

Original Research Article

HISTOPATHOLOGICAL SPECTRUM OF ROUTINE TONSILLECTOMY AND ADENOIDECTOMY SPECIMENS IN PEDIATRIC PATIENTS

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ABSTRACT

Background: One of the most frequently performed surgeries in children is tonsillectomy and adenoidectomy, typically performed to treat obstructive airways symptoms and recurrent infections. Although the presence of unexpected pathological findings in children is rare, routine histopathological examination of excised specimens is still common practice. **Objective:** The purpose of this study was to determine the histopathological spectrum of the common tonsillectomy and adenoidectomy specimens of children.

Materials and Methods: A retrospective cross sectional study was performed on 180 children (3-16 years) who underwent tonsillectomy or adenoidectomy during a two-year period. Medical records were used for clinical and demographic data, and all surgical specimens were analysed with the conventional histopathological methods, including hematoxylin and eosin staining. To summarise results, descriptive statistical analysis was used.

Results: The most frequently observed finding was reactive lymphoid hyperplasia (128, 71.1%), followed by chronic nonspecific tonsillitis (39, 21.7%), follicular hyperplasia (9, 5.0%) and acute inflammatory changes (4, 2.2%). No dysplasia, any type of lymphoma or malignant tumors were revealed. There were no unusual clinically significant lesions found and the histopathological results were consistent with the clinical indications for surgery.

Conclusion: The results of this study show that the overall histopathological profile of the common pediatric tonsillectomy and adenoidectomy samples is predominantly benign with the most common diagnoses being reactive lymphoid hyperplasia and chronic inflammatory changes. Occult malignancy in children is not usually diagnosed by routine histopathological examination, however, it is valuable to confirm clinical diagnoses and rule out unexpected pathological processes.

Keywords: Pediatric Adenotonsillectomy, Histopathological Assessment, Reactive Lymphoid Hyperplasia, Occult Malignancy, Selective Pathology, Chronic Tonsillitis.

INTRODUCTION

Adenoidectomy and tonsillectomy are among the most common surgical procedures performed in the world in children in otorhinolaryngology. They are mainly indicated in patients with recurrent tonsillitis,

chronic adenoiditis, adenotonsillar hypertrophy and obstructive sleep-disordered breathing, which can adversely affect the child's quality of life, growth, behaviour and academic performance.



Figure 1: Benchmarking of Benign Histopathological Findings (Reactive Hyperplasia & Chronic Nonspecific Tonsillitis) Across International Pediatric Studies (2001–2024).

The palatine tonsils and adenoids form a critical part of Waldeyer's ring and are important in early childhood for acting in antigen recognition and immune responses to create mucosal immunity. Repeated infections and chronic inflammation can cause enlargement of these lymphoid tissues, causing airway obstruction and frequent episodes of upper respiratory infections which require surgery to remove them (Erdag et al., 2005; Verma et al., 2009). Histopathological assessment of surgical specimens has always been considered an essential component of the routine clinical practice after tonsillectomy and adenoidectomy. The main goal of microscopic examination is the confirmation of a clinical diagnosis, the recognition of inflammatory or reactive changes and the recognition of an unsuspected benign or malignant pathology. These in children are almost invariably found to have benign histopathological changes, especially reactive lymphoid hyperplasia and chronic inflammatory changes. However, many institutions still routinely perform pathological examination due to the potential for occult malignancy and/or unusual pathological features that may not be clinically apparent prior to surgery (Strong et al., 2001; Erdag et al., 2005).

The most common histopathological change in adenotonsillar samples from children is reactive lymphoid hyperplasia. It is a reflection of chronic antigenic stimulation of lymphoid tissue due to repeated exposure to the bacterial and viral pathogens. Histologically, reactive hyperplasia is defined by enlarged lymphoid follicles, with prominent germinal centers and intact tissue architecture. Chronic nonspecific tonsillitis, follicular hyperplasia and variable amounts of inflammatory cell infiltration are also common. These results are similar to clinical findings of recurrent infection/obstructive symptoms and justifies the need for surgical intervention (Verma et al., 2009; Kalcioğlu et al., 2010).

