points, our analysis demonstrated a MCID in overall MDADI scores as there was an increase of 13 points. However, we did not correlate these changes with specific clinical anchors such as feeding difficulties or aspiration status, as highlighted by Hutcheson et al. [13].

To further explore the general quality of life, EORTC QLQ-C30 revealed improved overall quality of life in CLT patients post-TORS, with summary scores nearing 100, indicating better functioning and health related quality of life. This aligns with previous studies that have explored quality of life following TORS for oropharyngeal cancer. We acknowledge that the EORTC QLQ-C30 is a cancer-specific questionnaire and may not be the ideal tool for addressing all relevant aspects. However, given the absence of better alternatives and its strong performance in earlier studies on benign diseases [18, 19], we believe this questionnaire is the most suitable option for this patient group.

The results of the GBI do not mirror the observed quality of life improvements, averaging to 17.7 on a −100 to 100 scale, measured at mean 36-month post-TORS. While GBI is recognized for assessing surgical otolaryngology interventions [20], our findings were unexpected compared to prior CLT study, which found GBI average score of 49.5 [7]. However, it is unclear at what point in time after surgery this measurement was taken. Potential explanations include the GBI's more specific nature compared to the EORTC QLQ-C30 questionnaire or because of the long follow-up time, the positive impact of the procedure has worn off. Surprisingly, CLT did not seem to influence social support, with a median score of 0 in the social subdomain, challenging assumptions how treatment of CLT would improve social interactions and therefore quality of life.

Regarding tonsillitis complaints, our findings align with previous research by Di Luca [7], supporting the hypothesis that LT removal reduces tonsillitis-related complaints. While they recorded specific symptoms pre- and post-TORS, we used a scale for nuanced insight, highlighting any exacerbation or improvement. Similar research on palatine tonsils demonstrated that tonsillectomy in recurrent tonsillitis increases health related quality of life measured via health related VAS scores and GBI [21].

It is known that in some cases lymphoid tissue arising from Waldeyer's ring can regenerate and cause problems. Typically, this scenario arises in palatine tonsillotomy procedures, where partial removal of the palatine tonsils occurs. Tonsillotomy could be seen as beneficial as the chances of post-operative bleeding are lower. In the case of removal of LT, no partial benign removals have been described. Aligning with our research of which approximately 70% of patients were classified with LT grade 0 12 months after surgery, TORS effectively removed LT and this was sustained over 37.5 months [22], and 49.6 months [7].

In our patient population, the majority of patients had lymphoid hyperplasia noted in their pathology reports. Only a limited number (9%) of pathology reports of the LT showed presence of chronic inflammation. However, lymphoid hyperplasia can be an indication of chronic irritation. Studies on palatine tonsils showed no significant differences in the pathology reports of patients with recurrent palatine tonsillitis versus those with complaints of palatine tonsil hypertrophy [23, 24]. However, in one study all specimens showed signs of chronic inflammation [23]. Further research is required to understand why the majority of our specimens do not show evidence of chronic inflammation. This would help better correlate these findings with the clinical symptoms reported by patients. Identifying chronic inflamed lymphoid tissue in the specimens would also strengthen the case for recurrent infection as a contributing factor to the patients' complaints. Nevertheless, we emphasize that CLT is primarily a clinical diagnosis rather than one based on histological findings. This distinction highlights the importance of clinical evaluation of patients' symptoms in diagnosing CLT as histological features may not always correlate directly with clinical manifestations.

Two patients experienced postoperative bleeding following TORS. However, this was self-limiting without further surgical intervention. The majority of patients did not encounter complications, indicating the safety of TORS in our cohort. Average duration of the procedures was 50 min, notably shorter than a different study where the average operating time was 70 min [25]. This variance could be attributed to the fact that the referenced study involved the removal of malignant tumors. Hospitalization lasted 3.5 days, longer than for benign palatine tonsillectomies, which could vary between days of the surgery to 2 days. With benign tonsillectomy of the palatine/adenoid tonsils, considerations of patient being alone at home or distance of home to the hospital are made in chance of post-operative bleeding [26]. As LT removal is painful, all of our patients had pain treatment via PCA which automatically made hospitalization duration longer.

