



## HISTOMORPHOMETRIC STUDY OF VERMIFORM APPENDIX.

Sikander Hayat Niazi<sup>1</sup>

1. MBBS, FCPS (G. Surgery),  
M. Phil (Anatomy)  
Islamic International Medical College  
(Riphah University Islamabad)

**Correspondence Address:**

Dr. Sikander Hayat Niazi  
House no 414 Street 16  
Chaklala Scheme III Rawalpindi.  
sikanderz@rocketmail.com

**Article received on:**

26/12/2018

**Accepted for publication:**

25/05/2019

**Received after proof reading:**

30/09/2019

**ABSTRACT... Objectives:** To understand the histopathology of various diseases of vermiform appendix, the knowledge of normal histology of the organ at different age group is mandatory. **Study Design:** Comparative study. **Setting:** Islamic International Medical College Rawalpindi. **Period:** January 2014 to March 2015. **Material and Methods:** Total forty negative appendectomy/normal appendices specimens removed along with other abdominal operations were included in this study. Four equal groups (10 specimens in each) were made, spacing 15 years between each group. The last group had no upper age limit due to less availability of the specimens. The middle parts of specimens were included in this study the various parameters i.e. wall thickness, lymphoid nodules and lumen sizes were measured under microscope after calibration in micrometers after staining. **Results:** The lumen size decreases with advancing age. There was inverse relationship between lumen size and wall thickness. Surprisingly sum of mean lumen size and mean wall thickness of all age groups had no much difference. The number and size of lymphoid nodules decreases with advancing age. **Conclusion:** Although lumen size decreased as age advances but did not obliterate completely till 74 years age. The number and size of lymphoid nodule decreased but wall thickness size remained same and they are observed even at the age of 74 years.

**Key word:** Appendectomy, Lymphoid Nodules, Vermiform Appendix.

**Article Citation:** Niazi SH. Histomorphometric study of vermiform appendix. Professional Med J 2019; 26(10):1635-1639. DOI: 10.29309/TPMJ/2019.26.10.2919

### INTRODUCTION

To avoid complications during surgical and radiological procedures, the anatomical knowledge of vermiform appendix is prime importance.<sup>1</sup> The Vermiform appendix is blind ended tube associated with caecum with varying in length (commonly 6-9 cm).<sup>2</sup>

The appendix lies in the right iliac fossa and its base is situated one third of the way up the line joining the right anterior superior iliac spine to the umbilicus (McBurneys point).<sup>3</sup>

Vermiform appendix is not a useless organ.<sup>4</sup> As age advances the weight of appendix decreases due to decreasing number of lymphatic nodules with replacement by connective tissue.<sup>5</sup>

Appendix has irregular lumen due to lymphoid nodules and mucosal glands range from 42-130 in number at different age groups.<sup>6</sup> The histological

differentiation of vermiform appendix shows that it is a specialized organ.<sup>7</sup> At different age groups the circular, longitudinal muscular layers and sub mucosa varies in thickness considerably.<sup>8</sup>

It has been observed that wall thickness and size of lymphoid nodules between normal and inflamed appendix have significant differences.<sup>9</sup> Although it is helpful but not conclusive to diagnose negative appendicitis by ultra sound and C T scan findings.<sup>10</sup>

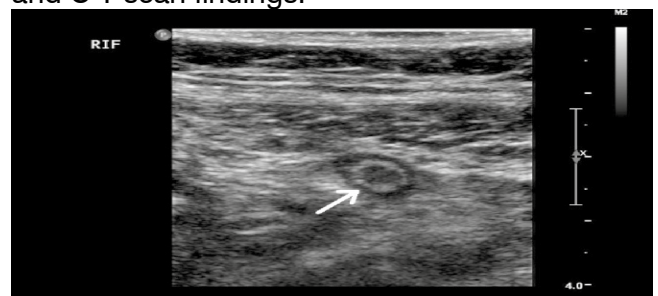


Figure-1. Normal appendix (Transverse section) Ultra-sound picture

## MATERIAL AND METHODS

Total forty negative appendectomy/normal appendices (removed along with other abdominal operations) specimens, were included in this study. It was conducted at IIMC Rawalpindi from January 2014 to March 2015.

