

Effect Of Tonsillectomy & Adenoidectomy Or Both On Monocyte, Eosinophil And Lymphocyte Counts

Mushtaq Neamah Abdul Sayed,

Assistant professor, consultant otolaryngology surgeon, Alhabobi teaching hospital, head of otolaryngology department, college of medicine university of Thiqr(F.I.C.M.S), C.A.B.S.

Adnan khudhier Yaqoop,

M.B.CH.B., F.I.C.M.S. surgeon of rhino otolaryngology H & N surgery, Al Mawanae teaching hospital Basra, Iraq 2020

Abstract:

This is prospective study done at ENT department in Al Mawanae teaching Hospital, Basra, Iraq for the period from June 2018 to November 2019, 50 patients aged (3—50) years were subjected to surgery ((tonsillectomy 10 cases, adenoidectomy 8 cases and adenotonsillectomy 32 cases)) and followed post operatively by testing complete blood pictures for all patient. The results were revealed that *neutrophil* would decrease in (tonsillectomy, adenoidectomy, adenotonsillectomy groups) postoperatively in 52% (26/50) of cases in a period up to 1 year and 3 months, *Lymphocyte* decrease in number in 4 months post operatively in 42% (21/50) and 60% (30/50) after 1 year and 3 months postoperatively. *eosinophil* count would increase postoperatively in adenotonsillectomy group 18/32 (56%), and in all group 27/50 (54%). *Monocyte* decreased in 23/50 (46%) of all cases postoperatively and in adenotonsillectomy group 13/32 (40%) of cases. We conclude although there were decreasing in WBC count and lymphocyte and monocyte count postoperatively but they were still within normal limit and no effect on cellular immunity of a person, while there is a raise in eosinophil counts may coincide with high risk of developing of an allergy or increase the severity of the existing one postoperatively, so these surgeries should be done with caution in a patient with allergies unless strictly indicated.

Aim of the study

To evaluate the effect of tonsillectomy and adenoidectomy or adenotonsillectomy on WBC count, lymphocyte and monocyte, and eosinophil counts

Introduction:

The number of leukocytes in the blood is often an indicator of disease, and thus the *white blood cell count* is an important subset of the complete blood count⁽¹⁾⁽²⁾. The normal white cell count is usually between $4 \times 10^9/L$ and $1.1 \times 10^{10}/L$. In the US, this is usually expressed as 4,000 to 11,000, ----⁽³⁾ white blood cells per microliter of blood. White blood cells make up approximately 1% of the total blood volume in a healthy adult, making them substantially less numerous than the red blood cells at 40% to 45%. However, this 1% of the blood makes a large difference to health, because immunity depends on it. Adaptive immunity is mediated by T lymphocytes and B lymphocytes. Each T or B cell expresses receptors that specifically recognize one special chemical structure of a microbial molecule (known, as antigen). Activated B cells also secrete a soluble form of their antigen receptors, known as antibodies or immunoglobulin (Ig).⁽⁴⁾ white blood cells can be classified into: neutrophil are more abundant white blood cell constituting 60% to 70% of circulating lymphocyte, they defend against bacteria and fungal infection their activity and death forming pus. They seen in first step of inflammation and active in phagocytosing bacteria. Life span approach to between 5 and 135 hours.,

Eosinophil

They compose about 2—4% of white blood cell, their count fluctuate throughout the day⁽³⁾⁽⁵⁾, seasonally, and during, menstruation, they increase in response to allergies, parasitic infection, collagen diseases of spleen and central nervous system⁽¹⁾

Basophil

Are chiefly responsible for allergic and antigen reaction recognized by several coarse dark granules with bi or tri lobed nucleus, they excrete histamine, heparin and chemical signal, that attract eosinophil and neutrophil to the area of infection they are the rarest of the white blood cells (less than 0.5% of the total count) ⁽¹⁾.

