



A STUDY ON MORPHOLOGY AND THE ARTERIAL SUPPLY OF VERMIFORM APPENDIX

Dr. Nutan Roy

Associate Professor, Department of Anatomy, Madhubani Medical College, Madhubani, Bihar

Dr. Alka Diwedi*

Assistant Professor, Department of Anatomy, Madhubani Medical College, Madhubani, Bihar *Corresponding Author

Dr. Mohammad Zakiuddin

Professor & HOD, Department of physiology, Madhubani Medical College, Madhubani.

ABSTRACT

Background: The Vermiform Appendix has been considered as a vestige of evolution with a tendency to become diseased and as a bane to humanity. **Aims And Objective:** To observe the morphology of appendix and anatomical variations, its position, base, length, details of meso-appendix and appendicular artery in adult. **Materials And Methods:** Descriptive study done in Madhubani Medical College, Madhubani, Bihar after the institutional ethical clearance and consent. The morphology of vermiform appendix studied in 40 cases during abdominal appendicectomy in the department of surgery. The study conducted from August 2022 to June 2023. **Results:** In the present study 12 o'clock position (45%) was the commonest followed by 5 o'clock position (25%), 11 o'clock position (10%), 2 o'clock position (12.5%) and 6 o'clock position (7.5%). The occurrence of 12 o'clock position in 18 cases was higher followed by pelvic position in 10 cases. **Conclusion:** The vermiform appendix was taken up for study in view of its different positions, changing anatomical relations and the clinical complication when inflamed. Life time risk for appendicitis is 8.6% for males and 6.7% for females with increased risk in 2nd decade of life. So, good knowledge about its morphology and its vascular supply is mandatory for interventional surgeons.

KEYWORDS : Appendix, Retrocecal; Preileal; Postileal; and Variations.

INTRODUCTION

The Vermiform appendix is a vestigial structure in humans and is represented by a blind ended muscular tube, situated at the confluence of the three Taenia coli of the caecum. The appendicular base is described to have a relatively constant position in the postero-medial wall of the caecum [1], although it can sometimes be found on the postero-lateral wall and the lower pole of the caecum [1]. The appendix is described to be of variable length but usually ranges from 7.5–10 cm in adults [1]. The appendix is known to show extreme variability in its position and morphology. The classical positions described in the text books include retrocaecal, pelvic, pre-ileal, post-ileal, para-caecal, sub-caecal, and promonteric [2, 3]. Even though it's a vestigial structure with no proven function, it still qualifies attention due to the fact that it gets inflamed rather commonly, resulting in acute appendicitis, one of the most common cause for an acute abdomen in surgical casualties. Though a classical sequence of symptoms is described for acute appendicitis may vary making the clinical presentation of appendicitis highly inconsistent [4, 5]. The reason for this inconsistency could be due to the variability of its relationship with the surrounding structures.

The vermiform appendix (VA) is normally located in the right lower quadrant of the abdomen. Its position in the abdomen corresponds to a point on the surface of the anterior abdominal wall known as Mc Burney's point. The position of base of appendix is constant lying 2cm below ileo-caecal valve [6]. During embryonic development its position in the abdomen is not constant. It is found at different locations in the abdominal cavity depending upon the stage of development and rotation of gut [7]. The vermiform appendix belongs to Mucosa Associated Lymphatic Tissue (MALT) and also called as Abdominal Tonsil. The lumen is irregularly narrowed by sub mucosal lymphoid tissue. It may be widely patent in early childhood but often partially or wholly obliterated in adults. Its lumen may be occluded by fecolith, foreign body or worms [8, 6] Even though the vermiform appendix is considered to be a vestigial organ; its importance in surgery results only from its propensity for inflammation, which results in the clinical syndrome known as "Acute Appendicitis". It is the most common cause of an acute abdomen in young adults all over world [9]. Worldwide, perforated appendicitis is the leading general cause of death. Obstruction of lumen is found to be major cause and may be caused by fecolith, foreign body, parasites or neoplasm. Obstruction leads to bacterial overgrowth and continued secretion of mucus leads to intraluminal distension. Subsequent impairment of lymphatic and venous drainage produces mucosal ischemia [10]. Diagnosis is complicated in obese, elderly patients and in pregnancy. Presentations of symptoms vary in certain positions like diarrhea and frequency of micturition in pelvic, retching in post-ileal, silent appendix in retro- caecal etc. Vermiform appendix has greater

clinical significance as it is involved in many diseases such as appendicitis, carcinoma and diverticulitis. But appendicitis is rare in children below two years of age due to its anatomical characteristics and its relation with caecum. The immunological importance of appendix removal as a precautionary method to prevent future possibility of appendicitis [11].

