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Histologic analysis of pediatric tonsil and adenoid specimens: Is it really necessary?☆

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SUMMARY

Objective: To evaluate the incidence of unexpected histologic findings in routine tonsillectomy and adenoidectomy specimens.
Methods: A retrospective medical record review was performed at a tertiary care children's hospital. The pathology records of 2062 children who underwent tonsil or adenoid surgery were analyzed and the final histologic diagnosis was recorded.
Results: Four unexpected histologic findings were found on routine tonsil and adenoid specimens. None were clinically significant. A review of the literature shows a very low rate (0.015%) of unexpected clinically significant diagnoses in pediatric adenotonsillectomy specimens.
Conclusions: Given rarity of unexpected clinically significant diagnoses in pediatric adenotonsillectomy specimens, the cost and effort of analyzing each specimen histologically is difficult to justify.

1. Introduction

Tonsillectomy with or without adenoidectomy is the second most common pediatric surgical procedure performed in the United States, while adenoidectomy alone is the seventh most common procedure [1]. Indications for surgery can be placed into one of two groups as routine or non-routine. Routine indications are upper airway obstruction and obstructive sleep apnea, chronic infection, eustachian tube dysfunction, and halitosis in the setting of no related significant physical findings. Non-routine indications include tonsillar asymmetry, tonsillar lesions, and items in the patient's history that may arouse a suspicion of malignancy such as weight loss, night sweats, associated lymphadenopathy, hoarseness, a history of alcohol or tobacco use, carcinogen or radiation exposure, family history of cancer, or immunocompromised status. Patients with non-routine indications for adenotonsillectomy are at a higher risk for malignancy and it is well established that surgical specimens should be analyzed histologically. For those patients undergoing routine adenotonsillectomy a question still exists as to whether specimens produced should be examined.

In this study we analyze diagnoses made on histologic review of routine adenotonsillectomy specimens over the last 5 years at the Children's Hospital of Los Angeles. We also thoroughly review the literature for other pediatric studies and make our recommendations for the histologic review of routine pediatric adenotonsillectomy specimens.

2. Methods

A retrospective chart review was performed on patients who underwent routine tonsillectomy, adenoidectomy, or adenotonsillectomy between 2002 and 2006 at the Children's Hospital of Los Angeles. The pathology reports for these cases were reviewed and recorded after obtaining IRB approval for this study. Patients with non-routine indications for surgery were not included in our analysis. Patients who underwent suction bovie cauterization of the adenoid bed were also excluded as no specimen was collected. The medical chart, pathology requisition form, and histologic slides were reviewed for patients with an unexpected histologic diagnosis. To ensure that no cases were missed we examined our pathology database for adenotonsillar malignancies.

At our institution tonsil and adenoid specimens are received by the pathology department in formalin. Gross visual inspection is performed by a certified pathology assistant. Weight and length measurements are recorded. The specimen is the sectioned serially into 3 mm thick slices. On average, two of these sections are archived in paraffin blocks for each tonsil and adenoid. Slides of the specimen are prepared and stained with hematoxylin and eosin. For each tonsil at least five sections are reviewed and for adenoid tissue at least two sections are reviewed. A staff pathologist, with

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or without the assistance of a fellow and resident, examines each slide and makes a final diagnosis. Slides are permanently archived and paraffin block sections are stored for 6 months.

3. Results

A total of 2062 patients met our inclusion criteria. The average age was 6.1 years old, with a range of 8 months to 18 years of age. Tonsillectomy was performed on 1017 patients, adenotonsillectomy on 835 patients, and adenoidectomy alone on 210 patients. Final pathologic diagnosis was benign follicular hypertrophy in 74.6% of specimens (3541/4749) and benign follicular hypertrophy with evidence of infection with actinomycetes in 25.3% of specimens (1204/4749).

Only four specimens had diagnoses different than follicular hyperplasia with or without infection. The first patient with an unexpected diagnosis is a 3-year-old female who underwent routine adenotonsillectomy for adenotonsillar hypertrophy. Final pathology of the adenoid tissues showed necrotizing granulomas with giant cells. The patient was worked up for etiology but no disease was identified.

