ISSN 2394–806X (Print), ISSN 2454-5139 (Electronic)
IJHRMLP, Vol: 04 No: 01 January, 2018
Printed in India

ORIGINAL PAPER

A study on lymphoid follicles of appendix

Hazarika Bornali[1], Deka Rup Sekhar[2]

***Received on** May 08, 2017; **accepted** June 04, 2017*

ABSTRACT

***Introduction**: Appendix is well recognized as an immunologic organ that actively participates in the secretion of immunoglobulins, particularly immunoglobulin A (IgA). The appendix is an integral component of the gut associated lymphoid tissue (GALT) system. Obstruction of the lumen is the dominating factor in acute appendicitis. **Methods**: The present study was undertaken at Gauhati Medical College & Hospital involving the departments of Anatomy and Forensic Medicine. Specimens of appendix were taken from the department of Forensic Medicine before putrefaction of the body. Specimens were collected after due permission/consent from the concerned authority and also from the nearest relatives of the deceased. Appendixes were studied in two age groups as '0 to 14 years', and '20 to 50 years'. The data recorded was analysed statistically using Student's T-test. P value d" 0.05 is considered as statistically significant. **Result**: The average number of the lymphoid follicle of appendix in the age group of '0 to 14' years is 11.900 ± 1.649. The average number of the lymphoid follicle appendix in the age group of '20 to 50' years is 7.636 ± 0.855. The average diameter of the lymphoid follicle of appendix in the age group of '0 to 14' years is 120.780 ± 14.890 µm. The average diameter of the lymphoid follicle of appendix in the age group of '20 to 50' years is 91.500 ±7.092 µm. **Conclusion**: number and diameter of lymphoid follicles of human appendix both increases upto adolescent period only. Afterwards, it decreases with advancement of age.*

***Keywords**: Appendicitis, inflammation, age*

INTRODUCTION

The appendix is an evagination of the caecum characterized by a relatively small, narrow, and irregular lumen due to presence of abundant lymphoid follicles. It contains fewer and shorter intestinal glands and has no teniae coli. The vermiform appendix is located in the right lower quadrant of the abdomen.[2, 3] The small entrance of the dead-end pocket of appendix makes it difficult to clean out and prone to physical blockage, which ultimately is the cause of appendicitis.[4] Similar to the tonsils, the lymphatic tissue in the appendix is typically in a constant state of chronic inflammation, and it is generally difficult to tell the difference between pathological disease and the "normal" condition.[5] The incidence as per position of appendix has been reported as 65.28% for retrocaecal, 31.01% pelvic, 2.26% subcaecal, 1% preileal and 0.4% for right paracolic / postileal.[6] The most characteristic feature of the appendix, particularly in young, is the presence of masses of lymphoid tissue in mucosa and submucosa.[7] The commonest positions seen in clinical practice are retrocaecal or retro colic, pelvic or descending. Other positions are sub caecal, pre ilial and post ilial.[8] The appendix is commonly 8 to 10 cm in length (about 3½ inches), though cases upto 20 cm long or more have been reported. It was found that the average length of the appendix in 220 consecutive postmortem examinations to be 9.9 cm. It has been described as tending to be about a centimeter longer in the male than in the female, though some investigators have found no particular difference with sex; its average diameter is about 6 mm at its base.[9] The appendix is the commencement of the large gut. At an early embryonic stage it has the same caliber as the caecum and is in line with it. It is formed by the excessive growth of the right wall of the caecum which pushes the appendix to the inner side. The average length is 9 cm.[10] According to some author the length of the appendix varies from 2 to 20 cm & the average length is 9 cm in adults.[11] Histologically appendix presents four coats from outside inwards: serous, muscular, submucous and mucous.[12] The reduction in appendicular lymphoid tissue that occurs in later life may be another reason why the disease is infrequent in elderly.[13]

OBJECTIVES

(i) To find out the number and diameter of lymphoid follicles of appendix in different ages. **(ii)** To see whether there is any significant differences of number and diameter of lymphoid follicles in different ages.