Lymphocyte

Are much more common in the lymphatic system than in blood. B-Lymphocyte which produce antibodies that bind to the pathogen, block pathogen invasion and activate complement system and enhance pathogen destruction.

Monocyte

Largest white blood cell it has function of phagocytosis and present pieces of pathogen to the cells, so that the pathogen may be recognized and killed ⁻⁽¹⁾ pharyngeal tonsil, tubal tonsil, palatine tonsil, lingual tonsil and nasopharyngeal tonsil (adenoid) are aggregates of lymphoid tissue covered by either respiratory epithelium or non keratinized stratified squamous epithelium. Human born with four type of tonsils. The tonsils are immunocompetent organs which serve as the immune system's first line of defense against ingested or inhaled foreign pathogens, and as such frequently engorge with blood to assist in immune responses to common illnesses such as the common cold. The tonsils have on their surface specialized antigen capture cells called M cells that allow for the uptake of antigens produced by pathogens. These M cells then stimulate the underlying B cells and T cells in the tonsil that a pathogen is present and an immune response is stimulated. B cells are activated and proliferate in areas called germinal centers in the tonsil. These germinal centers are places where B memory cells are created and secretory antibody (IgA) is produced. A 2012 study provided evidence that the tonsils also produce T cells themselves, in a manner similar to the way of the thymus gland. ^{-(1), (6)}. WBC count may increase in response to intense physical exertion, convulsion, acute emotional reaction, pain, pregnancy, labor and certain disease, such as infection and intoxication. The counts may be decreased in response to certain type of infection, drugs, or certain condition such as anemia, malnutrition or anaphylaxis—⁽⁷⁾

PATIENT AND METHOD

---A prospective study was done in ENT department in Al Mawanae teaching hospital, Basra, Iraq, for the period from June-2018, to November-2019, 50 patients aged (3—50 years) underwent tonsillectomy, adenoidectomy or both, (10 tonsillectomy, 8 adenoidectomy, 32 adenotonsillectomy), all patients subjected to ear, nose and throat examination and nasendoscopic examination, WBC, radiological assay and ASO titer, as preoperative evaluation and all patients were followed postoperatively by testing of complete and differential blood picture in different post operative periods (less than one month, 3 months, 5 months, 8 months and more than one year). Monitoring white blood cell, neutrophil, lymphocyte, monocyte and Eosinophil numbers

Results:

In our study most of the operations were done among patients of 3-6 years as shown in table 1.

Table 2 revealed that most of our patients in this study were male who had decline in WBC as well as in lymphocytes counts but no statistically characteristic difference from female.

Total WBC shown decrease in count after 15 months postoperative in all types as shown in table 3, also lymphocyte and monocyte counts were declined, whereas there was increment in the number of the eosinophil cells.

A significant decline in the count of the lymphocytes and monocytes after adenotonsillectomy (65%), (40%). whereas there was increase in the eosinophil count after these operations (56%) as appears in table 4.

Adenoidectomy also followed by decrease in count of lymphocytes (62%) and increment in number of eosinophil cells (50%), while tonsillectomy alone caused declining in the count of lymphocytes (40%) and monocytes (30%) and increasing in the count of eosinophil(50%) as shown in table 4.

Table 1: age distribution in relation to types of operations

Type of operation	Age 1-3 yrs	Age> 3- 6yrs	Age> 6- 10yrs	Age> 10- 20yrs	>20- 30ys	>30- 50yrs	sum
tonsillectomy		3	1	2	3	1	10
adenoidectomy	1	2	2	1	2		8
adenotonsillectomy		17	10	5			32
sum	1	22	13	8	5	1	50

Table -2 shows the distribution of declined in total white blood cell and lymphocyte counts in proportion to gender

declined cases	Male 31	Female 19	Total number 50
White blood cell count	15 (48.3%)	11 (57.9)	26 (52%)
lymphocyte count	16 (51.6%)	14 (73.6%)	30 (60%)

Table 3: white blood cell component in relation to different postoperative period.

