International Journal of Otorhinolaryngology and Head and Neck Surgery
Venkatesha BK et al. Int J Otorhinolaryngol Head Neck Surg. 2017 Apr;3(2):354-358
http://www.ijorl.com
pISSN 2454-5929 | eISSN 2454-5937

Original Research Article

DOI: http://dx.doi.org/10.18203/issn.2454-5929.ijohns20170444

Clinical grading of tonsils: does it truly represent total tonsil volume in patients with recurrent tonsillitis

Venkatesha B. K.*, Yogeesha B. S., Asha M.

Department of Otorhinolaryngology, S.S. Institute of Medical Sciences & Research Centre, Davangere, Karnataka, India

Received: 11 January 2017
Accepted: 28 January 2017

***Correspondence:**
Dr. Venkatesha B. K.,
E-mail: bk.venkatesha@gmail.com

ABSTRACT

Background: Tonsils undergo hypertrophy due to recurrent infection or as a part of generalized lymphoid hypertrophy. There is a good correlation between clinical tonsil grade and objective tonsil volume in adult snorers and obstructive sleep apnea (OSA) patients. Relationship between clinical grading, oropharyngeal tonsil volume and total tonsil volume has been investigated in OSA patients but a very few in recurrent tonsillitis patients.
Methods: A total of 50 tonsillectomy specimens from 25 patients who underwent tonsillectomy for recurrent tonsillitis were evaluated for tonsil volume oropharyngeal volume. These volumes were evaluated by a mathematical formula. Total volume, oropharyngeal and tonsillar volume were correlated with clinical grading of the tonsil. Also neck circumference, body mass index was assessed and correlation with clinical grading was found out with spearman correlation coefficient.
Results: A spearman's correlation was used to determine the relationship between 50 tonsillectomy specimens for total volume and clinical grading. There was a moderate positive monotonic correlation between total tonsil volume and clinical grading (rs =0.407, n =50, p <0.01, Correlation is significant at the 0.01 level 2-tailed) and there was a mild positive monotonic correlation between intraoral tonsil volume and clinical grading (rs =0.351, n =50, p <0.05 Correlation was significant at the 0.05 level 2-tailed).
Conclusions: Total tonsil volume and oropharyngeal volume correlates well with clinical grading of the tonsil. BMI and neck circumference does not correlate with the clinical grading of the tonsil.

Keywords: Tonsil volume, Chronic tonsillitis, Tonsillar hypertrophy

INTRODUCTION

Tonsillar hypertrophy is a common clinical condition seen by an otorhinolaryngologist. Tonsils undergo hypertrophy due to recurrent infection or as a part of generalized lymphoid hypertrophy. Tonsillar hypertrophy is implicated in obstructive sleep apnea syndrome. Tonsillar hypertrophy grading was based on free pharyngeal airway rather than tonsillar volume itself. There is a good correlation between clinical tonsil grade and objective tonsil volume in adult snorers and obstructive sleep apnea (OSA) patients.[1] However, the mucosal folds/reflections from palatoglossus and palatopharyngeus will determine the intra oral projection of tonsil. To our knowledge, relationship between clinical grading, oropharyngeal tonsil volume and total tonsil volume has been investigated in OSA patients but a very few in recurrent tonsillitis patients.

The purpose of this study was to evaluate the correlation between clinical grading and oropharyngeal tonsil volume (OTV), total volume (TV) of the tonsils in recurrent tonsillitis patients.

The objective of the study was to correlate clinical grading of tonsils with oropharyngeal and total tonsil

volume and to correlate neck circumference, body mass index (BMI) with tonsil volumes.

METHODS

Data collected prospectively from 25 consecutive patients (a total of 50 tonsillectomy specimens) who underwent tonsillectomy for recurrent tonsillitis from August 2015 to April 2016, at S.S. Institute of Medical Sciences, Davangere, Karnataka. This study was approved by Institutional Ethical Committee. Study included patients who had both palatine tonsils removed by cold dissection surgery for recurrent tonsillitis with clinical grade >2 using dissection method as shown in Figure 1. Photogragphs of the tonsillectomy specimen were taken in two dimensions with measuring scale as given in Figure 2. Mucosal attachments were clearly demarcated in the tonsillectomy specimens as given in Figure 3. The portion of the tonsil medial to the mucosal fold reflection was considered as oropharyngeal tonsillar portion and rest was considered to be intrafossa tonsillar portion. Volume of the total tonsil and oropharyngeal tonsil portion and intrafossa projected portions were calculated separately using the mathematical formula.[2]

$V = \frac{\pi}{6}$ f (length. width)$^{3/2}$ where f=$\frac{H}{\sqrt{LW}}$ = 1.69±0.03

Subjective size of the tonsil was clinically measured using Friedman grading system,* Following parameters were documented for each patient, BMI, Neck circumference, laterality of the tonsil, clinical grading of the tonsil, total tonsil volume (TTV), oropharyngeal tonsil volume (OTV).

