

# Should paediatric tonsillar asymmetry be an indication for tonsillectomy? A single centre experience

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## ABSTRACT

**BACKGROUND:** Paediatric tonsillar lymphoma (TL) is a rare diagnosis. Historically, the presence of clinical features such as tonsillar asymmetry, grossly abnormal tonsil appearance and cervical lymphadenopathy raise concern for this diagnosis. Tonsillar asymmetry is considered to be the most concerning clinical feature; however, asymmetry is often apparent due to differences in depth or shape of tonsillar fossa and tonsillar pillars, rather than a true difference in volume. There is debate whether a tonsillectomy is required in all cases of tonsil asymmetry to exclude lymphoma, and what clinical features should raise concern. The aim of this study was to establish whether the presence of clinical asymmetry can be deemed a reliable marker for genuine tonsil size discrepancies. We also sought to evaluate the clinical and examination characteristics that are concerning for lymphoma.

**METHODS:** Retrospective review of clinical records for paediatric tonsil specimens sent for histological evaluation between 1 January 2012 and 1 January 2023 driven by a clinical suspicion of lymphoma at Starship Children's Hospital, New Zealand. Patient demographics and clinical data were recorded. A comparison was made between tonsil size asymmetry on clinical examination (Brodsky criteria) and tonsil volume difference based on dimensions given in pathology reports.

**RESULTS:** One hundred and forty-three patients had tonsillectomies between 2012 and 2022 at Starship Children's Hospital due to concern for lymphoma. Of these, three were positive for lymphoma. Presence of pain and abnormal tonsil appearance were predictors for lymphoma ( $p < 0.02$ ). Interrater reliability agreement between clinical size difference and tonsil volume was poor,  $\text{Kappa} = -0.13$   $p < 0.05$ .

**CONCLUSION:** Clinical size difference is a poor predictor for true tonsil volume difference. We advise that assessment of tonsil size should be performed in conjunction with the examination of gross visual abnormalities and lymphadenopathy to guide clinical decision making.

Paediatric tonsillar lymphoma (TL) is a rare diagnosis. Historically, a clinical examination finding of tonsillar asymmetry has been associated as a "red flag" for TL, and, as such, many children in our centre undergo tonsillectomy based on asymmetrical tonsillar size during clinical assessment.<sup>1</sup> Aside from size asymmetry, other features have been associated with TL, including rapid enlargement in size of tonsil, grossly abnormal appearance (colour, shape), immunosuppressed populations and presence of cervical lymphadenopathy.<sup>1-3</sup>

Lymphoma accounts for 12% of malignancy in children.<sup>4</sup> The most common lymphoma occurring within Waldeyer's ring is non-Hodgkin's lymphoma (NHL).<sup>2</sup> The most common NHL subtypes found in children are Burkitt lymphoma, followed by diffuse large B-cell lymphoma (DLBCL). Both are aggressive malignancies, making early diagnosis

a key factor in influencing survival rates.<sup>3,5</sup>

There are no strict international guidelines recommending tonsillectomy for clinical size asymmetry alone.<sup>5</sup> However, tonsillar asymmetry continues to be a well-recognised indication for tonsillectomy both globally and in our centre. Presumably, this is due to the significance of a delayed diagnosis of lymphoma weighed against relatively low rates of complications following tonsillectomy.

However, clinical examination techniques of tonsillar size are based on examination of the exophytic portion of the tonsil only, such as the Brodsky criteria.<sup>6</sup> As such, asymmetry in size is often apparent due to differences in depth or shape of tonsillar fossa and tonsillar pillars, rather than a true difference in volume between the two tonsils.<sup>2</sup>

The aim of this retrospective case series is

to evaluate the accuracy of examination-based tonsillar asymmetry compared with true volumetric differences. We seek to establish whether the presence of clinical asymmetry can be deemed as a reliable marker for genuine tonsil size discrepancies (volume difference), thereby warranting tonsillectomy in these patients. In addition, we aim to identify any risk factors or protective factors associated with paediatric TL from history and clinical examination. These findings will serve to enhance the clinical assessment of paediatric patients who exhibit features of concern and help clinicians make more informed decisions regarding the need for tonsillectomy.

