Comparative Study between Recurrent Tonsillitis and Tonsillar Hypertrophy Based: Histopathological Grading and Hematological Parameters in Children

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Abstract

The current study investigates the differences between recurrent tonsillitis patients (T patients) and tonsillar hypertrophy patients (H patients) according to histopathological grading and some hematological testes in the study groups. The samples were taken (removed tonsil, and blood) from 20 children with tonsillitis and 20 children with tonsillar hypertrophy, by which tonsils kept in formalin(10%) for histopathological study. Blood samples were obtained during the period from November 2019 to January 2020. The histopathological difference in tonsils tissue was observed between the two groups. The result showed significant differences in the lymph follicles, germinal center, fibrosis, necrosis, and infiltration of inflammatory cell. No significant difference ($p > 0.05$) of the Erythrocyte Sedimentation Rate (ESR) level in T patient group(13.2±8.3mm/hr), compared to H patient group (13.06±7.5mm/hr). The WBC count (White blood cell) showed a non-significant difference ($p > 0.05$) between the groups.

Keywords: *Recurrenttonsillitis, Tonsillarhypertrophy, WBC count, ESR.*

Introduction

Tonsils are considered as part of the lymphatic Waldeyern ring, which is responsible for the first line of defines against microbes since they are located at the entry of the respiratory and the digestive tract[(1)].There are three types of tonsils (pharyngeal tonsil, lingual tonsil, and palatine tonsils), the palatine tonsils is frequently referred to as "tonsils" in the medical terminology and sometimes known as facial tonsils. They're located in the lateral position of the oropharynx[(2)]. The tonsils are physiological serves as a protection against respiratory antigens and play an important role in the adaptive immune response.[(3).]

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Tonsillitis is the most common inflammation of palatine tonsils of microbial origin. It may be either chronic or acute, that is generally caused by either viruses or bacteria[(4)]. Recurrent tonsillitis is defined as a person suffering from multiple tonsillitis attacks annually. Recurrent and chronic tonsillitis can involve frequent episodes of inflamed tonsils that have a significant effect on patient health[(5)].

Tonsillar hypertrophy sometimes is idiopathic tonsillar hyperplasia that leads to unusual palatal tonsillar enlargement. Pediatric tonsillar hypertrophy is not a consequence of recurrent inflammation, acute tonsillitis or middle ear infections[(6)]. Tonsillectomy is the most performed treatment that completely removes the tonsil, including its capsule, by dissecting the peritonsillar space between the tonsil capsule and the muscular wall surgery[(7)].Our study aimed to identify the histopathological, and hematological changes accompanying these complications of diseases.

Materials and Method

The study groups are 20 with tonsillitis(T patient

group) and 20 with tonsillar hypertrophy(H patient group). The tissue specimens were obtained during operations of tonsillectomy from Central teaching hospital of pediatric in Baghdad City the haematological study was conducted at the Educational Laboratories/ Medical City and from November 2019 to January 2020. The specimens of tonsil tissue were obtained from children after operations of tonsillectomy. The tissue specimens were kept in the fixation solution (formalin 10%) for histopathological study according to the method of Suvaran[8]. Five ml of venous blood was collected from the patient and transferred the EDTA tube. Assayed was done by using CELL-DYN Ruby haematology analyzer for WBC count. Fresh blood was used to measure ESR, disposable ESR tubes and disposable ESR pipettes.

Statistical Analysis: The Statistical Analysis System (SAS),the obtained data were subjected to the X2 test and one way analysis of variance (ANOVA) test to compare various groups with each other. Results were expressed as mean + standard deviation (SD) and values of $p>0.05$ were considered statically non- significant while $p<0.05$ and <0.01,0.001 were considered significantly different, highly significantly different respectively. The statistical analysis was carried out by SPSS (V. 24).