Statistical analysis

Continuous data were expressed as mean plus standard deviation, and categorical data as number and percentage. The correlations between clinical grading and total tonsil volume (TTV) and oropharyngeal tonsil volume (OTV) in all participants as well as in age groups were analyzed using a Spearman's correlation. A p value less than 0.05 was considered statistically significant. A spearman's correlation was used to determine the relationship between TTV, OTV and clinical grading. And also tests of significance were used to determine the relationship between tonsils of two sides.

RESULTS

Study population included 25 patients (ranging from 4 years to 38 years with the mean age of 15.84 years) (7 adults patients more than16 years old and 18 children less than 16 years). Clinical tonsillar grade varied from grade II to grade IV (grade II: 14 tonsils, grade III: 33 tonsils and grade IV: 3). Total tonsillar volume ranged from 0.84cm3 to 4.427 cm^3. Intra oral projected volume ranged from 0.21 cm^3 to 2.375 cm^3. Neck circumference ranged from 24 to 40 cms, with a mean of 29.04 cms. Mean neck circumference measured 17.36, 28.67 and 27.66 cm respectively in grade 2, 3 and 4 respectively. Body mass index measured 21.27, 18.02 and 17.1 Kg/cm^2 respectively in grade 2, 3 and 4 tonsillectomy specimens as given in Table 1.

Total tonsil volume and intra oral tonsillar portion volume correlates well with clinical grading of the tonsil as seen in Figure 4. BMI and Neck circumference does not correlate with the clinical grading of the tonsil. Both in children and adults, neither mean neck circumference nor body mass index correlated with the clinical grading of the tonsils as given in Figure 6. No statistically difference was noted between the parameters.

Correlations

A spearman's correlation was used to determine the relationship between 50 tonsillectomy specimens for total volume and clinical grading. There was a moderate positive monotonic correlation between total tonsil volume and clinical grading (rs =0.407, n=50, p <0.01, Correlation is significant at the 0.01 level 2-tailed) and there was a mild positive monotonic correlation between intraoral tonsil volume and clinical grading (rs= 0.351, n =50, p <0.05 Correlation was significant at the 0.05 level 2-tailed).

Table 1: Clinical data of the studied group representing range and mean.

Variables	Grade II (n=14)	Grade III (n=33)	Grade IV (n=3)	Total (n=50)
Age in years	4-38	4-38	9-11	4-38
	Mean: 19.29	Mean: 15.70	Mean: 10.33	Mean: 15.8
Neck circumference (cms)	24-40	20-40	27-29	20-40
	Mean: 17.36	Mean: 28.67	Mean: 27.66	Mean: 29.04
BMI (Kg/m^2)	12.9-26.49	11.7-29.16	15.3-18	11.7-29.16
	Mean:21.27	Mean:18.02	Mean:17.1	Mean 18.76
Total tonsil volume (cm^3)	0.84-2.37	0.84-3.67	2.4-4.43	0.84-4.42
	Mean: 1.66	Mean: 2.13	Mean: 3.27	Mean: 2.06
Intra oral tonsillar volume	0.21-2.23	0.29-2.38	1.55-2.38	0.21-2.375
	Mean: 0.96	Mean: 1.25	Mean: 1.99	Mean: 1.21

Figure 1: Clinical photograph of oropharynx demonstrating the grade of the tonsillar enlargement.

Figure 2: Measurement of total width in tonsillectomy specimen.

Laterality

There was no statistically significant difference between two sides total and intraoral tonsil volume, p value- 0.257 and p value 0.309 respectively.

Figure 3: Measurement of oropharyngeal width green arrows indicating the mucosal reflection.

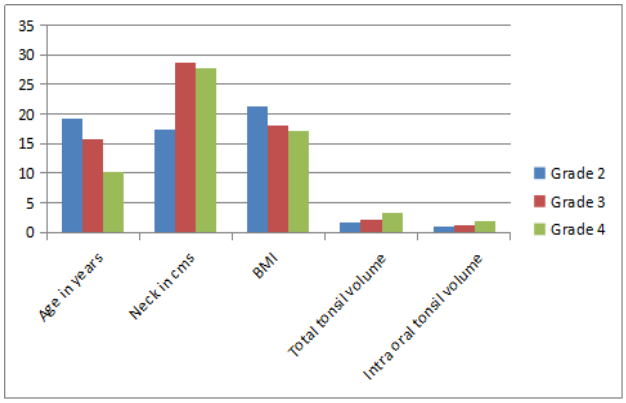

Figure 4: Graphical representation of clinical data, total tonsil volume and oropharyngeal tonsil volume.