MATERIALS AND METHODS

Materials: Scalpel, forceps (pointed & toothed), L blocks

Address for correspondence:
[1]Assistant Professor
Email: doc_bornali@yahoo.com
Mobile: +919435016598
[2]Associate Professor (**Corresponding Author**)
Dept. of Anatomy, Gauhati Medical College, Guwahati-32, Assam

(Leuckhart's L piece), Haematoxylin and Eosin stain, DPX (distrene, tricresyl phosphate and xylene), microscope.

Method: The present study was undertaken during the year 2012 at Anatomy department of Gauhati Medical College & Hospital. Appendix of 63 males and 63 females were studied in two age groups as '0 to 14 years' and '20 to 50 years'. Slices were made by cutting the specimen with sharp scalpel. The sizes of the slices were about 3-5mm thick. The fixation of the slices were done by keeping them in 10% formal saline (10% formal saline =100 ml formaline + 8.5 gm sodium chloride + 900 ml tap water) for 24-48 hours. The tissues were subjected to dehydration by immersing them into ascending strength of alcohol- 50%, 70%, 90% and absolute alcohol for specified time. The slices were immersed into clearing agent xylol for half an hour. Then wax impregnation was done by passing the tissue through liquid paraffin bath, maintained at about 60 degree centrigade temperature. Wax impregnation removes the clearing agent from the tissue. Paraffin blocks were prepared with the help of L blocks (Leuckhart's L piece) washed with glycerine. Melted paraffin was poured into the squares of appropriate size and tissues were dipped into it from the impregnation bath with hot tipped forceps. The blocks were labeled with small piece of paper dipped into the block before solidification. Blocks were solidified by submerging them into cold water bath.

Section cutting and slide preparation: It was done by using standared procedure in the microanatomy laboratory of Anatomy department.

Staining of the slides: The staining was done with routine Haematoxylin and Eosin stain.

Parameters: Two parameters were taken for the histological study. (a) Average diameter of lymphoid follicle in micrometer. (b) Number of lymphoid follicles per low power microscopic field in average. For this purpose 20 microscopic field were counted for each specimen and average number of lymphoid follicles these were counted.

RESULTS

The results and observations of the present study is tabulated and graphed as follows:

Table 1 Diameter of Lymphoid follicles in '0 to 14' years

Number of cases	Age in years	Diameter in micrometre
1	0	0
2	5	99
3	5	105.6
4	7	132
5	8	125.4
6	8	141.9
7	10	135.3
8	11	161.7
9	13	158.4
10	14	148.5
Sum		**1207.8**
Mean		**120.780**
S.D.		**±47.087**
S.E.M.		**±14.890**

In this group, 10 number of appendix specimens were taken between the age group of 0 to 14 years where the diameter of lymphoid follicles ranges from 99 to 161.7 micrometre with a mean value of 120.780, Standard Deviation ±47.087 and Standard Error of Mean ±14.890 as evident from **Figure 1**.

Table 2 Number of Lymphoid follicles in '0 to 14' years

Number of cases	Age in years	Number of follicles
1	0	0
2	5	7
3	6	9
4	7	12
5	8	15
6	8	16
7	10	16
8	11	13
9	13	16
10	14	15
Sum		**119**
Mean		**11.900**
S.D.		**±5.216**
S.E.M.		**±1.649**

In this group, 10 number of appendix specimens were taken between the age group of 0 to 14 years where the number of lymphoid follicles ranges from 0 to 16 with a mean value of 11.900, Standard Deviation ± 5.216 and Standard Error of Mean ±1.649 as evident from **Figure 2**.