## Methods

Data were obtained from the Starship Child Health (SCH) Clinical Records department following institutional approval through the SCH Research Office. Records were obtained for all patients who underwent a tonsillectomy or tonsil biopsy by ORL between 1 January 2012 and 1 January 2023. Patients were included in analysis if tonsil tissue was sent for histological analysis due to clinical concern for lymphoma. Patients with tonsil biopsy and formal tonsillectomy were included. Patients were excluded if the indication for histology was not due to a clinical concern for malignancy. Clinical concern for lymphoma was determined by documentation of presence of tonsillar asymmetry in size (difference of equal to or greater than 1 Brodsky grade between sides), abnormal appearance of tonsil tissue (asymmetry in shape, colour), abnormal palpation consistency, presence of B symptoms or cervical lymphadenopathy. The following demographic data were collected: age, sex and ethnicity. Ethnicity categories were NZ European, Māori, Asian, Pacific peoples and other. Clinical data for lymphoma association analysis included concurrent history of recurrent tonsillitis, sleep disordered breathing (SDB), type B symptoms, clinical examination findings and viral serology.

Outcome data included histology results and volume of tonsils. Tonsil volume was determined using dimensions provided in the pathology report, assuming a roughly cuboidal shape for each tonsil: length x width x height (mm). Tonsil volume difference was determined by the volume difference between sides. Tonsil volume was only calculated in patients who underwent bilateral tonsillectomy. Clinical size asymmetry was calculated by subtracting the Brodsky grade difference

between left and right tonsil. We compared clinical size asymmetry with volume difference.

## Statistical analysis

Patients' demographics and clinical characteristics were summarised using descriptive statistics. Chi-squared test was applied to examine the association between histology and patient factors. Spearman's coefficient was used to detect for correlations between clinical size difference and volume difference. With our sample size ( $n=91$ ), we were powered to detect a small to moderate correlation between these two variables ( $r=0.27$ ), assuming a power of 80% and alpha (type I error) of 0.05. Interrater reliability testing using Kappa was used to evaluate the level of agreement between clinical size difference and volume difference. To facilitate interrater reliability testing, volume difference was divided into four categories using quartiles, with the median as the central dividing point. A two-tailed  $p$ -value  $<0.05$  was regarded as statistically significant. Statistical analyses were carried out using SAS 9.4 (SAS Institute Inc., Cary, NC, USA.) and SPSS 28 (SPSS, IBM, USA).

## Results

A total of 143 patients had tonsillectomy or tonsillar biopsy at SCH between 1 January 2012 and 1 January 2023 due to clinical concern for paediatric tonsillar lymphoma. Patients were more commonly male (61.5%) and of NZ European ethnicity (41.3%), with a mean age of 7.2 years (SD 4.2). Patient demographics are summarised in Table 1. Twenty-two patients (14.8%) had tonsillar biopsy (18 of these were in combination with coblation tonsillectomy) and 113 had excisional tonsillectomy (76.3%). The remaining 13 had no operation note available (8.8%).

Clinical concern for possible malignancy was the primary reason for tonsillectomy or tonsillar biopsy in all 143 patients subject to analysis. The primary reason for lymphoma concern was clinical size asymmetry in 113 (79.0%) cases. Additionally, 35 (24.5%) patients were noted to have cervical lymphadenopathy, 42 (29.4%) had abnormal appearance of the tonsils (colour, shape, texture), seven (4.5%) had abnormal palpation, four (2.8%) had weight loss and five (3.5%) had night sweats. These findings are further characterised in Table 2.

There were three confirmed diagnoses of lymphoma in our series—one case of DLBCL, one with high-grade B-cell lymphoma and one case

of Burkitt lymphoma. The remaining histology results were benign.

Figure 1 compares clinical size asymmetry to volumetric difference for the 91 patients included in this analysis. Two of the three lymphoma cases were in this analysis, and both had large differences in volumetric difference between tonsils (represented on the graph as the two most significant volume difference outliers). The Spearman's correlation coefficient for clinical size difference and volume difference was  $-0.1$   $p=0.36$ . The Kappa value of overall agreement between clinical size difference and volume difference was  $-0.13$   $p<0.05$ .

Figure 1 shows the comparison of clinical tonsil asymmetry, as defined by a difference in Brodsky grades, compared with a volumetric difference ( $\text{mm}^3$ ) of tonsils based on histology results. The two statistical outliers in "1 grade difference" and "2 grades difference" represent the patients who had a diagnosis of lymphoma, further highlighting how abnormal they appeared compared to the larger population.

