

Histomorphometric Study of Lymphoid Nodules of Vermiform Appendix

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ABSTRACT

Objective: To study the lymphoid tissues of vermiform Appendix at various age groups to establish that appendix is an important organ of gut associated lymphoid tissue (GALT) and its role in etiology of acute appendicitis.

Study Design: Comparative study

Place and duration: The study was conducted at Islamic International Medical College Rawalpindi from July 2011 to June 2013.

Materials and Methods: Four age groups spacing 15 years between each group, except last group (advanced age) which had no limit because of less availability of the specimens, were made. In each group histological sections of 10 normal looking surgically amputated vermiform appendices were included. The parameters including number of lymphoid nodules and diameter of lymphoid nodules measured under the microscope.

Results: There was gradual decrease of mean number of lymphoid nodules with advancing age but even at the age of 74 few numbers of lymphoid nodules were observed. There was great variation of diameter of lymphoid nodule at different age groups but at advanced age it was much decreased.

Conclusion: The lymphoid nodules decreased with advancing age but these were present even at the age of 74 years. The diameters of lymphoid nodules are remarkable except at advanced age.

Key words: Vermiform appendix, lymphoid nodule, Microscope.

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Introduction

The clinical presentations associated with this blind ending tube (vermiform appendix) are so many and diverse that many lives have been lost in the past either due to misdiagnosis, mismanagement or complications associated with it. The appendix length varies from 2 to 20 cm with an average of 9 cm.¹

The variable number of lymphoid nodules located in the lamina propria extending to sub-mucosa, are arranged circumferentially around the lumen of the appendix. The crypts of Lieberkuhn are absent between epithelial lining and lymphoid nodules at places where the lymphoid nodules are close to epithelial lining. Zahid A. observed that the vermiform appendix is an important component of mammalian mucosal immune function, particularly B-lymphocyte-mediated immune responses and T-lymphocytes derived extra-thymically and it is also

suggested that vermiform appendix is not a vestigial organ.² The normal function of appendix probably helps to promote local immunity.³ The appendix contains both isolated and aggregated lymphoid follicles and it is a part of gut associated lymphoid tissue (GALT).⁴ The irregularity of the lumen of vermiform appendix is due to mucosal folds which appear due to lymphoid follicles.⁵ The lymphoid nodules appear in the vermiform appendix about two weeks after birth⁶. In full term human fetus there is no obvious lymphoid tissue seen in the vermiform appendix but two well organized lymphoid nodules are observed within first two weeks and about 10-12 well organized and prominent lymphoid nodules are visible in transverse section of vermiform appendix of man of thirty two weeks old.⁷ As the age advances, the weight of the appendix decreases because number and size of lymphoid nodules reduces. In or near

appendix, in any pathology, the primary and secondary immune response is high in young age.

Materials and Methods

This study was conducted at Islamic International Medical College Rawalpindi from July 2011 to June 2013. In this study, a total of 40 normally looking surgically amputated vermiform appendix specimens were included. According to age, these specimens were divided into four equal groups. Each group consists of 10 specimens with spacing of 15 years between each group except the last group. Due to less availability of appendices, the last group ranges from 46-74 years. The groups were as follow: Group A: 0- 15 years Group B: 16-30 years Group C: 31-45 years Group D: 46-74 years

The 5 micrometer thickness sectioning of tissue blocks with microtome made. The specimens stained with Haemotoxylin and Eosin. Only the results of middle part of the vermiform appendix are included in this study. The histological slides were examined under the light microscope after calibration of ocular micrometer.

Procedure for measurement of the diameter of the lymphoid follicle

The measurements were taken twice for each nodules, one was taken among the maximum transverse diameter and another at perpendicular to the first one. Then the number of micrometer divisions were multiplied by the correlation factor derived earlier keeping the magnification constant.

Diameter of the lymphoid follicle was calculated as:

$$\text{Diameter of lymphoid follicle} = \frac{\text{Maximum transverse Diameter} + \text{Perpendicular diameter}}{2}$$

By using the above formula the diameter of all lymphoid nodules of each slide were measured and then mean diameter of each slide calculated. Then the mean diameter of each group calculated as shown in the tables.