Results and Discussion

Histopathological study of Tonsils: The histological study using H & E stain in obtained tonsil tissue after tonsillectomy. In T patients group, lymph follicle -1 was seen in 11(55%) with less than 25 follicles and in lymph follicle-2 showed and 9(45%) with more than 25 follicles, the result showed a significant difference ($p<0.05$) between two lymph follicle groups. The result showed a significant difference ($p<0.05$) when compared between two lymph follicle groups of H patients group in which the lymph follicle -1 was seen in 6(30 %) with less than 25 follicles and in lymph follicle- 2 showed 14(70%) with more than 25 follicles. On the other hand, there was a significant difference ($p < 0.05$) between the T patients and H patients group of lymph follicle -1 and -2. Also, the result showed a significant difference ($p < 0.05$) between germinal centers-1 which seen in 9 (45 %) and germinal centers-2 which seen in 11 (55 %) in T patients group. Also, H patients group showed a significant difference ($p < 0.05$) between germinal centers-1 in 8(40 %) and germinal centers -2 that seen in 12(66%).Also, when compared the T patients group with H patients group there was a significant difference ($p<0.05$) observed in germinal centers-1,but there was a non-significant difference ($p>0.05$) observed in germinal centers-2 between T and H patients group (Table-1) and (Figure-1 A,B).

Table 1: Distribution of patients by the categorical variables: lymph follicles and germinal centers in the cases Recurrent Tonsillitis and Tonsillar Hyperplasia

Category	Group	1		2		P. value
		%	N	N	%	
Lymph follicles	T	11	55	9	45	0.05
	H	6	30	14	70	0.01
P. value		0.01		0.01		----
Germinal centers	T	9	45	11	55	0.05
	H	8	40	12	60	0.01
P. value between the main groups		0.05		NS		

T: Recurrent tonsillitis, **H**: Tonsillar hyperplasia.
Number of lymph follicles **1**: less than 25 follicles per field of x4, **2**: 25 or more follicles per x4.
Number of germinal centers **1**: less than 6 germinal centers per field of x10, **2**: more than 6 germinal centers per field of x10.
NS: No significant, **P value**: P>0.05, each group total number = 20

The histopathology examination of tonsil tissue in our study agreement with Rajeshwary *et al.*[9] and AL-Hussaini*et al.*[10] indicated the presence of multiple lymphoid follicles, germinal centers, fibrosis and infiltration of inflammatory cells. The enlargement of germinal centers of the H patients group in comparison

with those from the T patients group indicates the lymphoid follicle is very active[11]. The lymph follicle hyperplasia and enlargement are most findings in the removed tonsils of pediatric in the lymph nodes areas of active, mixed, and chronic inflammation that may be seen[12]. The follicular area enlargement is the main histological characterization of hypertrophied tonsil as a result to a hyperplastic disorder of lymphoid cells that can be explained due to difference in etiology and immune response in this tonsil[13].

The other histopathological changes in (Table-2) and Figure-1 C,D,E) fibrosis, necrosis, neutrophil in epithelium crypt, and infiltration plasmocyte between T and H patient groups as three levels (0-absent, 1-mild, 2-moderate, and 3-severe).

The resulted showed that percentage of necrotic tissue was very little in general, only milled necrosis was seen in 2(10%) of the T patients group, and 1(5%) of the H patients group that showed a significant difference ($p<0.001$) between the two groups of patients.

The obtained data showed fibrosis in T patients group was demonstrated in high percentage as mild fibrosis in 12(60%), 6(30%) as moderate fibrosis and only 2(10%) appeared with intense fibrosis, while in H patients group fibrosis appeared with 5(25%) mild fibrosis,6(30%) moderate and 9(45%) intense fibrosis which was the highest percentage. The result showed a highly significant difference ($p < 0.01$) between the T and H patients group of fibrosis.

In the T patient group, the neutrophil in epithelium crypt was absent in 4(20%) and appeared in 10(50%) as mild and in 6(30%) as moderate. The result showed a significant difference ($p<0.01$) when compared with H patients group in which the neutrophil in epithelium crypt was absent in 7(35%) and seen in 9(45%) as mild and in 4(20%) as moderate.

Based on the result the plasmocyte infiltration on the T patients group was observed in 11(55%) as mild, 7(35%) as moderate, and 2(10%) as intense. While in the H patient group an excessive number of plasmocyte infiltration has been observed,a mild infiltration in 8(40%) and moderate infiltration in 12(60%) has been recorded. The result showed a significant difference ($p<0.01$) when compared between the T and H patient group.