According to age, these specimens were arranged in four equal groups. Ten specimens were included in each group i.e. Group A, B, C, D. The age difference between each group was 15 years. The age range in the last group was extended due to less availability of specimens i.e. from 46 to 74 years. In all groups, only middle parts of appendices specimens' slides were included after standard tissue staining. The various parameters i.e. wall thickness, lumen size and lymphoid nodules were measured in micron meters under the light microscope after calibration.

### Data Analysis

ANOVA and Tukey- hoc tests were used to compare the differences in the wall thickness, and lumen size between four age groups. The p value of  $< 0.05$  is significant.

## RESULTS

A sample of total 40 specimens, age of the participants ranging from 6 to 74 years, were prepared and analyzed for the study. Mean age of the sample was  $32.4 \pm 19.8$  years. There were 29 (72.5%) males and 11 (27.5%) females.

The wall thickness (serosa to mucosa), lumen size of vermiform appendix were measured under light microscope. Mean lumen size and mean wall thickness of middle part of appendix was then added for comparison between the groups.

The mean lumen size in group A was  $228.5 \pm 77.5 \mu\text{m}$ , in group B was  $129.6 \pm 59.5 \mu\text{m}$ . In group C was  $112.8 \pm 34.7 \mu\text{m}$  and in group D, the mean lumen size was  $73.9 \pm 34.3 \mu\text{m}$ . The mean luminal size was greatest in group A ( $228.5\mu\text{m}$ ). The maximum luminal size was also observed in group A. ANOVA reported a highly significant difference between the four groups ( $p < 0.01$ ).

The mean wall thickness in group A was  $173.3 \pm 31.9 \mu\text{m}$ , in group B was  $258.2 \pm 55.6 \mu\text{m}$ , in group C was  $275.9 \pm 55.6 \mu\text{m}$  and in Group D was  $271.4 \pm 76.1 \mu\text{m}$ .

On applying ANOVA, a highly significant difference was found between the four age groups ( $p < 0.01$ ).

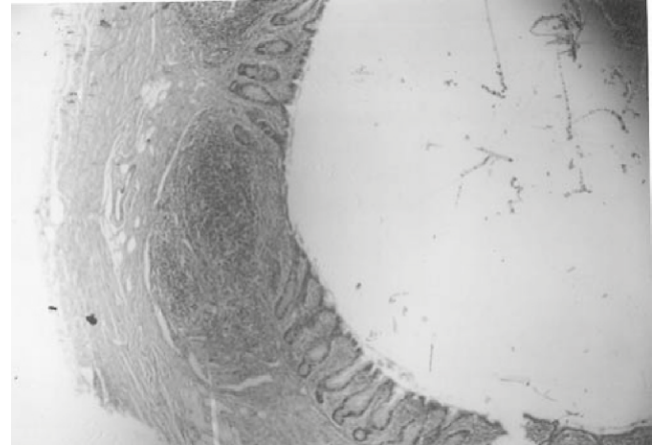


Figure-2. Photomicrograph appendix of group A (6 years age) showing wall thickness. H&E stain. X 100



Figure-3. Photomicrograph appendix of group A showing lumen size (6 year age) H&E stain. X 100

## DISCUSSION

In our study negative appendectomy specimens were included. In other countries, most studies had been conducted on postmortem appendix specimens.