Although all adenotonsillar specimens have been routinely sent for microscopic examination, there have been several investigators who have wondered about the need and the cost-effectiveness of children routinely having to undergo a histopathological

examination. A large retrospective study has shown that malignant lesions that are unanticipated are extremely rare in children without clinical suspicion of malignancy. Erdag and colleagues examined thousands of children's specimens and discovered no clinically important occult malignancies, and so they determined that routine microscopic examination does not change the way patients are treated. This rate has been also reported in several institutions around the world and is very low for the unexpected occurrence of malignant disease in routine Pediatric adenotonsillectomy specimens (Erdag et al., 2005, Randall & Martin, 2007, Kalcioğlu et al., 2010).

Occult malignancy is rare in childhood but in certain clinical circumstances, histopathology is useful. Children who are unwell, with an enlarged tonsil on one side, with cervical lymphadenopathy, with constitutional symptoms, with other types of immunodeficiency, with previous malignancy, or whose tonsils enlarge rapidly, or with abnormal findings on the intra-operative exam, may need additional pathological evaluation to rule out lymphoma or other serious conditions. Under these circumstances, a diagnosis is easily confirmed by microscopic examination and the clinical care can be directed accordingly. This has led to the recommendation of not necessarily performing histopathology on all patients but on those patients who are at higher risk on preoperative risk assessment (Mestry et al., 2024; Kalcioğlu et al., 2010), as well as careful clinical evaluation before surgery.

A few international studies have investigated the histopathological spectrum of the routine tissues obtained from tonsillectomy and adenoidectomy in children, and have all described reactive lymphoid hyperplasia as the most common diagnosis, followed by chronic tonsillitis and follicular hyperplasia. These studies have been conducted in Europe, Asia, the Middle East and Africa, and the results have been similar despite the variations in healthcare and patient populations, suggesting that the same pathological entities are most frequently encountered in the adenotonsillar tissue in children. These observations further underscore that the clinical indications for surgery are usually confirmed by the microscopic examination (Adeyemo et al., 2011; Faramarzi et al., 2009).

These ongoing discussions around routine histopathological examination have clinical and economic implications. In many developing countries, the routine submission of all specimens adds to the workload of the laboratory, costs to the healthcare system and doesn't necessarily result in any betterment of patient care, as the occurrence of an unexpected clinically important pathological finding is very rare. Histopathological examination, however, remains as a medicolegal document, will confirm the clinical diagnosis, and may occasionally detect unusual inflammatory or infectious diseases that may require further treatment. Thus, ongoing research on the histopathological spectrum of

children's adenotonsillar specimens are still useful to define evidence-based institutional policies, and to establish the most appropriate approach either routine or selective microscopic examination in various health-care settings.

The literature has remained consistent that when routine pediatric adenotonsillar specimens were evaluated for unexpected clinically significant pathology, it has been noted to be extremely rare. In large retrospective studies, the findings have shown that reactive lymphoid hyperplasia is the most common microscopic diagnosis and chronic nonspecific inflammation and follicular hyperplasia are the most common (and least common) remaining diagnoses. Malignant lesions in children are very rare and are generally associated with other clinical characteristics like unilateral tonsillar enlargement, cervical lymphadenopathy, constitutional symptoms, previous malignancy or immunodeficiency, but not with common adenotonsillar disease. The results have led to many clinicians recommending routine examination according to institutional policies and medicolegal requirements and selective histopathological examination in high-risk patients (Kepekçi, 2017).

Several studies have shown that malignant diagnoses are essentially always made in adults while benign lymphoid hyperplasia is the common finding in children. Therefore, accurate clinical evaluation before surgery remains the best means to determine children's need for further pathological evaluation. However, the clinical diagnosis is still the only way to get a pathological diagnosis and confirm inflammatory disease and to provide reassurance about the absence of an occult malignancy. The advantages are still valid in tertiary care units where patients can have atypical clinical presentation (Koc, 2012).

Although there have been many studies internationally, published data in many developing countries describing the histopathological spectrum of cases from tonsils and adenoids in pediatrics is limited. Differences in disease prevalence, health services available, indications for surgery and pathological reports can affect the distribution of histological findings in various populations. Therefore, it is important to assess the spectrum of usual adenotonsillar specimens of local pediatric population to see if the current policy of routine histopathological examination of adeno-tonsils is justified. This evidence can also help to formulate cost-effective guidelines without overlooking pathological lesions which have clinical significance (Aksakal, 2018). Present study will contribute to the literature by delineating the histopathological features of the routine tonsillectomy and adenoidectomy specimens from pediatric patients and determine the incidence of important pathological changes in relation to existing clinical practice.