Results

In our study the four groups A, B, C, & D were made according to the age. The microscopic study was performed after calibration by ocular micrometer. The overall age range was between 6-74 years (mean age 32 years). The age rang, in group A was 6-14 years (mean age 10 years), in group B 16-26 years (mean age

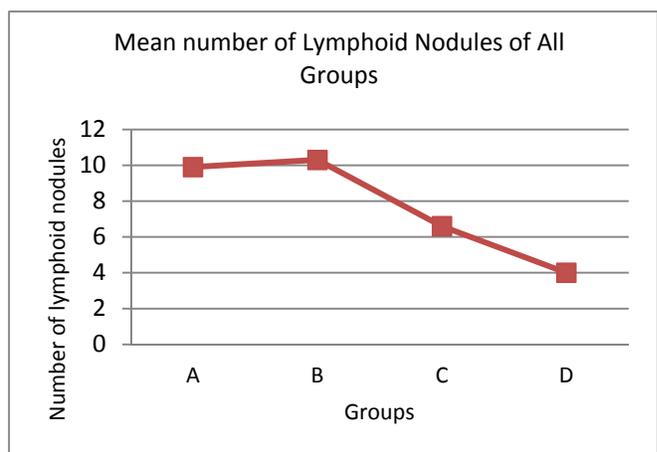
20 years), in group C 31-45 years (mean age 38 years) and in group D 46-74 years (mean age 60.5 years).

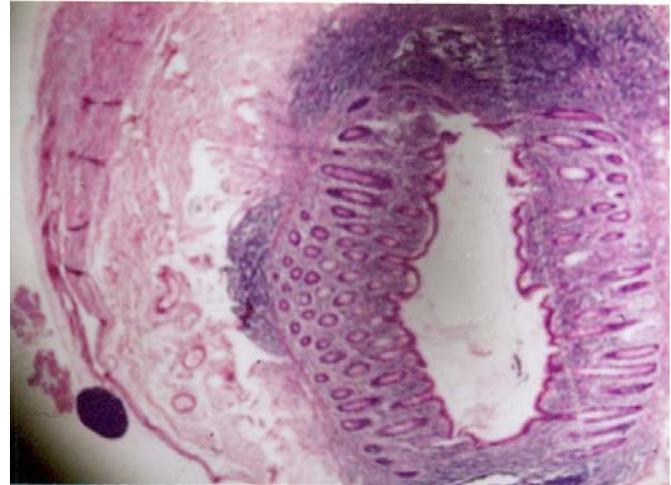
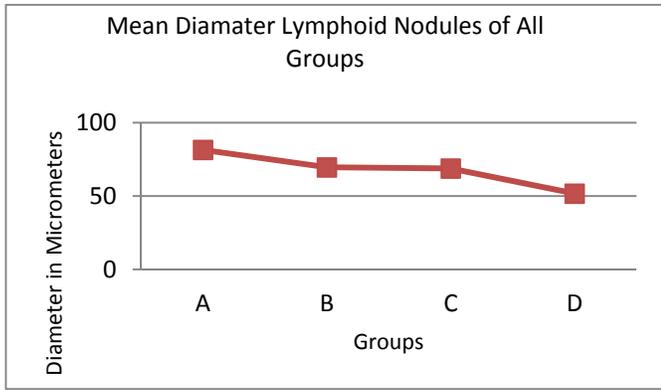
The mean numbers of lymphoid nodules were, in group A 9.9, in group B 10.3, in group C 6.6 and in group D 4.0. (Table I) The maximum numbers (10.3) were in Group B and minimum numbers of lymphoid nodules (3.8) were in group D. In group A, the number of lymphoid nodules range was (07-12), in group B the range was (07-16), in group C the range was (0-10) and in group D, the range was (02-07).

The diameter range of lymphoid nodules in group A was (61-106 μm), In group B range was (46-86 μm), In group C range was (58-88 μm) and In group D the range was (36-72 μm). The mean diameter of lymphoid follicles in group A was 81.5 μm, in group B 69.9 μm, in group C 68.8 μm and in group D 51.7 μm.

As the male and female specimens of vermiform appendix were not adequate, so gender comparison was not made.