The second patient is a 3-year-old male who underwent adenotonsillectomy for both chronic infections and upper airway obstruction. The patient was initially admitted for acute pharyngitis and had surgery on hospital day number two. Intraoperative findings revealed necrotic tissues of both the tonsils and adenoids. The final pathologic diagnosis was benign lymphoid hyperplasia with necrotizing inflammation and budding candidiasis. This patient completed intravenous antibiotics, was discharged on oral antibiotics, and follow-up showed normal healing with no complications.

The third patient is a 4-year-old female with upper airway obstruction and recurrent tonsillitis. A routine tonsillectomy with suction bovie adenoidectomy was performed with no abnormalities noted at time of surgery. Final pathologic diagnosis revealed a squamous epithelial lined cyst of the tonsil.

Patient four is a 4-year-old male who underwent tonsillectomy for tonsillar hypertrophy. At surgery, no abnormalities were noted and final diagnosis also revealed squamous epithelial lined cyst of the tonsil. All four patients had routine follow-up with no complications.

4. Comment

Adenotonsillectomy is estimated to be the second most common surgery performed on children nationwide; second only to myringotomy. Approximately 287,000 tonsillectomies with or without adenoidectomy are performed each year. Adenoidectomy alone is the seventh most common pediatric surgery, reported at almost 130,000 cases per year [1]. This would yield almost 1 million specimens annually from these surgeries nationwide that are potentially prepared for and read by a pathologist. Not only is this time consuming, but also is a costly task with potentially limited benefit as well.

Nine other studies have similarly examined the incidence of unexpected pathology in routine tonsil and adenoid specimens in the pediatric population [2–9]. Including our data, 20,560 routine pediatric tonsil and adenoid specimens were examined revealing only three clinically significant unexpected findings (Table 1). Garavello et al. detailed two patients, aged 6 and 8 years old, who underwent routine tonsillectomy for chronic tonsillitis with no suspicion of malignancy preoperatively. Both patients were diagnosed with Burkitt's non-Hodgkin's lymphoma of the tonsil and received chemotherapy [7]. Dohar and Bonilla described one pediatric patient in whom a glycogen storage disorder was diagnosed from a routine tonsil specimen [3]. No comment was made as to change in management of this patient after making this diagnosis.

Eleven other studies investigated the incidence of unexpected pathology in routine tonsil and adenoid specimens but in a combined pediatric and adult population [12–22]. A total of 39,664 patient specimens were reviewed between these studies (Table 2). Two patients with clinically significant diagnoses were found. Starry described a 16-year-old male diagnosed with lymphosarcoma of the tonsil [12]. It was not stated what the patient's indication for surgery was, nor if there were clinical findings prior to surgery. Daneshbod et al. reviewed 15,120 routine adenotonsillectomy specimens to find one patient of unknown age who underwent routine tonsillectomy who was diagnosed with lymphoma of the tonsil [16].

Case reports have described diagnoses incidentally made from routine pediatric adenotonsillectomy specimens. Two females, aged 5 and 12, were diagnosed with sarcoidosis on routine adenotonsillectomy specimens with no other presenting symptoms [23,24]. Further workup of both patients did not reveal systemic symptoms and no additional treatment was recommended. Both patients were observed.

A case report of Crohn's disease diagnosed from a routine tonsillectomy specimen in a 10-year-old female has been described [25]. Extensive workup of non-caseating granulomas found on a tonsillectomy included a colonscopy which confirmed a diagnosis of Crohn's disease. The patient was treated with steroids and mesalamine.

Two 3.5-year-old males underwent routine adenoidectomy and were diagnosed with extramedullary plasmocytoma of the adenoids as described in a case report. Histologically a dense population of neoplastic plasma cells was seen, and immunohistochemistry demonstrated kappa light chain restriction. Neither

Table 1
Studies of clinically significant diagnoses made from routine pediatric adenotonsillectomy specimens.

Author	Reference number	Year	Total patients	Clinically significant diagnoses made
Ridgway	[2]	1987	1,100	None
Dohar	[3]	1996	2,012	1—glycogen storage disorder
Strong	[4]	2001	1,583	None
Younis	[5]	2001	2,099	None
Williams	[6]	2003	4,070	None
Garavello	[7]	2004	1,217	2—non-Hodgkin's lymphoma in a 6 and 8 years old
Erdag	[8]	2005	2,743	None
Dost	[9]	2006	400	None
Yasan	[10]	2006	1,216	None
Dewil	[11]	2006	2,058	None
Verma			2,062	None
Total			20,560	3 patients; 0.015%

Table 2
Studies of clinically significant diagnoses made from routine pediatric and adult adenotonsillectomy specimens.

