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**Original Research Article**

# Histopathological study of upper versus lower poles of tonsil in chronic tonsillitis among pediatric age group

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## ABSTRACT

**Background:** To compare the histopathological findings between upper and lower poles of tonsil in pediatric age group keeping in view the local and distant effects of chronic tonsillitis.
**Methods:** Three relevant parameters, grade of inflammation (GOI), activity of inflammation and hyperplasia were histopathologically examined in the tonsils of n=60 pediatric patients with chronic tonsillitis who underwent tonsillectomy in Department of Otorhinolaryngology and Head and Neck Surgery, VIMS, Ballari, Karnataka, India. These parameters were analyzed and were subjected for statistical analysis.
**Results:** In our study, among 60 patients, n=32 (54.2%) were female and n=28 (45.8%) were male. Those aging 5-10 years were n=34 (57.6%) and 11-15 years were n=26 (42.4%). The tonsillar enlargement of grade 3 were present in n=46 patients (77.7%), n= 12 patients (20%) had grade 2 and n=2 patients (1.3%) had grade 4.
**Conclusions:** The GOI and hyperplasia parameters in our study have highly significant association statistically ($p<0.01$) in histopathology of upper poles when compared with lower poles both sides. Further, the activity of inflammation when analyzed was more in upper pole when compared with lower poles both sides, However this parameter in left side upper and lower poles of tonsil was not statistically significant . Among the 60 cases studied, in all the cases, the GOI was of high grade and activity of inflammation and hyperplasia was low grade. Chronic tonsillitis and histopathology of chronically infected tonsils becomes an important step in the management of the disease.

**Keywords:** Chronic tonsillitis, Grade of inflammation, Activity of inflammation, Hyperplasia, Histopathological examination

## INTRODUCTION

The harmful environmental factors and microbes are defended by the largest accumulation of lymphoid tissue in internal Waldeyer's ring namely palatine tonsils.

The major morbid problem in pediatric age group because of the recurrent infection of tonsils and in the view of indiscriminate use of antibiotics, the chronicity of infection in palatine tonsils and mechanical obstacle for the air passage makes tonsillectomy mandatory even though the palatine tonsils are age dependent involuntary organs.[1-3]

The distant and the local structures like middle ear complex, upper aero digestive tract and the paranasal sinuses are frequently affected in chronic tonsillitis.[4]

This complex impact features of chronic tonsillitis necessitates the thorough study of histopathological findings of the diseased tonsil.

In the view of the above studies literature review, our study aim emphasizes on histopathological findings between upper and lower poles of the tonsil in chronic tonsillitis of pediatric age group.

## METHODS

This was a prospective study conducted from Febraury 2018 to March 2019 in Department of Otorhinolaryngology and Head and Neck Surgery, Vijayanagara Institute of Medical Sciences, Ballari, Karnataka, India.

### *Inclusion criteria*

The study includes 60 chronic tonsillitis patients of pediatric age group of both sexes selected on simple random basis who underwent tonsillectomy in our institution.

### *Exclusion criteria*

Patients >15 years and with local and distant complications of chronic tonsillitis.

Tonsillectomies were performed by cold steel dissection and snare method. The specimens were segregated based on the side and were further separated based on the upper and lower poles of tonsil. They were subjected for histopathological examination. A microscopic evaluation of Haematoxylin and eosin stained slides was performed. A magnification of 40X was used to count lymphocytes and neutrophils and magnification of 10X was used to count the lymphoid follicles.

Three relevant parameters were analyzed in the histopathological evaluation which included: grading of inflammation, activity of inflammation and hyperplasia. They were further scaled as low, medium or high.

Grade of inflammation (GOI) was analyzed (Wittlinger et al) by counting the number of lymphocytes per High Power Field (HPF) as: low is ≤20/HPF, medium=20–40/HPF, high≥40/HPF (Figure 1).

The activity of inflammation was analyzed by counting the number of neutrophil granulocytes per "high power field" as: low≤10/HPF, medium=10–20/HPF, high≥20/HPF (Figure 2).

The hyperplasia was analyzed by counting the number of follicles per Low Power Field (LPF) as: low≤5/LPF, medium=5–10/LPF, high≥10/ LPF (Figure 3).

The results were subjected for statistical analysis.

### *Statistical analysis and methods*

Data was collected by using a structure proforma. Data entered in MS excel sheet and analyzed by using SPSS 23.0 version IBM USA. Qualitative data was expressed in terms of proportions. Quantitative data was expressed in terms of Mean and Standard deviation. Association between two qualitative variables was seen by using Chi square/ Fischer's exact test. Descriptive statistics of each variable was presented in terms of Mean, standard deviation, standard error of mean. A p value of <0.05 was considered as statistically significant whereas a p value <0.001 was considered as highly significant.