## Discussion

Paediatric tonsillar lymphoma is a rare but serious diagnosis in the paediatric population.<sup>4</sup>

Our results, like previous studies, emphasise the rarity of paediatric tonsillar lymphoma, with only three diagnoses of lymphoma over an 11-year period.<sup>3,4,7</sup> Features of clinical size asymmetry, abnormal appearance and cervical lymphadenopathy are among the "red flag" features for TL.<sup>4</sup> While typically present in TL, tonsillar asymmetry is also relatively common in benign tonsillar pathology.<sup>1</sup> The decision for tonsillectomy in children with tonsillar asymmetry alone is a topic of debate among otolaryngologists. Many do not recommend routine tonsillectomy for children with tonsillar size asymmetry in the absence of other concerning features, due to high rates of benign tonsillar asymmetry in children.<sup>1-3</sup>

Tonsil asymmetry is over-diagnosed in patients due to variability in tonsillar fossa shape and depth creating the appearance of asymmetry.<sup>8</sup> Despite multiple criteria assessing clinical size asymmetry, in our literature search we found no criteria for determining clinically significant tonsillar volume difference after excision.<sup>8</sup> As such, we calculated a difference in tissue volume and compared this to a difference in Brodsky grades as a crude measure to assess clinical accuracy at determining size asymmetry.

With our study numbers we would be able

**Table 1:** Patient demographics.

| Demographics     |              |
|------------------|--------------|
| <b>Age</b>       | <b>Years</b> |
| Mean (SD)        | 7.2 (4.2)    |
| 95% CI           | 6.5–7.9      |
| Range            | 0.9–16.6     |
| <b>Gender</b>    | <b>N (%)</b> |
| Female           | 55 (41.3%)   |
| Male             | 88 (61.5%)   |
| <b>Ethnicity</b> |              |
| NZ European      | 59 (41.3%)   |
| Māori            | 21 (14.7%)   |
| Pacific peoples  | 24 (16.8%)   |
| Asian            | 22 (15.4%)   |
| Other ethnicity  | 17 (11.9%)   |

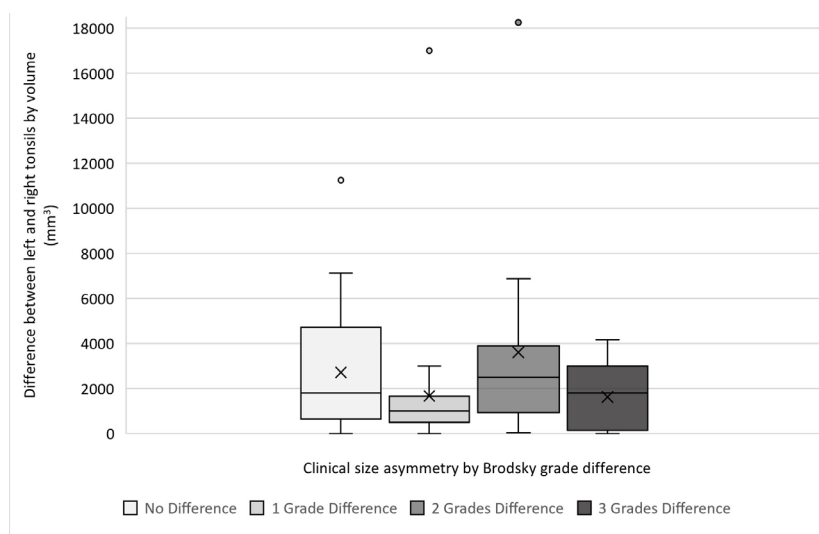
**Table 2:** Clinical presentation in patients with concern for tonsillar lymphoma.