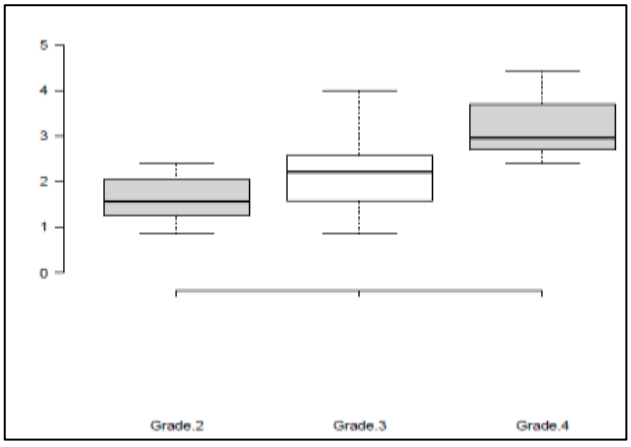

Figure 5: Box plot showing total tonsil volume in cm3 and clinical grading.

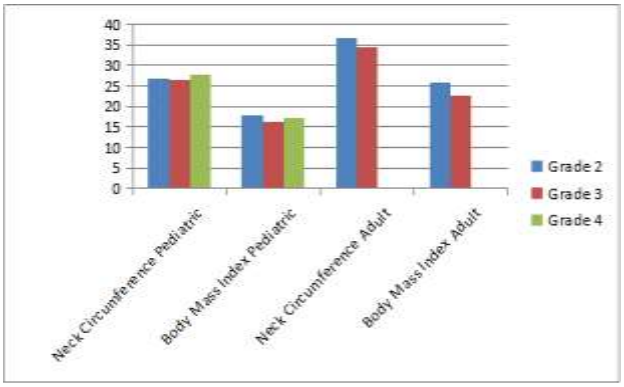

Figure 6: Bar diagram representing the relationship between neck circumference and body mass index in pediatric <16 year old and adult patients.

DISCUSSION

The tonsillar hypertrophy is a frequently encountered clinical condition by an otorhinolaryngologist; the tonsils undergo hypertrophy secondary to chronic infection, the reason behind hypertrophy in chronic or recurrent tonsillitis setting being proliferation of lymphoid follicles or cervical vascular congestion.

The position of the tonsil in the oropharynx is determined by the mucosal fold reflection from the anterior and posterior pillars. The triangular mucosal fold arising from the palatoglossal fold inferiorly and semilunar fold arising from the palatopharyngeal fold superiorly determine the extent to which tonsils are set back between the anterior and posterior folds. Also in some instances, tonsils seem to be very much on the surface of the lateral wall of the oropharynx giving a false impression of large tonsil. So tonsils that stand out prominently in the oropharynx are better as "prominent" than "large" tonsils.[3] Contrary to the rigid structures like nose, larynx and trachea, pharyngeal part is the least supported, any compromise in the airway lumen caused by tonsil and adenoid hypertrophy will worsen obstructive symptoms in OSA patients, patho-physiological mechanisms involved in further worsening of tonsillar hypertrophy being deposition of soft tissue leading to the narrowing of the pharyngeal lumen or larger fat pads tissue edema.[4]

Subjective clinical grading used in determining the tonsil hypertrophy varies; Brodsky's grading scale is being commonly used. It is based on tonsillar airway obstruction.[5,6] Other grading system used are Point scale.[7] Friedman classified tonsil from 1-4, tonsil size 1 implies tonsils hidden within the pillars, tonsil size 2 implies the tonsil extending to the pillars, size 3 implies tonsils are beyond the pillars but not the midline, tonsil size 4 implies tonsils that extend to the midline in our study Friedman staging was followed.[8]

Unlike other methods of measuring tonsillar volume, measuring surgically excised tonsil specimen is the most accurate method.[1] Volume discplacement method has been followed by many to measure the total tonsil volume, but when measuring the oropharyngeal tonsil volume, surgical dissection of the specimen has to be carried out at the mucosal reflection site and exact division might not be obtained.[1] Radiological methods have been used to assess the grading and determine the volume of the tonsils.[9] Other simple cost effective useful method for measuring tonsil volume would be to take the photograph of the surgically excised tonsils and measure their volume, this will also reduce the inter observer bias.[5] Calculating volume with 2 dimensional image is also a suitable option as this has been utilised in calculating the tumor volume to be irradiated in pre-operative radiation planning phase.[2] Applying subjective grading to the total volume, has its own limitations as cause of large appearance is different in recurrent tonsillitis, a physiological variant or in OSA patient setting. Subjective grading of the tonsils is neither a true determinant of total volume of the tonsil or oro-pharyngeal portion of the tonsil nor represents the clinical/subjective grading of the tonsil. It has an implication in the management of the OSA, careful selection of patients for tonsillectomy has to be made before giving this option for OSA patient as substantial tonsillar hypertrophy rarely causes OSA.[10]