Table (2): Distribution of patients by the categorical variables: fibrosis, necrosis, neutrophil in epithelium crypt, and infiltration plasmocyte in the cases Recurrent Tonsillitis and Tonsillar Hyperplasia

Category	Group	0		1		2		3		P. value
		N	%	N	%	N	%	N	%	
Necrosis	T	18	90	2	10	-	-	-	-	0.001
	H	19	95	1	5	-	-	-	-	
Fibrosis	T	-	-	12	60	6	30	2	10	0.01
	H	-	-	5	25	6	30	9	45	
Neutrophil in epithelium crypt	T	4	20	10	50	6	30	-	-	0.01
	H	7	35	9	45	4	20	-	-	
Infiltration plasmocyte	T	-	-	11	55	7	35	2	10	0.01
	H	-	-	8	40	12	60	-	-	

T: Recurrent tonsillitis, **H**: Tonsillar hyperplasia., **0**-absent, **1**-mild, **2**-moderate, **3**-intense, **P value**: P>0.05, each group total number = 20

The result disagrees with Reis *et al.*[14] who considered the germinal center is the only difference between the two groups. The results showed neutrophils and plasmocyte cells infiltration that may be related to long time chronic infection or frequent attacks that led to the moving of more inflammatory cells to the tissue. In chronic infection, the circulation of blood is poor as a result of degenerative changes causing fibrosis like in chronic tonsillitis[12].

The result agree with Onal *et al.*[15] and Wittlinger *et al.*[16], the small size tonsils with tonsillitis infection

had low lymphoid tissue and high fibrotic tissue large hypertrophied tonsils have high lymphoid and low fibrotic tissue. There was an increase in the neutrophil count is often seen. Blood circulating neutrophils have short life-span then die after entering the inflamed tissues[17].

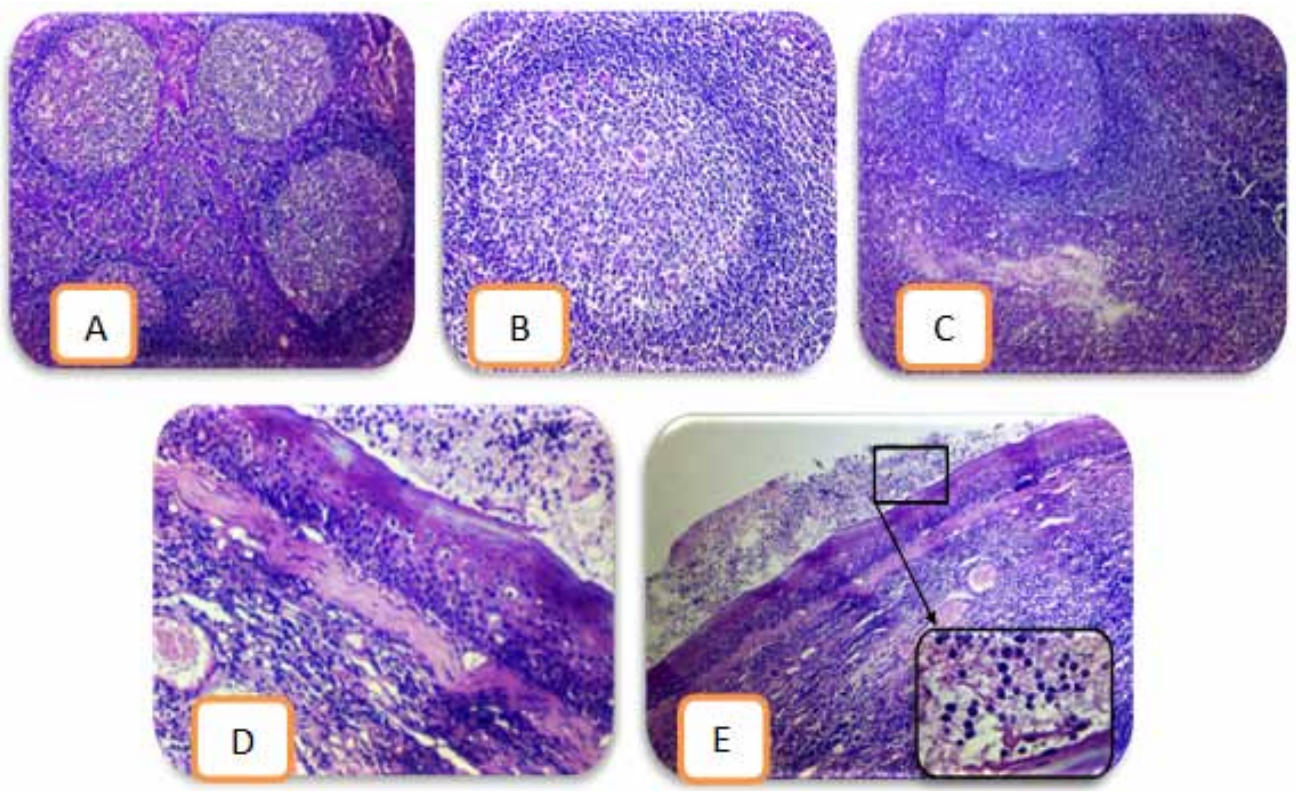

Figure 1: Cross section in palatine tonsil detected by demonstrating, A: increased in size of lymphoid follicles, B: Germinal centers, C: Fibrosis, D: Neutrophil in epithelium crypt, E: Infiltration plasmocyte (H & E, X4).