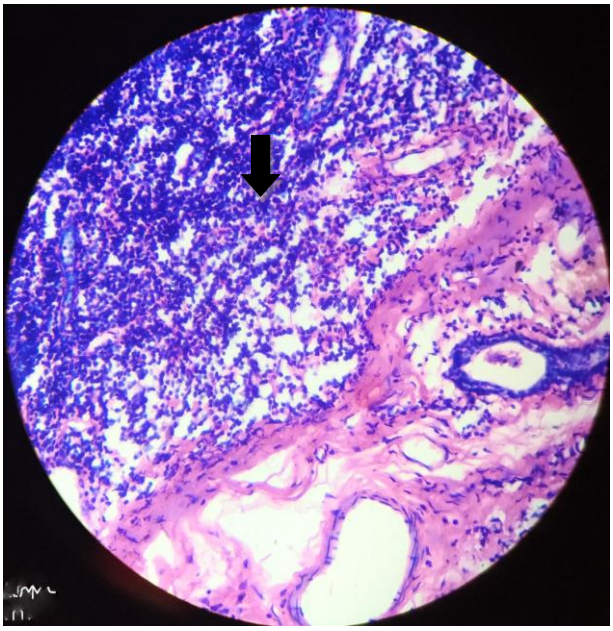

**Figure 1: Histopathological examination under microscope (10X/0.25), lymphocytes (arrow) giving the grade of inflammation parameter.**

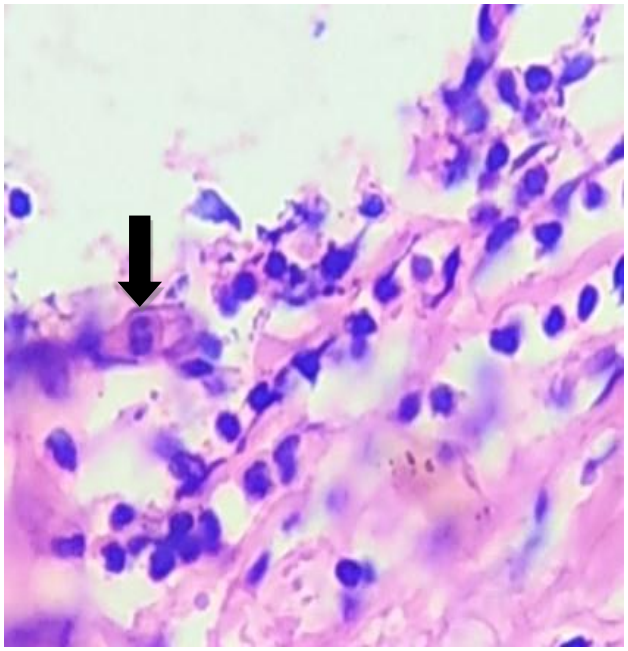

**Figure 2: Histopathological examination under microscope (40X/0.25), neutrophil (arrow) giving the activity of inflammation parameter.**

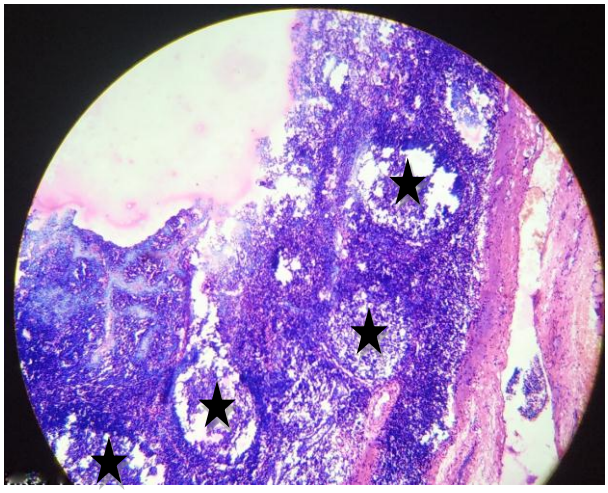

**Figure 3: Histopathological examination under microscope (10X/0.25), lymphoid follicles (star) giving the hyperplasia parameter.**

## RESULTS

In our study, Out of 60 patients, n=32 (54.2%) were female and n=28 (45.8%) were male (Table 1). Those aging 5-10 years were n=34 (57.6%) and 11-15years were n=26 (42.4%) (Table 2). n=46 patients had grade 3 tonsillar enlargement (77.7%), n=12 patients (20%) had grade 2 and n=2 patients (1.3%) had grade 4 tonsillar enlargement (Table 3).