|                             | Histology        |                  |                |                   |
|-----------------------------|------------------|------------------|----------------|-------------------|
|                             | Benign:<br>n=140 | Lymphoma:<br>n=3 | Total<br>n=143 | P-value           |
| <b>Symptom:</b>             |                  |                  |                |                   |
| Recurrent tonsillitis       | 45 (32.1%)       | 2 (66.7%)        | 47 (32.9%)     | 0.25              |
| Sleep disordered breathing  | 94 (67.1%)       | 2 (66.7%)        | 96 (67.1%)     | 0.99              |
| Pain                        | 35 (25.0%)       | 3 (100%)         | 38 (26.6%)     | <b>0.02*</b>      |
| Weight loss                 | 4 (2.9%)         | 0 (0%)           | 4 (2.9%)       | 0.99              |
| Night sweats                | 5 (3.6%)         | 0 (0%)           | 5 (3.6%)       | 0.99              |
| Fatigue                     | 21 (15.0%)       | 2 (66.7%)        | 23 (16.1%)     | 0.07              |
| <b>Clinical signs:</b>      |                  |                  |                |                   |
| Asymmetry on exam           | 110 (78.6%)      | 3 (100%)         | 113 (79.0%)    | 0.99              |
| Difference in Brodsky grade |                  |                  |                |                   |
| 1 grade difference          | 32 (22.9%)       | 1 (33.3%)        |                |                   |
| 2 grade difference          | 19 (13.5%)       | 1 (33.3%)        |                |                   |
| 3 grade difference          | 8 (5.7%)         | 0 (0.0%)         |                |                   |
| Cervical lymphadenopathy    |                  |                  |                |                   |
| Present                     | 33 (23.6%)       | 2 (66.7%)        | 35 (24.5%)     | 0.21 <sup>+</sup> |
| Not documented              | 67 (47.9%)       | 1 (33.3%)        | 68 (47.6%)     |                   |
| Abnormal appearance         | 39 (27.9%)       | 3 (100%)         | 42 (29.4%)     | 0.02*             |
| Palpation                   |                  |                  |                |                   |
| Abnormal on palpation       | 6 (4.3%)         | 1 (33.3%)        | 7 (4.9%)       | 0.35 <sup>+</sup> |
| Not documented              | 121 (86.4%)      | 2 (66.7%)        | 123 (86.0%)    |                   |
| <b>Serology:</b>            |                  |                  |                |                   |
| EBV                         |                  |                  |                |                   |
| Positive                    | 14 (10.0%)       | 1 (33.3%)        | 15 (10.5%)     | 0.50 <sup>+</sup> |
| Negative                    | 5 (3.6%)         | 1 (33.3%)        | 6 (4.2%)       |                   |
| Not tested                  | 121 (86.4%)      | 1 (33.3%)        | 122 (85.3%)    |                   |
| HIV                         |                  |                  |                |                   |
| Positive                    | 0 (0%)           | 0 (0%)           | 0 (0%)         |                   |
| Negative                    | 16 (11.4%)       | 2 (66.7%)        | 18 (12.6%)     |                   |
| Not tested                  | 124 (88.6%)      | 1 (33.3%)        | 125 (87.4%)    |                   |

\*Statistically significant result

<sup>+</sup>Data not documented excluded from analysis

**Figure 1:** Clinical tonsil asymmetry by Brodsky grade compared to difference in volume between tonsils on histology.



to expect to detect at least a weak to moderate correlation between variables by Spearman's testing if there was a correlation present. In our study, the combination of Spearman's coefficient (-0.1)  $p > 0.5$  and Kappa value (-0.13)  $p < 0.05$  suggest at most a very weak correlation between clinical size difference and volume difference, but in a negative direction, which is contradictory to what we would expect clinically. The low Kappa value and lack of a statistically significant Spearman's coefficient suggest that there are significant discrepancies between these variables; this point is further highlighted by the graph in Figure 1.<sup>9</sup> As such, we have shown that clinical assessment is likely to be a poor predictor of true tonsillar volume asymmetry and advise that decision making around tonsillectomy should not be based solely on Brodsky grading asymmetry. These results are consistent with other literature whereby depth and shape of tonsil fossa can cause apparent differences in size, as Brodsky grading is chosen based on the exophytic portion of the tonsils only.<sup>6</sup>

Previous studies have suggested basing tonsillectomy criteria on clinical tonsil size difference of  $>2$  on the Brodsky scale; however, by using this criterion we would have missed one of our lymphoma cases who only had a one-point Brodsky grade difference on clinical exam.<sup>3</sup> This patient had a large volume difference between tonsils, despite only a 1 Brodsky grade difference, which further highlights the inaccuracies between clinical examination of tonsillar size and true

volume asymmetry on histological analysis. We noted that the two lymphoma patients included in the volumetric analysis were significant outliers in terms of tonsillar volumetric asymmetry (as seen in Figure 1). While clinical examination may not be a good indicator of tonsillar volume, other studies have suggested that the use of tonsillar ultrasound could be used to determine true tonsillar asymmetry.<sup>10,11</sup>