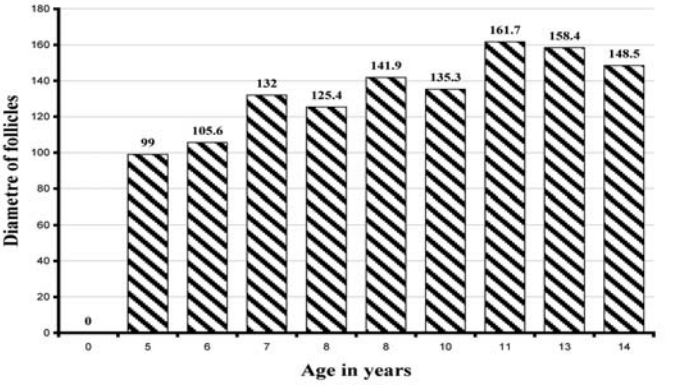

Figure 1 Diameter of lymphoid follicles in '0 to 14' years

Table 3 Diameter of Lymphoid follicles in '20 to 50' years

Number of cases	Age in years	Diameter in micrometer
1	20	125.4
2	25	115.5
3	26	112.2
4	29	102.3
5	31	99
6	32	99
7	39	89.1
8	40	82.5
9	48	66
10	49	49.5
11	50	66
Sum		**1006.5**
Mean		**91.500**
S.D.		**±23.525**
S.E.M.		**±7.092**

In this group, 11 number of appendix specimens were taken between the age group of 20 to 50 years where the diameter of lymphoid follicle ranges from 49.5 to 125.4 cm with a mean value of 91.500, Standard Deviation ± 23.525 and Standard Error of Mean ±7.092 as evident from **Figure 3**.

Table 4 Number of Lymphoid follicles in '20 to 50' years

Number of cases	Age in years	Number of follicles
1	20	14
2	25	11
3	26	10
4	29	7
5	31	7
6	32	6
7	39	5
8	40	6
9	48	7
10	49	5
11	50	6
Sum		**84**
Mean		**7.636**
S.D.		**±2.838**
S.E.M.		**±0.855**

In this group, 11 number of appendix specimens were taken between the age group of 20 to 50 years where the number of lymphoid follicles ranges from 5 to 14 with a mean value of 7.636, Standard Deviation ± 2.838 and Standard Error of Mean ±0.855 as evident from **Figure 4**.