In our study, the mean luminal size of group A (0-15 years) is greatest of all the groups. The luminal diameter is greater in a group (0-20 years) in females in a Bangladesh study.<sup>11</sup>

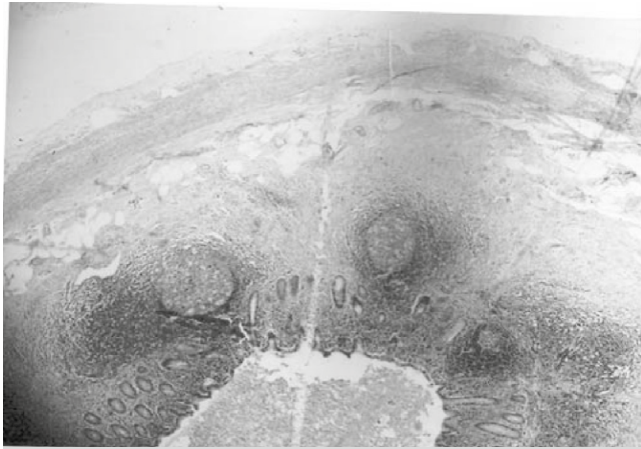


Figure-4. Photomicrograph of appendix of group C showing wall thickness H&E stain. X 100

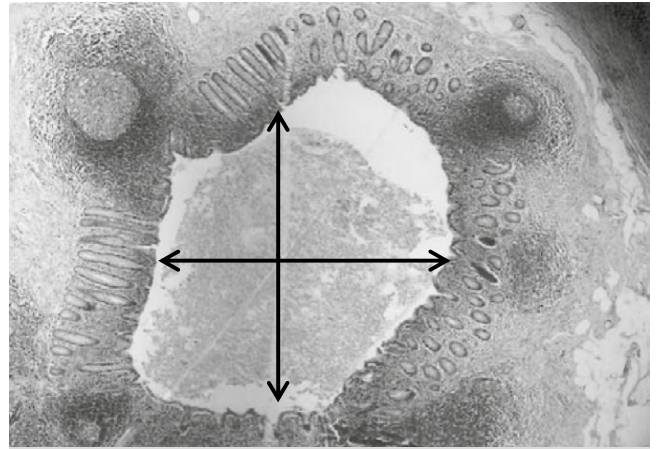


Figure-5. Photomicrograph of appendix of group C showing lumen H&E stain. X 100

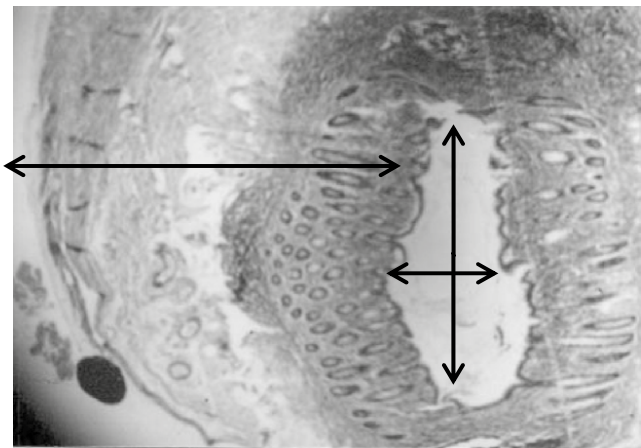
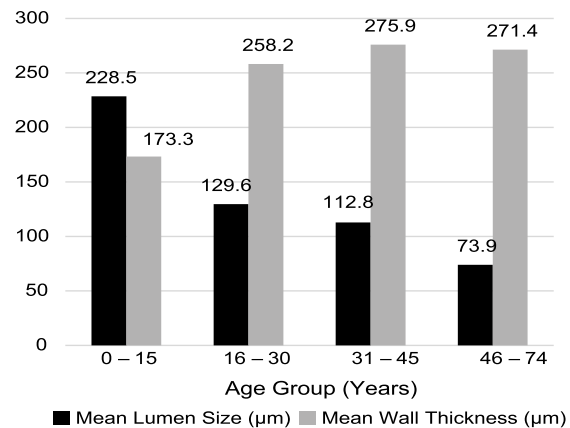


Figure-6. Photomicrograph of appendix of group D (74years) showing wall thickness and lumen H&E stain. X 100



Graph-1. Comparison of mean lumen size and mean wall thickness between different age groups