5.1 | Strengths and Limitations

A unique aspect of our study is the inclusion of baseline MDADI scores, not only confirming that patients experience quality of life impairing dysphagia but also demonstrating a consistent upward trend with at the end of follow-up similar scores as reported in previous research. An assessment of multiple patient reported outcomes makes this study stand out. Multiple quality of life measurements provides a more in-depth view as a general quality of life measurement tool, the EORTC QLQ-C30 indicate an overall increase in the quality of life among CLT patients.

Usually it is said that the procedure TORS causes a worsened swallowing function the first month after surgery [27]. However, our data demonstrate an improvement in the experience of swallowing function following TORS, as observed through our retrospective analysis. Another strength of our study is the real life data collected in a nonacademic general hospital which reflects the general population. This makes our findings more generalizable.

It is crucial to acknowledge the study's limitations, primarily its retrospective observational cohort design and small study size with additional loss of patients during follow-up. Our cohort consisted of mainly females with as main complaints infection and pain in combination with LT hypertrophy which makes it a homogeneous group on one side that most patients are female. However, we are unsure of how our cohort reflects the general population of CLT patients as no numbers have been recorded.

Additionally, we want to highlight that in our study we did not correlate patient-reported dysphagia to objectively measured swallowing function. Research has shown that tools like the MDADI do not strongly align with functional outcomes such as the water swallow test (WST) or the penetration-aspiration scale (PAS) [28, 29]. This reinforces the importance of incorporating both subjective patient-reported outcomes and objective assessments in future studies to provide a comprehensive understanding of dysphagia. In our center, swallowing tests are currently limited to patients undergoing more invasive surgeries, such as total laryngectomy. Expanding the use of objective swallowing assessments across the treatment timeline could help better capture the functional and quality-of-life impacts of dysphagia. Furthermore, the absence of data on postoperative tonsillitis episodes prevents confirmation of whether patients experience pharyngitis or tonsillitis-like diseases after LT removal. In addition, the duration of conservative therapies prior to TORS could also be of value to be able to determine when patients are in need of surgery.

These findings carry implications for treatment decisions. Our analysis showed that patients selected based on Friedman tonsil grade (3 or 4) and a primary complaint of infection were favorable candidates for TORS. However, we want to emphasize the importance of thoroughly considering conservative treatment options before proceeding with TORS, as surgical intervention inherently carries risks. Chronic inflammation of LT, similar to the palatine and adenoid tonsils, may necessitate conservative treatment via recurrent antibiotics and corticosteroids usage, adversely impacting the quality of life for affected individuals [30]. Results of our cohort may aid in a clearer understanding when surgical intervention may be more beneficial.

Future studies should explore the prevalence and incidence of CLT in the general population as it remains unknown. Additionally, investigating the frequency of postoperative tonsillitis episode after TORS and comparing it to conventional treatment with antibiotics would be valuable. In this way, intention-to-treat analyses could be done which is of importance given the cost considerations of TORS compared to conservative treatments and (inter)national protocols could be made.

6 | Conclusion

The study suggests that TORS positively influences quality of life and swallowing, as indicated by patient-reported outcomes. Additionally, TORS successfully removes LT, which may contribute to the relief of tonsillitis symptoms. Moreover, TORS appears to be a safe procedure for these patients, with a low incidence of postoperative complications.

Acknowledgments

L.Q.S. and R.E.P. conceived the study, led its design, and edited the manuscript, while AGLT conducted data analysis and contributed to writing and editing the manuscript. All authors reviewed and approved the final version of the manuscript, ensuring its integrity and accuracy.

Ethics Statement

The study has been registered in the Regionale Toetsingcommisie Patientgebonden Onderzoek (RTPO) research register (case number nWMO2021-0023) and Institutional Review Board of the MCL has assessed the study and judged that no ethical approval is needed in accordance with Dutch Medical Research Law legislation.