MATERIALS AND METHODS

This study used a retrospective cross sectional study design to analyze the pathohistological spectrum of ordinary tonsillectomy and adenoidectomy material of children. The study was carried out in department of Otorhinolaryngology (ENT) in association with department of Histopathology, a tertiary care teaching hospital during 24 months. It was a retrospective analysis of hospital records and archived histopathological specimens, so an individual informed consent was not required by the ethics committee, which also ensured confidentiality and anonymity of the patient data.

This study involved children 3-16 years old who had tonsillectomy, adenoidectomy, or adenotonsillectomy. 180 patients were included in this study. The sample size was determined through the OpenEpi sample size calculator (Version 3.01) with a 95% confidence level, a 5% margin of error and an estimated prevalence of 50% (based on published literature in the past). A non-probability consecutive sampling was used which involved the inclusion of all eligible patients who fulfilled the inclusion criteria over the duration of the study until the required sample size was reached.

The study included children who were 3 to 16 years of age and had a normal tonsillectomy, adenoidectomy, or adenotonsillectomy performed for recurrent tonsillitis, adenotonsillar hypertrophy, obstructive sleep-disordered breathing, or recurrent upper respiratory tract infections (URTI). To ensure homogeneity of the study population, patients with a history of malignancy in the head and neck region, previous known hematological disorders, immunity disorders, congenital craniofacial anomalies, previous tonsillar surgery, incomplete clinical data, damaged or absent histopathological samples, or samples with suspected malignancy were excluded.

The structured data extraction form designed for this study was used to retrieve patient information from hospital medical records, operation theatre registers and pathology laboratory databases. The following variables were recorded: age, sex, living area, initial complaints, the length of symptoms, main indications for surgery, surgical procedure performed and final histopathological diagnosis. All information recovered was checked against pathology records before data was entered to ensure there was completeness and accuracy.

Surgery was undertaken by experienced consultant otorhinolaryngologists, with standard surgical techniques under general anesthesia. The specimens were then immediately transferred to a container with 10% neutral buffered formalin for tissue preservation after surgical removal, with each specimen properly labeled. Specimens were sent to the histopathology laboratory where they were subjected to routine gross examination. Before tissue processing, careful measurements were taken and recording of the dimensions, weight, external appearance and colour

of the specimens as well as any visible abnormalities was made.

Histopathologic evaluation was performed following routine laboratory procedures. Specimens of tissue were fixed and then passed through graded alcohol solutions, cleared in xylene and embedded in paraffin wax. Approximately 3-5 µm thick sections were cut with a rotary microtome and placed on clean glass slides. The tissue sections were stained using Hematoxylin and Eosin (H&E) which is regarded as the gold standard stain used in routine histopathological evaluation. A light microscope was used to examine all stained slides independently by two experienced consultant histopathologists, who were blinded to the patients' clinical information to reduce observer bias. If a consensus did not occur, then a joint review was carried out until a consensus diagnosis was reached. When present, histopathological changes were classified as reactive lymphoid hyperplasia, chronic nonspecific tonsillitis, follicular hyperplasia, acute inflammatory changes, granulomatous inflammation, dysplasia, lymphoma, malignant neoplasm or other uncommon pathological lesions.

Patient records and histopathological reports were reviewed twice by principal investigator to assure quality and reliability of the data collected. A standardized proforma was used for extracting the data for uniformity. Histopathological report was carried out according to departmental standard operating procedure while calibration and

maintenance of all laboratory equipment points were performed regularly during the study period. To minimise transcription errors and enhance data accuracy, double data entry and random check of records were carried out.

Data collected were entered, cleaned, coded and analyzed using Statistical Package for Social Sciences (SPSS) version 26.0. Demographic and clinical data of the study population were summarized using descriptive statistics. Data for continuous variables (age, duration of symptoms) were reported as mean and SD while categorical (gender, clinical indication, type of surgery and histopathological diagnosis) were reported as frequencies and percentages. Demographic, clinical and histopathological variables were compared by Chi-square test or Fisher's exact test as appropriate. A p value < 0.05 was deemed as statistically significant.