**Table 1: Distribution according to age.**

| Age group in years | Frequency | % |
|---|---|---|
| **5-10** | 34 | 57.6 |
| **11-15** | 26 | 42.4 |
| **Total** | 60 | 100.0 |

**Table 2: Distribution according to gender.**

| Gender | Frequency | % |
|---|---|---|
| **Female** | 32 | 54.2 |
| **Male** | 28 | 45.8 |
| **Total** | 60 | 100.0 |

**Table 3: Distribution according to grade of tonsillar enlargement.**

| Oropharynx (grade of tonsil enlargement) | Frequency | % |
|---|---|---|
| **Grade 2** | 12 | 20.0 |
| **Grade 3** | 46 | 77.7 |
| **Grade 4** | 2 | 1.3 |
| **Total** | 60 | 100.0 |

**Table 4: Results of the number of lymphocytes, neutrophils and follicles in both sided upper and lower poles of tonsils.**

| | N | Mean | SD | SE | Range | Minimum | Maximum |
|---|---|---|---|---|---|---|---|
| **RU lymphocytes** | 60 | 128.31 | 26.98 | 3.51 | 140 | 60 | 200 |
| **RU neutrophils** | 60 | 3.17 | 2.76 | 0.36 | 10 | 0 | 10 |
| **RU follicles** | 60 | 3.86 | 0.57 | 0.07 | 3 | 2 | 5 |
| **RL lymphocytes** | 60 | 116.44 | 30.95 | 4.03 | 140 | 60 | 200 |
| **RL neutrophils** | 60 | 2.36 | 3.09 | 0.40 | 20 | 0 | 20 |
| **RL follicles** | 60 | 2.93 | 0.67 | 0.09 | 2 | 2 | 4 |
| **LU lymphocytes** | 60 | 123.73 | 27.09 | 3.53 | 150 | 40 | 190 |
| **LU neutrophils** | 60 | 2.56 | 3.04 | 0.40 | 20 | 0 | 20 |
| **LU follicles** | 60 | 3.75 | 0.54 | 0.07 | 3 | 2 | 5 |
| **LL lymphocytes** | 60 | 115.42 | 29.44 | 3.83 | 140 | 50 | 190 |
| **LL neutrophils** | 60 | 2.22 | 2.53 | 0.33 | 15 | 0 | 15 |
| **LL follicles** | 60 | 2.93 | 0.67 | 0.09 | 2 | 2 | 4 |

**Table 5: Results of the grade of inflammation, activity of inflammation, hyperplasia in right and left side upper and lower poles.**

| Parameter | Side/pole | N | Mean | SD | t | p | Inference |
|---|---|---|---|---|---|---|---|
| **Grades of inflammation: lymphocytes** | Right upper | 60 | 128.31 | 26.98 | 4.028 | 0.0001 (<0.001) | Highly significant |
| | Right lower | 60 | 116.44 | 30.95 | | | |
| **Activity of inflammation: neutrophils** | Right upper | 60 | 3.17 | 2.76 | 2.256 | 0.0278 (<0.05) | Significant |
| | Right lower | 60 | 2.36 | 3.09 | | | |
| **Hyperplasia: follicles** | Right upper | 60 | 3.86 | 0.57 | 11.195 | 0.0001 (<0.001) | Highly significant |
| | Right lower | 60 | 2.93 | 0.67 | | | |
| **Grades of inflammation: lymphocytes** | Left upper | 60 | 123.73 | 27.09 | 3.319 | 0.0001 (≤0.001) | Highly significant |
| | Left lower | 60 | 115.42 | 29.44 | | | |

Continued.

| Parameter | Side/pole | N | Mean | SD | t | p | Inference |
|---|---|---|---|---|---|---|---|
| **Activity of inflammation: neutrophils** | Left upper | 60 | 2.56 | 3.04 | 1.174 | 0.2451 (>0.05) | Not significant |
| | Left lower | 60 | 2.22 | 2.53 | | | |
| **Hyperplasia: follicles** | Left upper | 60 | 3.75 | 0.54 | 7.626 | 0.0001 (<0.001) | Highly significant |
| | Left lower | 60 | 2.93 | 0.67 | | | |