Age Group	Age Group	Mean Difference	P-Value	Mean Lumen Size ± SD (µm)
Birth - 15 Years	16 Years - 30 Years	98.90	.001	228.5 ± 77.5
	31 Years - 45 Years	115.70	.000	
	46 Years - 74 Years	154.60	.000	
16 Years - 30 Years	Birth - 15 Years	-98.90	.001	129.6 ± 59.5
	31 Years - 45 Years	16.80	.901	
	46 Years - 74 Years	55.70	.122	
31 Years - 45 Years	Birth - 15 Years	-115.70	.000	112.8 ± 34.7
	16 Years - 30 Years	-16.80	.901	
	46 Years - 74 Years	38.90	.396	
46 Years - 74 Years	Birth - 15 Years	-154.60	.000	73.9 ± 34.3
	16 Years - 30 Years	-55.70	.122	
	31 Years - 45 Years	-38.90	.396	

Table-I. Mean lumen size of vermiform appendix in all age groups

Age Group	Age Group	Mean Difference	P-Value	Mean Wall Thickness ± SD (µm)
Birth - 15 Years	16 Years - 30 Years	-84.90	.010	173.3 ± 31.9
	31 Years - 45 Years	-102.60	.002	
	46 Years - 74 Years	-98.10	.003	
16 Years - 30 Years	Birth - 15 Years	84.90	.010	258.2 ± 55.6
	31 Years - 45 Years	-17.70	.899	
	46 Years - 74 Years	-13.20	.954	
31 Years - 45 Years	Birth - 15 Years	102.60	.002	275.9 ± 55.6
	16 Years - 30 Years	17.70	.899	
	46 Years - 74 Years	4.50	.998	
46 Years - 74 Years	Birth - 15 Years	98.10	.003	271.4 ± 76.1
	16 Years - 30 Years	13.20	.954	
	31 Years - 45 Years	-4.50	.998	

**Table-II. Mean wall thickness in vermiform appendix in all age groups**

Age Group (yrs)	Lumen Size (µm) Mean ± SD	Wall Thickness (µm) Mean ± SD	Number of Lymphoid Nodules (n) Mean ± SD	Diameter of Lymphoid Nodules (µm) Mean ± SD	Mean Lumen Size + Mean Wall Thickness (µm) Mean ± SD
0 – 15	228.5 ± 77.5	173.3 ± 31.9	9.9 ± 1.3	81.5 ± 15.7	401.8 ± 73.6
16 – 30	129.6 ± 59.5	258.2 ± 55.6	10.3 ± 3.0	69.6 ± 12.6	387.8 ± 40.1
31 – 45	112.8 ± 34.7	275.9 ± 55.6	6.6 ± 2.9	61.9 ± 24.1	388.7 ± 57.3
46 – 74	73.9 ± 34.3	271.4 ± 76.1	4.0 ± 1.9	51.7 ± 9.4	345.3 ± 66.2

**Table-III. A Comparison of Lumen Size, Wall thickness, Number of lymphoid nodules, Diameter of lymphoid nodules, sum of mean lumen size and mean wall thickness among the four age groups**

In our study, the specimens were sectioned and stained at three levels i.e. base, middle and tip, but only middle component was included in this study. The lumen sizes of above components of specimen were variable. This was also observed in a study of Shgabau, Umar and Singh in Nigeria.<sup>12</sup>

There is inverse relationship between lumen size and wall thickness in our study irrespective of lymphoid nodules diameter. In a Shugaba and also Gupta G. study, the wall thickness increased with decreased lumen size when the diameter of the lymphoid nodules increased<sup>12,13</sup>

Overall total of mean wall thickness and mean lumen size were closer in various age groups irrespective of diameter of lymphoid nodules. This is due to quantity of the fatty tissue increased as the age advanced.

In many adults, the normal structure of the appendix is lost and appendage is filled with fibrous scar tissue as written in a text book of

histology.<sup>14</sup>

It is observed that after 15 years, there is progressive atrophy of lymphoid tissue proceeded concomitantly with fibrosis of wall and partial or complete obliterations of the lumen.<sup>15</sup> In our study the lumen size was well recognized in the specimens even at ages of 60-74 year.