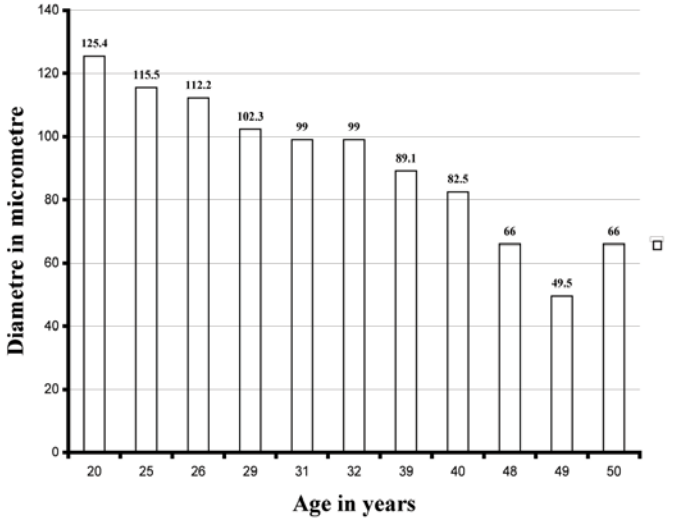

Figure 3 Diameter of lymphoid follicles in '20 t0 50' years

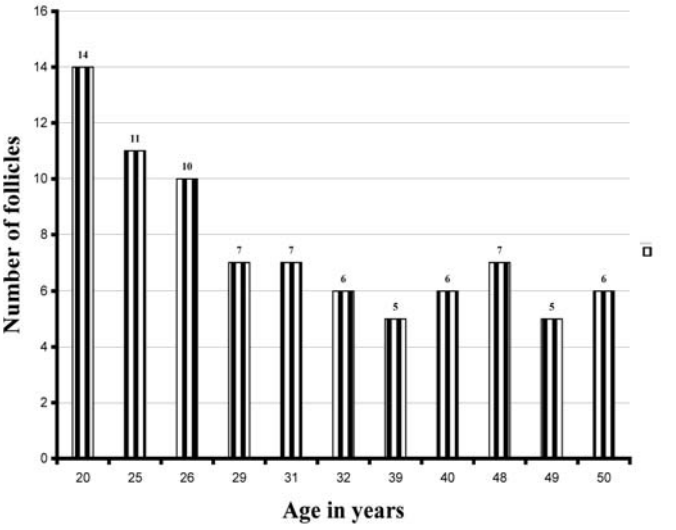

Figure 4 Number of lymphoid follicles in '20 t0 50' years

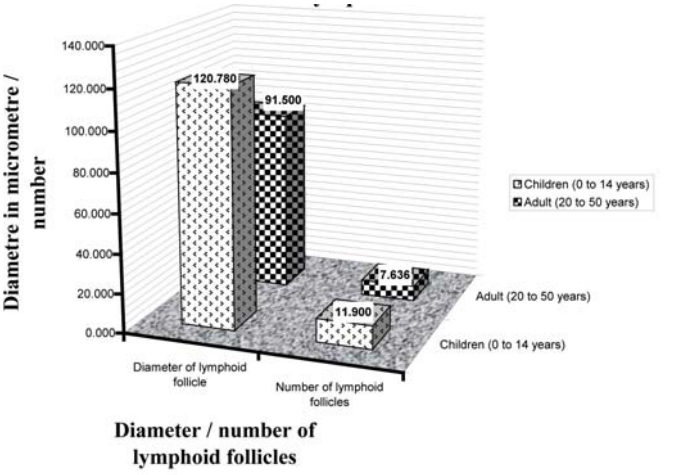

Figure 5 Mean number & diameter of lymphoid follicles in both groups

Table 5 Level of significance of differences of number and diameter of lymphoid follicle

Serial number	Comparison of mean between	"t"	P
1	Number of lymphoid follicle of children (0 to 14 years) &adult (20 to 50 years)	2.402	<0.05
2	Diameter of lymphoid follicle of children (0 to 14 years) &adult (20 to 50 years)	1.775	<0.05

DISCUSSION

The appendix is an evagination of the caecum characterized by a relatively small, narrow, and irregular lumen due to presence of abundant lymphoid follicles. It contains fewer and shorter intestinal glands and has no teniae coli.[14]

A lot of research has been conducted till date on the microanatomy of appendix. Appendix is characterized by a great

increase in the lymphoid tissue, the nodules occupying a large part of both mucous and sub mucous coat, the muscular is mucosa is rather deficient. The glands are much less closely packed than in large intestine. They are most numerous in early life and tend to disappear in old age. The lumen of appendix itself is often obliterated in later life. Researchers like Foster,[15] Bloom & Fawcett,[16] Copenhaver *et al*,[17] Plessis,[18] Borysenko and Beringer,[19] Cormack,[20] Telford and Bridgman,[21] have described the microanatomy of the appendix elaborately. In most of the studies the number and diameter of the lymphoid follicles of appendix are more in children than the adult.

Our study is consistent with this universal observation. Number and diameter of lymphoid follicle of appendix have been measured in matched sets of observation using the null hypothesis: Reject H_o if $P \leq t_á$ when $t_á = t_{0.05}$ setting the level of confidence at 95% probability signifying that if the differences in observation between the matched groups is significant at the level of $P < 0.05$, the hypothesis will be rejected establishing differences in length between the tested groups.

CONCLUSION

The average number of the lymphoid follicle of appendix in the age group of '0 to 14' years is 11.900 ± 1.649. The average number of the lymphoid follicle appendix in the age group of '20 to 50' years is 7.636 ± 0.855. The average diameter of the lymphoid follicle of appendix in the age group of '0 to 14' years is 120.780 ± 14.890 µm. The average diameter of the lymphoid follicle of appendix in the age group of '20 to 50' years is 91.500 ± 7.092 µm.

We can have an inference that the number of the lymphoid follicle of appendix in the age group of '0 to 14' years is more than the age group of '20 to 50' years, which is significant ($P<0.05$) as evident in **table 5**. On the other hand the diameter of the lymphoid follicle of appendix in the age group of '0 to 14' years is more than the age group of '20 to 50' years, which is significant ($P<0.05$), as evident in **table 5**.

Finally, under limitations of the present study it may be concluded that the number and diameter of lymphoid follicles of human appendix both increases upto adolescent period only. Afterwards, it decreases with advancement of age.