Erythrocyte Sedimentation Rate (ESR): Data in (Table 3) showed the (mean±SE) of ESR in the control group was (8.9±4.3mm/hr) which showed a non-significant difference ($p>0.05$) when compared with patient groups. As well as when compared between the T patients group (13.2±8.3mm/hr) and H patients group (13.06±7.5mm/hr), the result showed a non-significant difference ($p>0.05$).

This result is agreement with the previous study Mohamed *et al*.[18] and Mackway[19] who have also found there was no elevated in ESR of patient undergo tonsillectomy and Abdelkafy *et al*.[20] result where the most patient shows normal ESR. The ESR is a traditional inflammatory indicator, due to its low sensitivity and specificity and the use of newer inflammatory indicators the importance in clinical research have been reduced[21].

Table (3): The ESR difference in the cases Recurrent Tonsillitis and Tonsillar Hyperplasia.

Tested groups	ESR (mm/hr)
Recurrent Tonsillitis (T)	13.2±8.3
Tonsillar hypertrophy (H)	13.06±7.5
P value between test groups	NS
Control	8.9±4.3
P value between test groups and control	NS

Results are expressed as **mean ±Standard Error, NS**: No significant,**P value**: $P > 0.05$, each group total number = 20**, ESR:** Erythrocyte Sedimentation Rate

Blood Cell Count: Based on the result showed in (Table 4) only the total WBCs count, neutrophil and lymphocyte showed a significant difference

($p<0.05$) between the control group that was (2.9±1.1, 3.5±6.2, 6.4±1.2 cell/µl respectively) when compred with T patients group ((8.7±2.9, 4.7±3, 3.4±1.4cell/µl respectively) and the H patient group (8.0±2.5, 4.2±2.5, 3.2±1.5cell/µl respectively).

Table 4: Effect of study groups in different blood cells of patients and control.

Tested groups/(Cell/µl)	WBCs	Neutrophil	Lymphocyte	Monocyte	Eosinophil	Basophil
Recurrent Tonsillitis (T)	8.7±2.9	4.7±3	3.4±1.4	0.5±0.2	0.4±0.3	0.1±0.1
Tonsillar hypertrophy (H)	8.0±2.5	4.2±2.5	3.2±1.5	0.5±0.2	0.3±0.2	0.1±0.2
P value between test groups	NS	NS	NS	NS	NS	NS
Control	6.4±1.2	3.5±6.2	2.9±1.1	0.4±0.2	0.4±0.1	0.1±0.1
P value between control and test groups	0.01	0.05	0.05	NS	NS	NS

Results are expressed as mean ±Standard Error, WBCs: White Blood Cells, NS: No significant, P value: $P > 0.05$, each group total number = 20

The WBC count is the main blood indicators of general inflammation[22]. In current study, the significant increase in the count of WBC between patients and control group, even if it exists but remain within normal limits. As a result of the immune defense against microbial invasion, the total and differential levels of WBCs in blood will change[23]. Our result agrees with the study of Christensen *et al*.[17], Kara *et al*.[24] and Yorulmaz *et al*.[25], which showed there is an increase in the total WBC count for the patient group who undergo a tonsillectomy while disagree with study of Cengiz *et al*.[26] showed a non-significant difference in WBC count patient with the control group.

Conclusion

There is a histopathological difference between recurrent tonsillitis and tonsillar hypertrophy in germinal center, lymph follicle, fibrosis, necrosis and infiltration of inflammatory cell. In addition, significant increase in patient group when compared with control in WBC count, and no difference between T patients group and H patents group, and no significant difference in ESR level between all groups.

Ethical Clearance: The Research Ethical Committee at scientific research by ethical approval of both MOH and MOHSER in Iraq.

Conflict of Interest: None

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