Author	Reference number	Year	Total patients	Clinically significant pediatric diagnoses made
Starry	[12]	1939	12,370	Lymphosarcoma in a 16 years old
Weibel	[13]	1965	4,680	None
Yarrington	[14]	1967	200	None
Sodagar	[15]	1972	718	None
Daneshbod	[16]	1980	15,120	Lymphoma in a patient of unknown age with possible symptoms
Netser	[17]	1997	2,700	None
Alvi	[18]	1998	103	None
Ikram	[19]	2000	200	None
Erkilic	[20]	2002	1,220	None
Dell'Aringa	[21]	2006	250	None
Felix	[22]	2006	2,103	None
Total			39,664	Two patients; 0.005%

patient underwent further treatment and both are being followed [26].

One quarter of our patient population demonstrated adenotonsillar actinomycosis. *Actinomyces* are part of routine oral flora and are anaerobic, Gram-positive bacteria. Incidence of tonsillar actinomycosis varies between 18.3% [27] and 28.5% [28], Bhargava et al. postulated that mucosal trauma of the tonsil led to *Actinomyces* invasion. Histologic examination demonstrates actinomycosis presence more reliably than microbiology studies. While some authors [27,28] note that patients undergoing adenotonsillectomy for obstructive symptoms are more likely to demonstrate presence of *Actinomyces* than those having surgery for chronic infections, this correlation is not consistent [29]. The presence of *Actinomyces* in our experience is clinically insignificant as no additional treatment is necessary for patients with this finding.

Strong et al. surveyed members of the American Academy of Otolaryngology assessing their pathologic processing practices of routine tonsillectomy and adenoidectomy specimens. Their study showed a statistically significant trend of surgeons moving away from full histologic analysis in 1989 to requesting only a gross analysis or even no pathology processing of routine adenotonsillectomy specimens in 1999 [4].

An alternative to microscopic analysis of specimens is a limited gross examination. The benefit of this largely depends on the division of labor within a pathology department. At the Children's Hospital of Los Angeles, when a routine specimen is sent for microscopic analysis, it is a technician who does the gross analysis and prepares the microscopic slides. A staff pathologist then reviews the slides and makes on a final diagnosis. When gross examination is requested by the clinician it is the pathologist who receives the specimen, measures it, cuts it in half to describe it, and dictates a final report. If all specimens underwent gross analysis at our institution, our pathology department would be equally burdened.

Additionally the purpose of gross analysis is to inspect for any irregularities. If the pathologist notes any, then he would order a microscopic analysis. One such abnormality is tonsillar asymmetry—however, there are no good standards that define this. Williams and Brown describe tonsillar asymmetry as a difference in the longest length of each tonsil as greater than 1 cm, ratio of the longest lengths of each tonsil greater than 2, or ratio of volumes of each tonsil as greater than 2 [6]. Their suggestions were made somewhat arbitrarily by comparing the data of 100 normal tonsils to *one* patient with Burkitt's lymphoma who presented with bilateral cervical lymphadenopathy and tonsillar asymmetry. Following criteria based on a patient with obvious preoperative physical findings does not provide any insight into the benefit of a gross analysis of *routine* adenoid and tonsil specimens.

Recent studies have shown that surgeons' perception of tonsillar asymmetry is often incorrect. Harley described 258 children who underwent routinely indicated tonsillectomy with an intraoperative description of tonsillar asymmetry. Only 47 of 258 children, or 18.2%, were determined to have true tonsillar asymmetry by volume measurements, none of which had abnormal histologic diagnoses. Conversely, patients with preoperative tonsillar symmetry on physical examination often demonstrated volume asymmetry during gross analysis. Perceived tonsillar asymmetry was highly correlated with depth of tonsillar fossa and not the actual size of the tonsil [30]. Even so, there will be cases where the surgeon finds a worrisome appearance to the adenoids or tonsils or perceives that the patient's tonsils are asymmetric. In these instances it is within the purview of the surgeon to request histology of the tissues removed.