Mean number of lymphoid nodules + Mean diameters of all groups		
Groups with age rang	Mean number of lymphoid nodules	Mean Diameter of lymphoid nodules (μm)
A (0-15 years)	9.9	81.5
B (16-30 years)	10.3	69.6
C (31-45 years)	6.6	68.8
D (46-74 years)	4.0	51.7





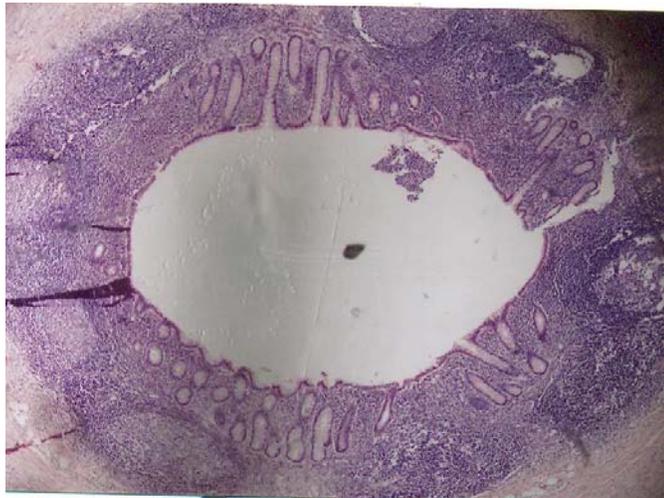
Microphotograph of vermiform appendix of 74 years old man showing lymphoid nodules. H & E stain X40

Discussion

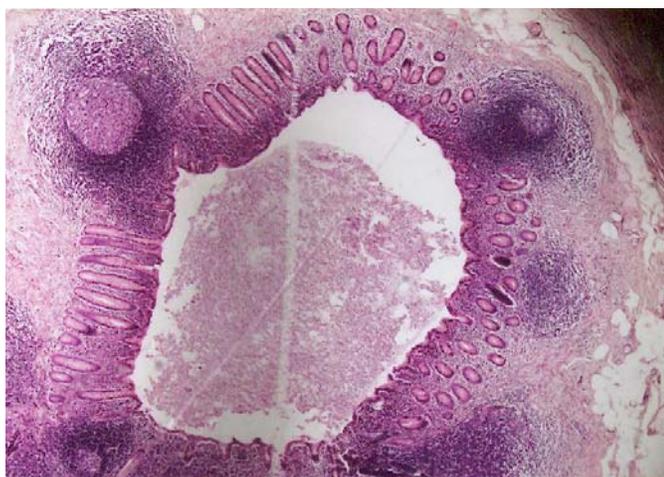
At different age groups, the microanatomy of appendix is variable. The lumen size and wall thickness depends on number and diameter of lymphoid nodules. There are large numbers of lymphoid nodules in the vermiform appendix and it is a part of Gut Associated Lymphoid Tissue (GALT). It is proposed by Zahid A. that appendix perform to train immune system of the body for production of antibodies when exposed to antigen and also play a role in foetal development by manufacturing hormones.²

In this study, the highest number of lymphoid nodules (10.3) is in the group B (16- 30 years) and the lowest number of lymphoid nodules (3.8) is in the group D (46-74 years). In a Bangladesh study⁸, the highest number of lymphoid follicles was in age group up to 20 years and lowest in age group between 56-70 years and similarly the diameter of lymphoid follicles is highest in age group up to 20 years and lowest in age group of 56-70 years but the age grouping was somewhat different from our study. In another study, the highest average diameter of lymphoid follicles was found in group 0-20 years and lowest average diameter was found above 50 years age.⁹ The above referred study agreed with Borley⁵ and Arey.¹⁰ In another Bangladesh study¹¹ the mean numbers of lymphoid nodules are less than half of our study.

In old age, the numbers of the lymphoid nodules are reduced and these are replaced by fibrous tissue.^{11,12} It is observed in our study, that although the mean number of lymphoid nodules is lowest (3.8) in group D (45-



Microphotograph of vermiform appendix of 10 years boy showing lymphoid nodules. H & E stain X40



Microphotograph of vermiform appendix of 35 years old man showing lymphoid nodules. H & E stain X40

74Years) but even at the ages of 60 years, 63 years, and 65 years, the number of lymphoid nodules are equivalent to some specimens of group A, B, and C. Even at the age of 74 years three lymphoid nodules were found. Although the lymphoid nodules and other structures in the wall of appendix are replaced by fibrous tissue in old age but normally it is also observed in many adults¹³. The germinal centers in most of the lymphoid nodules of human appendix are present in the children up to 16 years of age but the number of germinal centers are less in adults and they are absent in the nodules in old age persons.¹⁴ In our study the germinal centers were not explored.

Like the vermiform appendix, the Peyer^s patches (Lymphoid nodules) which are concentrated at distal 25cm of ileum are more numerous in young adults and they become less prominent as age advances.^{15, 16}

Conclusion

The lymphoid nodules decreased with advancing age but these were present even at the age of 74 years. The diameters of lymphoid nodules are remarkable except at advanced age.

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