Period WBCs change	1month postoperatively	4months postoperatively	15months postoperatively
Total White blood cell count Declined	(23/50) 46%	(24/50) 48%	(26/50) 52%
Lymphocyte count Declined	(20/50)40%	(21/50)42%	(30/50)60%
Monocyte counts Declined	(21/50)42%	(22/50)44%	(23/50)46%
Eosinophil counts Increased	(20/50)40%	(23/50)46%	(27/50)54%

Table 4: type of operations in relation to change in WBCs

Number of WBCs	Tonsillectomy 10	Adenoidectomy 8	Adenotonsillectomy 32
Lymphocytes (declined)	4 (40%)	5 (62%)	21 (65%)
Monocytes (declined)	3 (30%)	3 (37.5%)	13 (40%)
Eosinophil(increase)	5 (50%)	4 (50%)	18(56%)

DISCUSSION

WBC (white blood cell) count would decreased following tonsillectomy, adenoidectomy and Adenotonsillectomy groups postoperatively in52%(26/50) of cases in a period up to 1 years and 3months. Although there was decrease in WBC count after all these types of surgery, it is still within normal range - this goes with study ofAbolhassanFaramarzi et al,^{(7)- (8)}

Lymphocyte increase in number in 4 months post operatively in 42%(21/50) and 60%(30/50)after 1year and 3 months conducted with Lida Moore PhD .et el⁽⁷⁾.

In adenotonsilloectomy group ,lymphocyte as well as monocytes would decreased in count (65%) ,(56%) , and it was clear after 15 months.In tonsillectomy group ,lymphocyte would decreased in 50% of cases postoperatively and in adenoidectomy group, lymphocyte would decreased 80% of cases postoperatively

These findings goes with A. Böck et al ⁽⁸⁾and AbolhassanFamarzi et al studies--⁽⁸⁾Inspite of decrease of WBC and lymphocyte counts postoperatively in more than half of cases but still the level within normal limit ,thus no future significant effect on immunity this goes with AbolhassanFamarzi et al studies----⁽⁸⁾⁽⁹⁾⁽¹⁰⁾.

Monocyte would decreased postoperatively in (46%) , and adenotonsillectomy group was (40%) no significant changes monocyte count postoperatively , while tonsillectomy may lead to certain changes in the cellular and immune systems, these alterations are clinically insignificant and no increased frequency of immunomodulated diseases should be expected.----- A. Böck et al study---⁽⁹⁾⁽¹⁰⁾.

Eosinophil were checked postoperatively in 50 patient (32 adenotonsillectomy, 8 adenoidectomy,10tonsillectomy),and the result were as follow: eosinophil count would increased postoperatively in all groups 27/50(54%) and in adenotonsillectomy group 18/32(56%) ,this result goes with studies ^(11,12,13).Eosinophil count would increased postoperatively may be due to decrease in T-helper after removal of tonsil or adenoid or both-----⁽¹⁴⁾ and may be the reason, for increase in allergic reaction in the body after surgery and coincide with studies ofInt J PediatrOtorhinolaryngol1992 Sep, NalanYurtsever et el, and PRADEEP SHENOY, MBBS, DLO^{(11),(12),(13)}

Conclusion

Although there are decline in WBC(white blood cell) count and lymphocyte count postoperatively in all group (tonsilloadenoidectomy,tonsillectomy,and adenoidectomy) but, they still in a normal limit, and did`nt effect on monocyte count thus no future effect of these operations on immunity , while there are a raise in eosinophil counts may coincide with risk of developing of an allergy or increase the severity of an existing one, so these surgeries should not be done in a patient with allergies unless strictly indicated.