No discussion of medical intervention is complete without discussing the cost of treatments. With Medicare, the lowest reimbursement when compared to commercial insurers, the reimbursement for gross and microscopic analysis of a tonsil or adenoid specimen is $69.02. With the over 2000 specimens at CHLA alone, $145,000 has been spent with no effect on patient management. The annual cost to the United States for these services would be around 68 million dollars.

5. Conclusion

Our study of 2062 patients at Children's Hospital Los Angeles revealed no clinically significant diagnoses were made from histological analysis of tonsil and adenoid specimens. This data compares well with the available literature in which three clinically significant diagnoses were made from the analysis of 18,498 patient specimens—two patients with lymphoma and one with a glycogen storage disorder. Combining our findings with that of the literature, the rate of clinically significant diagnoses made from routine tonsil and adenoid specimens is 3 out of 20,560 cases (0.015%).

Based on our data nothing of significance was revealed by obtaining histologic review of our routine specimens and we do not feel the cost and effort of histologic analysis is justified. While nationwide there has been a shift for the otolaryngologist to order a gross only examination, a formal study is indicated to show whether there are certain characteristics on gross examination that would warrant a histologic analysis. A thorough history and physical is the most important predictor of an underlying disease process. If this does not generate suspicion of a malignancy or other significant diagnosis then neither gross nor histologic analysis should be necessary after a routine adenotonsillectomy.

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References

[1] M.F. Owings, L.J. Kozak, Ambulatory and inpatient procedures in the United States, 1996. National Center for Health Statistics, Vital Health Stat. 13 (139) (1998) 13.

[2] D. Ridgway, L.J. Wolff, R.C. Neerhout, D.L. Tilford, Unsuspected non-Hodgkin's lymphoma of the tonsils and adenoids in children, Pediatrics 79 (March (3)) (1987) 399–402.

[3] J.E. Dohar, J.A. Bonilla, Processing of adenoid and tonsil specimens in children: a national survey of standard practices and a five-year review of the experience at the Children's Hospital of Pittsburgh, Otolaryngol. Head Neck Surg. 115 (July (1)) (1996) 94–97.

[4] E.B. Strong, B. Rubinstein, C.W. Senders, Pathologic analysis of routine tonsillectomy and adenoidectomy specimens, Otolaryngol. Head Neck Surg. 125 (November (5)) (2001) 473–477.

[5] R.T. Younis, S.V. Hesse, V.K. Anand, Evaluation of the utility and cost-effectiveness of obtaining histopathologic diagnosis on all routine tonsillectomy specimens, Laryngoscope 111 (December (12)) (2001) 2166–2169.

[6] M.D. Williams, H.M. Brown, The adequacy of gross pathological examination of routine tonsils and adenoids in patients 21 years old and younger, Hum. Pathol. 34 (October (10)) (2003) 1053–1057.

[7] W. Garavello, M. Romagnoli, L. Sordo, R. Spreafico, R.M. Gaini, Incidence of unexpected malignancies in routine tonsillectomy specimens in children, Laryngoscope 114 (June (6)) (2004) 1103–1105.

[8] T.K. Erdag, M.C. Ecevit, E.A. Guneri, E. Dogan, A.O. Ikiz, S. Sutay, Pathologic evaluation of routine tonsillectomy and adenoidectomy specimens in the pediatric population: is it really necessary? Int. J. Pediatr. Otorhinolaryngol. 69 (October (10)) (2005) 1321–1325.

[9] P. Dost, Histological examination following adenoidectomy and tonsillectomy in children. Surprising results are very rare, HNO 54 (January (1)) (2006) 16–19.

[10] H. Yasan, H. Dogru, O. Candir, M. Tuj, S. Bircan, Incidence of unexpected pathology in routine adenoidectomy specimens, Int. J. Pediatr. Otorhinolaryngol. 70 (January (1)) (2006) 95–98.

[11] B. Dewil, M. Jorissen, P. Lemkens, Routine pathological evaluation after tonsillectomy: is it necessary? B-ENT 2 (2006) 103–108.

[12] A. Starry, Pathology of the tonsil with statistical report and microscopic study, Ann. Otol. Rhinol. Laryngol. 48 (1939) 346–358.