**Table 6: Results of the grade of inflammation, activity of inflammation, hyperplasia in right and left side upper and lower poles comparison.**

| | Group | N | Mean | SD | t | p | Inference |
|---|---|---|---|---|---|---|---|
| **Lymphocytes** | Right upper | 60 | 128.31 | 26.98 | 0.919 | 0.360 (>0.05) | Not significant |
| | Left upper | 60 | 123.73 | 27.09 | | | |
| **Neutrophils** | Right upper | 60 | 3.17 | 2.76 | 1.142 | 0.256 (>0.05) | Not significant |
| | Left upper | 60 | 2.56 | 3.04 | | | |
| **Follicles** | Right upper | 60 | 3.86 | 0.57 | 1.155 | 0.250 (>0.05) | Not significant |
| | Left upper | 60 | 3.75 | 0.54 | | | |
| **Lymphocytes** | Right lower | 60 | 116.44 | 30.95 | 0.183 | 0.855 (>0.05) | Not significant |
| | Left lower | 60 | 115.42 | 29.44 | | | |
| **Neutrophils** | Right lower | 60 | 2.36 | 3.09 | 0.261 | 0.795 (>0.05) | Not significant |
| | Left lower | 60 | 2.22 | 2.53 | | | |
| **Follicles** | Right lower | 60 | 2.93 | 0.67 | 0.000 | 1.000 (>0.05) | Not significant |
| | Left lower | 60 | 2.93 | 0.67 | | | |

Among the 60 cases studied, in all the cases, the GOI was of high grade and activity of inflammation and hyperplasia were of low grade (Table 4).

Based on the above parameters assessment, grade of inflammation and hyperplasia is found more in upper poles of tonsil irrespective of the side which means was highly significant ($p<0.001$) (Table 5 and 6). The activity of inflammation is more in upper poles of tonsil on right side and so was significant ($p<0.05$) though it was not significant on the left side (Table 5).

## DISCUSSION

The palatine tonsils are aggregates of lymphoid tissue located in the pocket formed between palatoglossus and palatopharyngeus muscles which make up anterior and posterior pillars and the overlying folds of mucosa.[6] Each palatine tonsil is covered by a stratified, non-keratinizing epithelium.

They are part of mucosa associated lymphatic tissue (MALT), a specialized compartment of immune system, initiating immune responses against antigens entering the body through the mouth or nose with greatest immunological activity between the ages of 3 and 10 years and thus are prominent during this period of childhood and later demonstrate age dependent involution.[1,7,8] The epithelium of tonsil is cryptic and reticulated and contains system of specialized channels which are lined by M cells which take up antigens into vesicles and then transporting them to lymphoid follicles/ extra follicular region. With recurrent tonsillar infections, this controlled process of antigen transport and presentation is altered due to shedding of the M cells from the tonsillar epithelium.[9] With recurrent infections, tonsil is no longer able to function for local protection adequately.

On histology, tonsils consist of lymphoid tissue with aggregates of lymphocytes arranged in follicular manner and embedded in stroma of connective tissue.[7]

In children and adolescents, chronic tonsillitis is one of the most prevalent infectious diseases.[10] The diagnosis of chronic tonsillitis is done clinically according to the Paradise criteria which is based on the recurrent sore throat episodes in subsequent period of years.[11] By definition, removal of tonsil with or without adenoidectomy dissected out in the plane of peritonsillar space between superior constrictor muscle and tonsillar capsule.[12] In the pediatric age group, tonsillectomy is performed as one of the common surgical procedures by the otorhinolaryngologist.[13]

In the literature, very few studies compared the histopathological findings between the two poles of tonsil and both sided tonsils. This study is therefore performed considering chronic tonsillitis patients of pediatric age group undergoing tonsillectomy and focusing on the histopathological examination of the upper and lower poles of tonsillar specimens of both sides.

Similar study was performed by Jovic et al where, they studied the ultrastructure of different morphological compartments in eighteen tonsillar specimen samples from the patients who underwent tonsillectomy, indicated for chronic tonsillitis.[14]

Ugras et al in their study concluded that slight to moderate or diffuse lymphocytic infiltrations in the surface epithelium is one of the histopathological findings of chronic tonsillitis.[15]

In a study conducted by Mohammed Ali Hiari, the histopathological examination of tonsillectomy specimens showed chronic lymphoid hyperplasia in 95% of cases.[16]

**I**n our study, we considered defining three parameters: grade of inflammation, activity of inflammation and hyperplasia of lymphoid follicles. The grade of inflammation and the hyperplasia parameters in our study have highly significant association statistically ($p<0.01$) in the histopathology of upper poles when compared with lower poles both sides. Further, the activity of inflammation when analyzed was more in upper pole when compared with lower poles both sides. However, parameter activity of inflammation in the histopathology of left side upper and lower poles of tonsil was not statistically significant. Among the 60 cases studied, in all the cases, the GOI was of high grade and activity of inflammation and hyperplasia were of low grade.