In a study by Hasan Yasan et al, the correlation subjective tonsil size to the objective tonsil volume body mass index, body surface area, age and gender, size was investigated and found a statistically significant correlation between objective volume of tonsils and subjective grading of tonsils, also with body mass index.[11] However subjective tonsil size assessment in children has a limited value especially in size 2 and 3, but subjective tonsil size reflects real palatine tonsil size in adults and hence predicting the real volume preoperatively.[12] In our study we found significant correlation between subjective grading and oro-pharyngeal tonsil volume and total volume of the tonsils in patients with recurrent tonsillitis. And also correlation was not seen between total tonsil volume and neck circumference and body mass index which suggests these parameters might be of importance in the OSA patients rather than chronic or recurrent tonsillitis patients.

CONCLUSION

Total Tonsil volume and Intra oral tonsillar portion volume correlates well with clinical grading of the tonsil. BMI and Neck circumference does not correlate with the clinical grading of the tonsil. No significant volume difference between right and left sided tonsil.

ACKNOWLEDGMENTS

We acknowledge Dr. Rachana A. R., Assistant Professor, Department of Community Medicine, SSIMS & RC, Davangere, for her contribution to statistical analysis.

Funding: No funding sources
Conflict of interest: None declared
Ethical approval: The study was approved by the Institutional Ethical Committee

REFERENCES

1. Cahali MB, Soares, CF, Dantas DA, Formigoni GG. Tonsil Volume, tonsil grade and obstructive sleep apnea: is there any meaningful correlation? Clinics. 2011;66(8):1347-51.
2. Feldman PJ, Goldwasser R, Mark S, Schwartz J, Orion I. A Mathematical Model for Tumor Volume evaluation using two Dimensions. J Appl Quantitative Meth. 2009;4(4):455-62.
3. Beasley N. Anatomy of the pharynx and esophagus. In: Gleeson M, Browning GG, Jurton MJ, Clarke R, Hibbert J, Jones NS et al, eds. Scott-Brown's Otorhinolaryngology Head and Neck Surgery. Chapter 149. 7th edition. UK: Hodder Arnold; 2008: 1944.
4. Tsara V, Amfilochiou A, Papagrigorakis JM, Georgopoulos D, Liolios E, Kaditis A. Guidelines for diagnosing a treating sleeps related breathing disorders in adults and children. Hippokratia. 2010;14(1):57-62.
5. Montgomery Downs HE, Ramdaan HH, Clawges HC, Mc Bean AL, Insana SP, Santy EE. Digital oral photography for Pediatric tonsillar hypertrophy grading. Int J Ped Otorhinolaryngol. 2011;75:841-3.
6. Kang KT, Choul CH, Weng WC, Lee PL, Hsu WC. Associations between Adenotonsillar Hypertrophy, Age,and Obesity in Children with Obstructive Sleep Apnea PLoS One. 2013;8(10):e78666.
7. Li AM, Wong E, Kew J, Hui S, Fak TF. Use of tonsil size in the evaluation of obstructive sleep apnea. Arch Dis Child. 2002;87:156-9.
8. Freedman M, Ibrahim H, Lee B. Clinical staging for sleep disordered breathing, Otolaryngol Head Neck Surg. 2002;127:13-21.
9. Arens R, McDonough JM, Costarino AT, Mahaboubi S, Catherine E, Tayag-Kier, et al. Magnetic Resonance Imaging of the Upper Airway Structure of Children with Obstructive Sleep Apnea Syndrome. Am J Respir Crit Care Med. 2001;164:698–703.
10. Verse TL, Kroker BA, Pirsig W, Broasch S. Tonsillectomy as a treatment of obstructive sleep apnea in adults with tonsillar hypertrophy. Laryngoscope. 2000;110(9):1555-9.
11. Yasan H, Aynali G, Erdogan O, Yariktas M. Does subjective tonsillar grading reflect the real volume of palatine tonsil. Int J Pediatr Otorhinolaryngol. 2011;75(5):618-9.
12. Wang JH, Hung YS, Jang YJ, Lee BJ. Palating tonsil size and its correlation with subjective tonsil size in patients with sleep disordered breathing. Otolaryngol Head Neck Surg. 2009;141(6):716-21.

Cite this article as: Venkatesha BK, Yogeesha BS, Asha M. Clinical grading of tonsils: does it truly represent total tonsil volume in patients with recurrent tonsillitis. Int J Otorhinolaryngol Head Neck Surg 2017;3:354-8.