[13] E. Weibel, Pathological findings of clinical value in tonsils and adenoids, Acta Otolaryngol. (Stockh.) 60 (1965) 331–338.

[14] M. Yarington, G. Smith, J. Benzmiller, Value of histologic examination of the tonsils, Arch. Otolaryngol. 85 (1967) 680–681.

[15] R. Sodagar, E. Mohallatee, Necessity of routine pathologic examination of tonsils, Ear Nose Throat J. 51 (1972) 229–230.

[16] K. Daneshbod, R. Bhutta, R. Dodagar, Pathology of tonsils and adenoids: a study of 15,120 cases, Ear Nose Throat J. 59 (1980) 466–467.

[17] J.C. Netser, R.A. Robinson, R.J. Smith, S.S. Raab, Value-based pathology: a cost–benefit analysis of the examination of routine and nonroutine tonsil and adenoid specimens, Am. J. Clin. Pathol. 108 (August (2)) (1997) 158–165.

[18] A. Alvi, A.J. Vartanian, Microscopic examination of routine tonsillectomy specimens: is it necessary? Otolaryngol. Head Neck Surg. 119 (October (4)) (1998) 361–363.

[19] M. Ikram, M.A. Khan, M. Ahmed, T. Siddiqui, M.Y. Mian, The histopathology of routine tonsillectomy specimens: results of a study and review of literature, Ear Nose Throat J. 79 (November (11)) (2000) 880–882.

[20] S. Erkiliç, A. Aydin, N.E. Koçer, Histological features in routine tonsillectomy specimens: the presence and the proportion of mesenchymal tissues and seromucinous glands, J. Laryngol. Otol. 116 (11) (2002) 911–913.

[21] A.R. Dell'Aringa, A.J.C. Juares, C. de Melo, J.C. Nardi, K. Kobari, R.M. Perches Filho, Histological analysis of tonsillectomy and adenoidectomy specimens—January 2001 to May 2003, Rev. Bras. Otorrinolaringol. (Engl. Ed.) 71 (January–February (1)) (2005) 18–22.

[22] F. Felix, G.A. Gomes, B.P. de Souza, G.A. Cardoso, S. Tommita, Evaluation of the utility of histopathologic exam as a routine in tonsillectomies, Rev. Bras. Otorrinolaringol. (Engl. Ed.) 71 (March–April (2)) (2006) 252–255.

[23] S.A. Erwin, Unsuspected sarcoidosis of the tonsil, Otolaryngol. Head Neck Surg. 100 (March (3)) (1989) 245–247.

[24] S. Saussez, V. Mahillon, A. Haller, J. Levy, A. Ferster, J.L. Dargent, Clinically unsuspected tonsillar sarcoidosis in a child revealed by routine histologic examination, Int. J. Pediatr. Otorhinolaryngol. 70 (January (1)) (2006) 155–158.

[25] R.M. Turchi, H. Soriano, G.L. Rodgers, Tb or not TB: Crohn's disease presenting with tonsillar granulomas, Otolaryngol. Head Neck Surg. 134 (March (3)) (2006) 528–530.

[26] G. Mann, M.M. Trebo, M. Minkov, I. Simonitsch, A. Chott, H. Gadner, Extramedullary plasmacytoma of the adenoids, Pediatr. Blood Cancer 48 (March (3)) (2007) 361–362.

[27] S.M. Pransky, J.I. Feldman, D.B. Kearns, A.B. Seid, G.F. Billman, Actinomycosis in obstructive tonsillar hypertrophy and recurrent tonsillitis, Arch. Otolaryngol. Head Neck Surg. 117 (August (8)) (1991) 883–885.

[28] D. Bhargava, B. Bhusnurmath, K.R. Sundaram, R. Raman, H.M. Al Okbi, R. Al Abri, A. Date, Tonsillar actinomycosis: a clinicopathological study, Acta Trop. 80 (October (2)) (2001) 163–168.

[29] A.C. van Lierop, C.A. Prescott, C.C. Sinclair-Smith, An investigation of the significance of actinomycosis in tonsil disease, Int. J. Pediatr. Otorhinolaryngol. 71 (December (12)) (2007) 1883–1888.

[30] E.H. Harley, Asymmetric tonsil size in children, Arch. Otolaryngol. Head Neck Surg. 128 (July (7)) (2002) 767–769.