In postmortem specimens of vermiform appendix at Mayo Clinic<sup>16</sup> the earliest total obliteration of lumen occurred at age of 12 year. In one study of autopsy group that high incidence of fibrosis suggested that this is an age related change.<sup>17</sup>

**CONCLUSION**

In this study, there was some inverse relationship between lumen size and wall thickness. The lymphoid nodules were present even at the age of 74 years. There is no much effect on the overall thickness of the wall even if the mean lymphoid nodule and lumen size were decreased with the advancing age.



## RECOMMENDATIONS

For a better understanding of histomorphometric studies the larger samples of vermiform appendix should be examined. For connective tissue contents at different age groups the Masson Trichrome stain may be used. In younger age group, the fibrosis of wall and the obliteration of the lumen of vermiform appendix may be further evaluated.

Copyright© 25 May, 2019.

## REFERENCES

- Salwe NA, Kulkarni PG, Sinha RS. **Study of morphological variations of vermiform appendix and caecum in cadavers of western maharashtra region.** International Journal of advanced physiology and allied sciences, 2014; 1(1): 21-24.
- Sinnatamby CS. **Last's Anatomy e-Book: Regional and Applied.** Elsevier Health Sciences; 2011 Apr 19.
- Snell RS. **The upper limb. Clinical Anatomy by Regions.** 9th ed. Philadelphia, PA: Lippincott Williams & Wilkins. 2012:334-433.
- Zahid A. **The vermiform Appendix: Not a useless organ.** J. coll Physicians and Surgeons, April 2004; 14(4):256-8.
- Rahman MM, Khalil M, Mst Khatija Jahan. **Mass of the vermiform appendix in Bangladesh people.** J Bangladesh Soc Physiol, 2008; 3: 8-12.
- BakarSM, Shamim M, Salam A, Sultana SA. **Microscopic studies on postmortem appendix of the adult males of Bangladesh.** Irish Journal of Medical Sciences, 2015; 185(1): 249-57.
- Standring S, editor. **Gray's anatomy e-book: the anatomical basis of clinical practice.** Elsevier Health Sciences; 2015 Aug 7.
- Berry JA, Lack LAH. **The vermiform appendix of man, and the structural changes there in coincident with age.** J Anat. Physiol, 1906 April; 40(part 3):247-56.
- Lal N, Potalia P. **Histomorphometric comparison of characteristics of healthy and inflamed human vermiform appendix with a special emphasis on the lymphoid tissue.** International journal of Advanced Research and Review, 2016; 1(4): 64-8.
- Kim SH, Choi YH, Kim WS. **Acute appendicitis in children: Ultrasound and CT findings in negative appendectomy cases.** Pediatric Radiology, 2014; 44: 1243-51.
- Rehman MM, Khalil M, Sultan SZ, Jahan MK, Shafiquzzaman M, Parvin B, **Histomorphometric study of lumen of human vermiform appendix.** Mymensingh Med J Jan 2012; 21(1): 39-43.
- Gupta G, StrivastavaSk, MathurSk, Gupta V. **Histomorphometric characteristics of human vermiform appendix with special reference to lymphoid tissue.** J Morphol.Sci, 2012; 29(3): 135-9.
- Shugaba AI, Umar MBT, Sing SP. **Histomorphometric profile of the human vermiform appendix.** J Med Sci, May-June 2006; 6(3):445-51.
- Michael H Ross, Wojciech P. **Histology.** 5<sup>th</sup>ed. 2006. Baltimore: lipponcot, William & Wilkin.
- Way LW, Doherty GM, editors. **Current surgical diagnosis & treatment.** Lange Medical Books/McGraw-Hill; 2003.
- Collins DC. **Mechanism and significance of obliteration of the lumen of the vermiform appendix.** Annals of surgery. 1936 Aug;104(2):199.
- Andreous P, Blain S, Duboulay CEH. **A histopathological study of the appendix at autopsy and after surgical resection.** Histopathology, Nov s 1990(On line Apr 2007); 17(5):427-3.

## AUTHORSHIP AND CONTRIBUTION DECLARATION

Sr. #	Author-s Full Name	Contribution to the paper	Author's Signature
1	Sikander Hayat Niazi	100%	