Recommendation :

The restriction of number of patients due to beginning of Covid 19 at November 2019 . We recommend to do a study with more number of patients and for the longer period of follow up in order obtain more reasonable result

REFERENCES

- 1-From Wikipedia, the free encyclopediahttps://en.wikipedia.org/wiki/White_blood_cell
- 2- "Vital and Health Statistics Series 11, No. 247 (03/2005)"(PDF). Retrieved 2 February 2014
- 3-□ LaFleur-Brooks M (2008). Exploring Medical Language: A Student-Directed Approach (7th ed.). St. Louis, Missouri, US: Mosby Elsevier. p. 398. ISBN 978-0-323-04950-4.□
- 4- John C Watkinson et el, Scott brown vol. 1 basic science eighth edition 5-Saladin K (2012). Anatomy and Physiology: the Unit of Form and Function (6 ed.). New York: McGraw Hill. ISBN 978-0-07-337825-1
- 6-, McClory, Susan; Hughes, Tiffany; Freud, Aharon G.; Briercheck, Edward L.; Martin, Chelsea; Trimboli, Anthony J.; Yu, Jianhua; Zhang, Xiaoli; Leone, Gustavo; Nuovo, Gerard; Caligiuri, Michael A. (2012). "Evidence for a stepwise program of extrathymic T cell development within the human

tonsil". *Journal of Clinical Investigation*. **122** (4): 1403–1415. doi:10.1172/JCI46125. ISSN 0021-9738. PMID 22378041. "Tonsils Make T-Cells, Too, Ohio State Study Shows". Ohio State University. Ohio State University, Comprehensive Cancer Center. March 4, 2012. Retrieved March 27, 2014

7-Lida Moore PhD .et el .The immunology of the tonsil in children ,the effect of bacterial load on Band T cells subset ,1988, Wiley on line library

8- IgM, IgG Serum Levels and Lymphocytes Count before and after AdenotonsillectomyIran.J.Immunol. VOL. 3 NO. 4 Autumn 2006187IgM, IgG, IgA Serum Levels and Lymphocytes Count Before and After Adenotonsillectomy----1- Abolhassan Faramarzi^{1*}, Azra Shamsdin², Abbas Ghaderi³Department of Otolaryngology Head and Neck Surgery ,Shiraz University of Medical Sciences, ²Department of Immunology, Fassa School of Medical Sciences, ³Shiraz Institute for Cancer Research –

9- "Tonsils Make T-Cells, Too, Ohio State Study Shows". Ohio State University. Ohio State University, Comprehensive Cancer Center. March 4, 2012. Retrieved March 27, 2014

10- The effect of tonsillectomy on the immune system: A systematic review and meta-analysisAuthor links open overlay pane lMohamadA.Bitar^{abc}AlexanderDowli^{ad}MarcMourad^a
https://doi.org/10.1016/j.ijporl.2015.05.016

11- Serum immunoglobulin E levels in children with chronic tonsillitisInt J PediatrOtorhinolaryngol1992 Sep;24(2):131-4.

12-Is Adenoidectomy and/or Tonsillectomy a Risk Factor for Allergic Diseases and Asthma in Adulthood?**NalanYurtsever**,¹Sadan Soyyigit,¹ZeynepCelebi Sozener,¹Dilsad Mungan,¹S. Kenan Kose,² and Zeynep Misirligil¹Author information Article Notes Copyright and License Information DisclaimerThis article has been cited by other articles in PMC. : **Arch Otolaryngol Head Neck Surg. 1989;115(9):1134-113**

13- September 1989-JAMA otolaryngology H/N surgery Allergic Rhinitis After TonsillectomyPRADEEP SHENOY, MBBS, DLO Author Affiliations Arch Otolaryngol Head Neck Surg. 1989;115(9):1134-1135. doi:10.1001/archotol.1989.01860330124036

14-Tonsillectomy and the immune system: a long-term follow up comparison between tonsillectomized and non-tonsillectomized children A. Böck W. Popp &K.R. Herkner European Archives of Oto-Rhino-Laryngology volume 251, pages423–427(1994).