Conflicts of Interest

The authors declare no conflicts of interest.

Data Availability Statement

The data that support the findings of this study are available from the corresponding author upon reasonable request.

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Appendix A

TABLE A1 | STROBE statement—checklist of items that should be included in reports of cohort studies.

	Item no.	Recommendation
Title and abstract	1	(a) Indicate the study's design with a commonly used term in the title or the abstract
		(b) Provide in the abstract an informative and balanced summary of what was done and what was found
Introduction		
Background/rationale	2	Explain the scientific background and rationale for the investigation being reported
Objectives	3	State specific objectives, including any prespecified hypotheses
Methods		
Study design	4	Present key elements of study design early in the paper
Setting	5	Describe the setting, locations, and relevant dates, including periods of recruitment, exposure, follow-up, and data collection
Participants	6	(a) Give the eligibility criteria, and the sources and methods of selection of participants. Describe methods of follow-up
		(b) For matched studies, give matching criteria and number of exposed and unexposed
Variables	7	Clearly define all outcomes, exposures, predictors, potential confounders, and effect modifiers. Give diagnostic criteria, if applicable
Data sources/measurement	8[a]	For each variable of interest, give sources of data and details of methods of assessment (measurement). Describe comparability of assessment methods if there is more than one group
Bias	9	Describe any efforts to address potential sources of bias
Study size	10	Explain how the study size was arrived at
Quantitative variables	11	Explain how quantitative variables were handled in the analyses. If applicable, describe which groupings were chosen and why
Statistical methods	12	(a) Describe all statistical methods, including those used to control for confounding
		(b) Describe any methods used to examine subgroups and interactions
		(c) Explain how missing data were addressed
		(d) If applicable, explain how loss to follow-up was addressed
		(e) Describe any sensitivity analyses
Results		
Participants	13[a]	(a) Report numbers of individuals at each stage of study—for example—numbers potentially eligible, examined for eligibility, confirmed eligible, included in the study, completing follow-up, and analyzed
		(b) Give reasons for nonparticipation at each stage
		(c) Consider use of a flow diagram
Descriptive data	14[a]	(a) Give characteristics of study participants (e.g., demographic, clinical, social) and information on exposures and potential confounders
		(b) Indicate number of participants with missing data for each variable of interest
		(c) Summarize follow-up time (e.g., average and total amount)
Outcome data	15[a]	Report numbers of outcome events or summary measures over time
Main results	16	(a) Give unadjusted estimates and, if applicable, confounder-adjusted estimates and their precision (e.g., 95% confidence interval). Make clear which confounders were adjusted for and why they were included
		(b) Report category boundaries when continuous variables were categorized
		(c) If relevant, consider translating estimates of relative risk into absolute risk for a meaningful time period

(Continues)

TABLE A1 | (Continued)

	Item no.	Recommendation
Other analyses	17	Report other analyses done—for example—analyses of subgroups and interactions, and sensitivity analyses
Discussion		
Key results	18	Summarize key results with reference to study objectives
Limitations	19	Discuss limitations of the study, taking into account sources of potential bias or imprecision. Discuss both direction and magnitude of any potential bias
Interpretation	20	Give a cautious overall interpretation of results considering objectives, limitations, multiplicity of analyses, results from similar studies, and other relevant evidence
Generalizability	21	Discuss the generalizability (external validity) of the study results
Other information		
Funding	22	Give the source of funding and the role of the funders for the present study and, if applicable, for the original study on which the present article is based

Note: An explanation and elaboration article discusses each checklist item and gives methodological background and published examples of transparent reporting. The STROBE checklist is best used in conjunction with this article (freely available on the web sites of PLoS Medicine at http://www.plosmedicine.org/, Annals of Internal Medicine at http://www.annals.org/, and Epidemiology at http://www.epidem.com/). Information on the STROBE Initiative is available at http://www.strobe-statement.org.

[a]Give information separately for exposed and unexposed groups.