The confidentiality of the study was ensured by giving all subjects a unique identification number which was used in all the recordings and not any personal information. The study data were kept in password protected electronic files and were only accessible to the research team. Patient information was not revealed during the study and all results were presented anonymously. The study was conducted in compliance with accepted norms in biomedical research involving human subjects and complied with scientific standards throughout the research process.

RESULTS

Table 1: Demographic Characteristics of pediatric patients (N=180)

Variable	Category	Frequency (n)	Percent (%)	Valid Percent	Cumulative Percent
Age	3-5	38	21.1	21.1	21.1
	6-8	56	31.1	31.1	52.2
	9-12	54	30.0	30.0	82.2
	13-16	32	17.8	17.8	100.0
Gender	Male	104	57.8	57.8	57.8
	Female	76	42.2	42.2	100.0
Residence	Urban	101	56.1	56.1	56.1
	Rural	79	43.9	43.9	100.0
Indication	Recurrent Tonsillitis	108	60.0	60.0	60.0
	Obstructive Symptoms	54	30.0	30.0	90.0
	Both	18	10.0	10.0	100.0

Among the 180 participants, the majority were aged 6-12 years (61.1%), predominantly male (57.8%), and from urban areas (56.1%). Recurrent tonsillitis was the most common clinical indication (60.0%), followed by obstructive symptoms (30.0%) and a combination of both (10.0%).

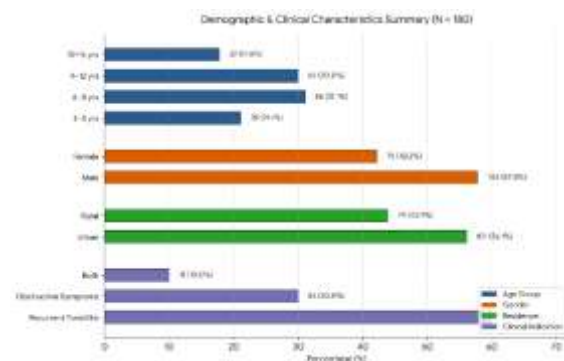
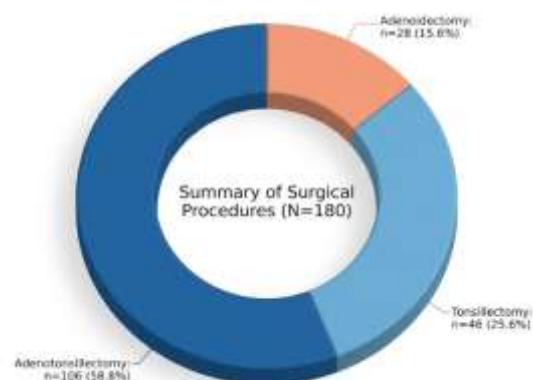


Table 2: Type of Surgical Procedure Performed (N = 180)

Procedure	Frequency	Percent	Valid Percent	Cumulative
Tonsillectomy	46	25.6	25.6	25.6
Adenoidectomy	28	15.6	15.6	41.2
Adenotonsillectomy	106	58.8	58.8	100.0

Adenotonsillectomy was the most frequently performed procedure, accounting for more than half of all cases. Tonsillectomy was the second most common, while adenoidectomy was performed least frequently.

**Table 3: Histopathological Diagnosis of Routine Specimens (N = 180)**

Finding	Frequency	Percent	Valid Percent	Cumulative
Reactive Lymphoid Hyperplasia	128	71.1	71.1	71.1
Chronic Nonspecific Tonsillitis	39	21.7	21.7	92.8
Follicular Hyperplasia	9	5.0	5.0	97.8
Acute Inflammatory Changes	4	2.2	2.2	100.0
Malignancy	0	0	0	100.0