All three lymphoma cases in our study presented with asymmetrical-sized tonsils, and in all cases the affected tonsil had a markedly abnormal appearance (discolouration and shape). Two of the three had cervical lymphadenopathy. In our study, risk factors associated with lymphoma diagnosis were the presence of pain ( $p < 0.02$ ) and abnormal appearance of tonsil ( $p < 0.02$ ) (shape, colour). A systematic review of paediatric TL recommends high suspicion for TL in children with asymmetrical tonsils, combined with cervical lymphadenopathy or an abnormal tonsil appearance.<sup>4</sup> Case series and review articles similarly note a high presence of these features in TL cases.<sup>1-4,12</sup>

Night sweats and weight loss were not present in any of our lymphoma cases. Due to the small numbers of lymphoma seen in our study, it is difficult to draw statistical conclusions from these results; however, these findings are consistent with the wider literature. Berkowitz et al. reported B symptoms in less than 30% of TL cases, and Dolev et al. reported no B symptoms present in their six reported TL cases.<sup>1,12</sup> The existing

literature recognises that B symptoms are less frequently observed in cases of NHL than in those with Hodgkin's lymphoma.<sup>4</sup> A review of 66 cases of paediatric TL reported low rates of B symptoms (9% of cases with weight loss and 10% of cases with fevers).<sup>4</sup> Therefore, basing tonsillar asymmetry tonsillectomy criteria on the presence of B symptoms alone could result in failure to identify TL cases.

Studies suggest recurrent tonsillitis and SDB to be important criteria; however, these recommendations appear less often.<sup>1,5</sup> In our study, recurrent tonsillitis was present in 32.1% of benign pathology and 66.7% of TL. SDB was present in 67.1% and 66.7% of benign and TL cases respectively. While features of recurrent tonsillitis and SDB can be present in TL, they present with similarly high prevalence in benign pathology, and may be less useful in determining clinical suspicion of TL. Recurrent tonsillitis and SDB are independent factors for tonsillectomy.<sup>5</sup> When these symptoms are combined with asymmetrical tonsils, it may guide clinicians to perform biopsies or use tonsillectomy techniques that promote tissue preservation for histological evaluation.

From the results of our study, we also suggest that clinical size difference should not be a hard indication alone for tonsillectomy in the absence of other concerning features. Due to the rarity of paediatric TL and the inaccuracy of clinically diagnosed tonsillar size asymmetry, we believe that clinical size difference alone could result in unneeded tonsillectomies, or in some cases even stand to miss cases of TL. Instead, we suggest a more holistic approach to assessment based on colour, palpation and shape in conjunction with size to be a better indicator of potential lymphoma.

There were several limitations with this study. In cases where pertinent clinical findings were not documented, it was assumed that these patients had negative findings. As all patients were assessed by the ORL department it was assumed that patients were examined adequately, and that the presence of these findings would have warranted documentation. It is possible that we underestimate the prevalence of some clinical

findings. Furthermore, due to the rare prevalence of TL, statically significant comparison between benign and lymphoma groups was limited. However, the trends displayed in our study mirror current international data. Our assessment of tonsillar volume was based on a simplified assumption of a cuboidal shape and did not consider potential variations in tonsil shape. Similarly, variations in dissection technique, resulting in over or under dissection of the tonsil tissue could not be accounted for. Additionally, while we acknowledge the likelihood of tonsil volume reduction following its removal from the blood supply, we assumed that this reduction would be uniform across both tonsils within the same patient. However, if there were discrepancies between the vascular supply between tonsils within the same patient, they may have impacted volumetric assessment. We do recognise that with our study numbers we could have potentially missed a very weak correlation between tonsillar volume difference and clinical size difference in our Spearman's testing; however, a weak correlation is unlikely to have any clinical significance in this context.

In conclusion, TL is a rare but important differential diagnosis in children and is the concern in a child presenting with tonsils of asymmetrical sizes. In our centre many patients undergo tonsillectomy for clinical assessment of size asymmetry alone. Our study has shown accuracy of clinician-based assessment of tonsillar asymmetry is a poor indicator for true tonsillar size difference. We therefore advise caution in basing decision for tonsillectomy off a difference in Brodsky grade alone. Instead, we advise assessment of size in conjunction with features of gross visual abnormalities (including colour, shape and size), pain and lymphadenopathy to guide clinical decision making. It is also possible that a preoperative radiological volumetric assessment of tonsil size may be a potential future tool worth investigating to determine true tonsillar volume asymmetry preoperatively.

**COMPETING INTERESTS**

None to declare. The corresponding author is not a recipient of a research scholarship. The data have been verbally presented at the South Pacific ORL Forum 2023. Research data are not shared due to privacy or ethical restrictions.

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