Wittlinger et al conducted a similar study on histopathological examination of tonsils where the above same parameters were analyzed and compared separately in pharyngeal and basal parts of tonsils as in three sections upper, lower pole and middle part of tonsillar specimens of 100 adult patients with chronic recurrent tonsillitis. They concluded that the grade of inflammation and activity, as well as the follicular hyperplasia in higher graded inflammatory processes is located more in the basal parts of the tonsils.[5]

## CONCLUSION

The grade of inflammation and the hyperplasia parameters in our study have highly significant association statistically ($p<0.01$) in the histopathology of upper poles when compared with lower poles both sides indicating the persistence of the inflammation more in upper pole when compared to lower poles. Further, the activity of inflammation when analyzed was more in upper pole when compared with lower poles both sides. However, parameter activity of inflammation in the histopathology of left side upper and lower poles of tonsil was not statistically significant, indicating the frequent involvement of right palatine tonsil in the complications such as peritonsillitis and quinsy. Among the 60 cases studied, in all the cases, the GOI was of high grade and activity of inflammation and hyperplasia were of low grade.

As the spaces of head and neck are communicated directly or indirectly to the peritonsillar/ tonsillar space to each other, and the visceral vascular compartment is the Lincoln's highway, alarms the need of understanding the local and distant complications of chronic tonsillitis.

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## REFERENCES

1. Jung KY, Lim HH, Choi G, Choi JO. Age-related changes of IgA immunocytes and serum and salivary IgA after tonsillectomy. Acta Otolaryngol Suppl. 1996;523:115-9.
2. Chole RA, Faddis BT. Anatomical evidence of microbial biofilms in tonsillar tissues:a possible mechanism to explain chronicity. Arch Otolaryngol. 2003;129(6):634– 6.
3. Messnerand AH, Pelayo R. Pediatric sleep-related breathing disorders. Am J Otolaryngol. 2000;21(2):98–107.
4. Bista M, Amatya RCM, Basnet P. Tonsillar microbial flora: a comparision of infected and noninfected tonsils. Kathmandu Univ Med J. 2006;13(4):18-21.
5. Wittlinger J, Stankovic P, Girrbach U, Gradistanac T, Güldner C, Teymoortash A, et al. Hyperplasia and the degree and activity of inflammation in chronic recurrent tonsillitis: a histopathological study. Eur Arch Otorhinolaryngol. 2017;274(7):2927-32.
6. Mckerrow WS. Diseases of tonsil. In: Gleeson M, Browning GG, Burton MJ, Clarke R, Hibbert J, Jones NS, et al (eds). Scott-Brown's Otorhinolaryngology, Head and Neck Surgery. 7th edtiton. 95th Volume, Newyork, NY: Edward Arnold; 2008: 1219-1228.
7. Perry M, Whyte A. Immunology of the tonsils. Immunol Today. 1998;19:414–21.
8. Richardson MA. Sore throat, tonsillitis , and adenoiditis. Med Clin North Am.1999;83:75-83.
9. Brandtzaeg P. Immune functions and immunopathology of palatine and nasopharyngeal tonsils. In: Benstein JM, Ogra PL (eds). Immunology of the Ear. Newyork, NY: Raven Press; 1987: 63-106.
10. Gerber, MA. Diagnosis of group a beta-haemolytic streptococcal. J Paediatrics. 1998;27:269-73.
11. Paradise JL, Bluestone CD, Bachman RZ, Colborn DK, Bernard BS, Taylor FH, et al. Efficacy of tonsillectomy for recurrent throat infection in severely affected children: results of parallel randomized and non-randomized clinical trials. N Engl J Med. 1984;310:674-83.
12. Mitchell RB, Archer SM, Ishman SL, Rosenfeld RM, Coles S, Finestone SA. Clinical Practice Guideline: Tonsillectomy in Children (Update). Am Acad Otolaryngol Head Neck Surg. 2019;160(IS):S1-S42.
13. Dohar JE, Bonilla JA. Processing of adenoid and tonsil specimens in children: a national survey of standard practices and a five-year review of the

experience at the Chil-dren's Hospital of Pittsburgh, Otolaryngol Head Neck Surg.1996;115:94—7.
14. Jovic M, Avramovic V, Vlahovic P, Savic V, Velickov A, Petrovic V. Ultrastructure of the human palatine tonsil and its functional significance. Rom J Morphol Embryol Rev Roum Morphol Et Embryol. 2015;56(2):371–7.
15. Ugras S, Kutluhan A. Chronic Tonsillitis can be diagnosed with Histopathologic findings. Eur J Gen Med. 2008;5(2):95-103.
16. Hiari MA. Histopathology of the Tonsil- Is it Important. Bahrain Med Bull. 1999;21(2):58-9.

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