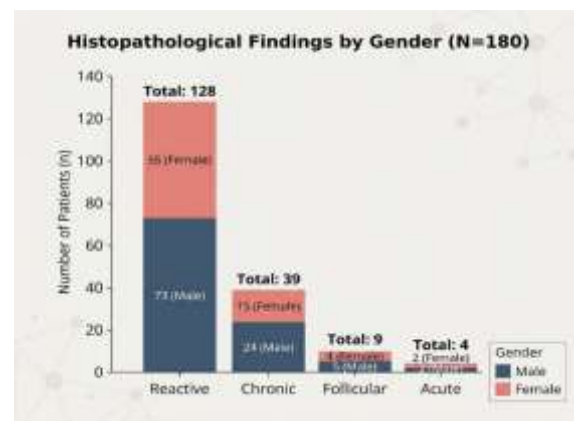
Reactive lymphoid hyperplasia was the most dominant finding, observed in nearly three-quarters of cases, followed by chronic nonspecific tonsillitis.

Follicular hyperplasia and acute inflammatory changes were rare, with no cases of malignancy detected.

Table 4: Cross-tabulation of Histopathological Findings by Gender

Finding	Male	Female	Total
Reactive	73	55	128
Chronic	24	15	39
Follicular	5	4	9
Acute	2	2	4

Across most histopathological findings, males predominated, particularly in cases of reactive lymphoid hyperplasia and chronic tonsillitis. In contrast, acute inflammatory changes were equally distributed between male and female patients.

**Table 5: Association Between Clinical Indication and Histopathological Diagnosis**

Indication	Reactive	Chronic	Follicular	Acute	Total
Recurrent	67	33	6	2	108
Obstructive	47	5	1	1	54
Both	14	1	2	1	18

Reactive lymphoid hyperplasia was the predominant finding across all clinical indications. However, chronic tonsillitis was noticeably more common in

patients presenting with recurrent tonsillitis compared to those with obstructive symptoms alone.

Table 6: Descriptive Statistics of Pediatric Patients

Variable	Mean±SD	Min	Max
Age	8.4±3.5	3	16
Symptoms (months)	12.8±5.6	3	30
Episodes/year	5.1±1.8	2	10
Hospital stay	1.2±0.5	1	3

Patients typically presented in mid-childhood with a chronic history of symptoms lasting over a year and multiple acute episodes annually. Hospitalization was brief, with most patients discharged within a day.

DISCUSSION

In the present study, routine tonsillectomy and adenoidectomy specimens of pediatric patients were evaluated histopathologically and the majority of specimens were found to have benign pathological changes. Pathological changes revealed the most common diagnosis as reactive lymphoid hyperplasia (71.1%) followed by chronic nonspecific tonsillitis (21.7%), follicular hyperplasia (5.0%) and acute inflammatory changes (2.2%). Importantly, there were no cases of dysplasia or malignancy. These findings suggest that the histopathological pattern seen in adenoid tissue from children is mostly reactive and inflammatory, and similar to the typical reasons for surgical removal (Erdag et al., 2005; Mestry et al., 2024).

The most common microscopic disease in the present study was reactive lymphoid hyperplasia. Physiologically the tonsils and adenoids are lymphoid organs that are constantly in contact with environmental antigens in childhood, consistent with this observation. The germinal centres increase in size as a result of repeated stimulation by viral and bacterial pathogens, hence the increased incidence of reactive hyperplasia in children that are undergoing adenotonsillectomy. This is similar to the results of the previous studies, which found that the most common diagnosis in routine pediatric specimens was reactive lymphoid hyperplasia (Verma et al., 2009; Erdag et al., 2005).

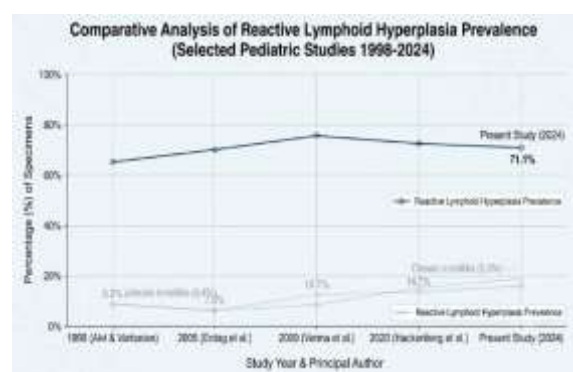


Figure 2: Comparative Trend Analysis of Reactive Lymphoid Hyperplasia Prevalence across Pediatric Studies (1998–2024)

Chronic nonspecific tonsillitis was the second most frequent diagnosis of the present study. This is a

logical result, as recurrent tonsillitis is one of the main reasons for tonsillectomy performed in children. The chronic inflammatory cell infiltrates and persistent infection give rise to typical microscopic changes such as lymphoid follicle hyperplasia, fibrosis and epithelial changes. The pathological findings help confirm the diagnosis and are justification for surgery in children who have had multiple infections. Similar findings have been reported in prospective and retrospective investigations of routine histopathological examination of tonsillar tissue (Hackenberg et al., 2020; Alvi & Vartanian, 1998).