Acknowledgements: We sincerely acknowledge the support of Dr. KL Talukdar, Professor, Department of Anatomy, Gauhati Medical College in carrying out the present study.

Conflicts of interest: No conflict of interest is associated with this work.

Contribution of authors: We declare that this work was done by the authors named in this article and all liabilities pertaining to claims relating to the content of this article will be borne by the authors.

Ethical clearance: Taken from institutional ethical committee.

REFERENCES

1. Junqueira LC, Carneiro J, Contopoulos AN. Digestive tract. Basic Histology. 2nd ed. Brazil: Springer; 1971. p. 308.
2. Golalipour MJ, Arya B, Azarhoosh R, Jahanshahi M. Anatomical variations of vermiform appendix in south-east Caspian sea (Gorgon-IRAN). J of Anat Soc of India 2003;52(2):141-3.
3. Schwartz SJ, Shires GT, Spencer FC, Dally JM, Fischer JE, Galloway AC. The appendix. Principles of surgery 1999;7(3):1383-5.
4. Liu CD, McFadden DW. Acute abdomen and appendix. Scientific Principles and Practice in Surgery. 2nd ed. Germany: Medscape; 1997. p. 1246-61.
5. Fawcett DW, Raviola E. Bloom and Fawcett. A textbook of histology. 6th ed. USA: Chapman and Hall; 1994. p. 292.
6. Wakely CP. The position of the vermiform appendix as ascertained by analysis of 10,000 cases. J Anat 1993;67:277.
7. Young B, Lowe JS, Stevens A, Heath JW. Gastrointestinal tract. Wheater's Functional Histology. 5th ed. France: Elsevier; 2007. p. 285.
8. Borley NR, Healy JC. Large intestine. Abdomen and pelvis. Gray's Anatomy. 40th ed. London Churchill Livingstone: Elsevier; 2008. p. 1143.
9. Hollinshead WH. The Jejunum, Ileum & Colon. Anatomy for Surgeons. 2nd ed. Philadelphia: Joanna Cotler Books; 1972. p. 484.
10. Plesssis DDJ. The gut. Chapter IX. A synopsis of surgical Anatomy. 11th ed. Baltimore: Williams & Wilkins; 1984. p. 59.
11. Townsend CM, Beauchamp RD, Evers BM, Mattox KL. The appendix. Chapter 49. Sabiston Textbook of Surgery. 18th ed. Germany: Saunders; 2009. p. 1333.
12. Dutta AK. The alimentary system. Essentials of Human Anatomy. Thorax and Abdomen. 8th ed. Kolkata: Current Books International; 2008. p. 221.
13. Stranding S. Large intestine. Abdomen and Pelvis. Section 8. Gray's Anatomy. 40th ed. London Churchill Livingstone: Elsevier; 2008. p. 1143.
14. Junqueira LC, Carneiro J, Contopoulos AN. Digestive tract. Chapter16. Basic Histology. 2nd ed. Brazil: Springer; 1971. p. 308.
15. Foster CL. Vermiform Appendix. The digestive system. Large intestine. Chapter XXV. Hewer's Textbook of Histology for Medical Students. 8th ed. London: Elsevier; 1964. p. 303.
16. Bloom W, Fawcett D. Intestine. Chapter27. A textbook of histology. 10thed. Philadelphia: Saunders; 1975. p. 674.
17. Copenhaver MW, Kelly DE, Wood LR. The Digestive System. Chapter16. Baileys Textbook of Histology. 7th ed. Philadelphia: Williams & Wilkins; 1978. p. 509-10.
18. Plesssis DuDJ. The gut. Chapter IX. A synopsis of surgical Anatomy, 11th ed. Johannesburg: Bristol; 1984. p. 59.
19. Borysenko M, Beringer T. Oral cavity & Alimentary tract. Chapter14. Functional Histology. 3rd ed. New York: Little Brown and Company; 1989. p. 328.
20. Cormack DH. The digestive system. Chapter13. Essential Histology. 1sted. Philadelphia: J.B. Lipincott Company; 1993. p. 291.