There was not a single case in which an occult malignancy was found in a specimen in the present study. This is similar to many large pediatric studies that have shown an extremely low incidence of unexpected malignant lesions in routine adenotonsillar specimens, where there was no clinical suspicion. A 10-year study of thousands of tonsillectomy specimens in a pediatric tertiary hospital also detected no unsuspected malignancies, and noted that routine microscopic examination of tonsils does not alter patient management. Similarly, a large retrospective paediatric study on over 14,000 children reported no occult malignancies in the specimens that were routinely examined (Mestry et al., 2024; Hackenberg et al., 2020).

The lack of any malignant lesion in the present study further corroborates the emerging data to suggest selective histopathological examination in selected patients. The microscopic examination should be used primarily in patients with suspicious clinical features, including unilateral massive tonsillar enlargement, cervical lymphadenopathy, constitutional symptoms, visible mucosal lesions, history of previous malignancy, and immunodeficiency. If these risk factors are not present, routine pathological examination can make a significant contribution to health care expenditure without significant additional clinical benefit (Jamie, 2017; Mestry et al., 2024).

The demographic data of the studied population revealed that the majority of patients was in the age group of 6-12 years, corresponding with that age when recurrent tonsillitis and adenotonsillar hypertrophy is most common. Histopathological analyses revealed no significant differences between the sexes, but there was a slight over-representation of males. These findings are similar to previous pediatric studies which also found age and gender distributions consistent with the current study (Erdag et al., 2005; Hackenberg et al., 2020).

The results of the present study are relevant to clinical practice. Regular histopathological examination is

useful for substantiation of the clinical diagnosis and keeping the medicolegal records. However, there is a good degree of clinical risk assessment selectivity in use and this could lead to decreased laboratory workload and healthcare costs without compromising patient safety, whilst still retaining most of the patients with unexpected malignancy. Preoperative careful assessment and strict follow of clinical guidelines continue to be vital to identifying children who should be referred for complete pathological assessment.

The overall results of the present study are in agreement with the current international literature on the routine pathological findings of adenoid and tonsil specimens that typically have a benign inflammatory diagnosis. The negative rate of clinically significant occult malignancy further emphasises the need for proper selection of the patients for histopathological examination, and also supports the continued use of routine pathology as per institutional protocol and medicolegal requirements.

CONCLUSION

In the present study, the authors showed that the most common histopathological features of routine tonsillectomy and adenoidectomy specimens from paediatric patients are reactive lymphoid hyperplasia and chronic nonspecific tonsillitis. Pathology, whether dysplastic or malignant, was not found in any of the children operated upon for recurrent infection or obstructive symptoms, and, therefore, clinically significant disease is extremely unusual in children operated upon for recurrent infection or obstructive symptoms. The results confirm the benignity of most of the pediatric specimens from the adenoid tonsils and highlight the importance of histopathological analysis in the confirmation of clinical diagnosis and the definition of rare pathological conditions in the event of clinical suspicion.

Limitations

The study was carried out in a single tertiary care hospital having a relatively small sample size, which might limit the generalizability of the results to other population groups. This was a retrospective study design which relied on the completeness of the medical records and pathology reports. Furthermore, no follow-up data was available for rare pathological conditions following the treatment.

Future Suggestions

The study results support further prospective studies at other centers in a larger number of pediatric patients with a broader spectrum of patients for evaluation of the need for standard histopathologic evaluation. Further studies are needed to evaluate the safety of using selective histopathological

examination to replace routine microscopic examination in low-risk paediatric patients and should incorporate long-term follow-up, cost-effectiveness analysis and standardized clinical risk assessment models.

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