Appendiceal variation is an extremely rare congenital anomaly seen in 0.004-0.009%. It may be associated with congenital anomalies like agenesis, duplication, triplication, horseshoe appendix etc. It may be associated with meckel's diverticulum. Also Appendix duplication was first classified by cave [12, 7] in 1936 and modified in 1963 by wallbridge [13]. This system classified into three types A, B & C. In 1980 Mitrofanoff [14], described the use of isolated appendix as an ideal conduit. Since then various methods to create an ideal continence mechanism using appendix was reported.

Modified Cave-wall Bridge (2012) Classification:

Classification of types of appendix duplication	Features
A	Single caecum with various degrees of incomplete duplication
B1[bird type]	Two appendices symmetrically placed on either side of the ileocecal valve
B2[tenia coli type]	One appendix arises from the caecum at the usual site, and second appendix branches from the cecum along the lines of the taenia at various distances from the first
B3	One appendix arises from the usual site, and the second appendix arises from the hepatic flexura.
B4	One appendix arises from the usual site, and the second appendix arises from the splenic flexura
C	Double caecum, each with an appendix
Horseshoe appendix	One appendix has two openings into a common caecum
D Triple appendix	One appendix arises from the cecum at the usual site, and two additional appendices arises from the colon

AIMS AND OBJECTIVE

To study the morphology of the vermiform appendix and to observe the anatomical variations of the position of the appendix, its base, length, details of meso-appendix and appendicular artery in adult.

MATERIAL AND METHODS

Study Design: Descriptive study in the Department of Anatomy, Madhubani Medical College, Madhubani, Bihar

Samples Of The Study- The morphology of vermiform appendix studied in 40 cases during abdominal appendicectomy in the department of surgery.

Study Duration - The study conducted from August 2022 to June 2023 (11 months)

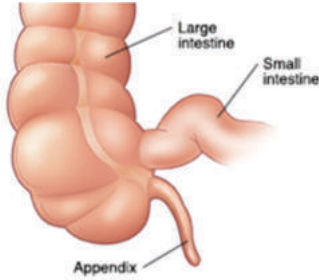


Fig: 1 Anatomy Of Vermiform Appendix.

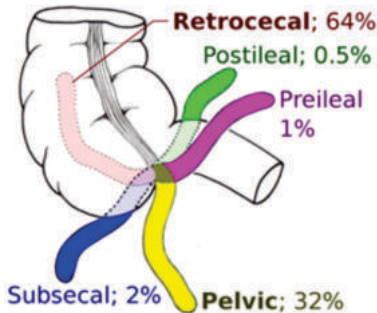


Fig: 2 Location Of Vermiform Appendix

The present study was conducted after an institutional ethical clearance and consent. Forty human appendices were collected from the department of surgery. The specimens were grouped according to age. They were from different age groups ranging from 25 yrs. to 60 years. After removing the appendices, they were examined for any congenital abnormalities like cyst, duplication, diverticula, length, width, lumen patency, mesentery attachment, fixity, and entrance of the artery in relation to the mesentery and also for the presence of accessory artery.

Anomaly Of The Appendix

In the present study, one bifid appendix was present in the 26 years old male. This bifid appendix symmetrically placed on either side of ileo caecal valve in the right iliac fossa. The length of the both appendix was 8cm and external diameter was 6mm. Its tip occupies 11 o'clock position and in paracaecal position. Complete mesoappendix was seen with two appendicular arteries arising from ileo colic artery. It belongs to type B1 according to modified cave wall bridge classification.

Inclusion Criteria

- Forty human appendices were collected from the department of surgery, Madhubani Medical College, Madhubani, Bihar.
- Both the genders are selected.

Exclusion Criteria

- Age less than 25 and more than 60

Statistical Analysis

The information collected regarding all the selected cases were recorded in a master chart. Data analysis was done with the help of computer by using SPSS 16 software and Sigma Stat 3.5 version (2012). Using this software mean, standard deviation and 'p' value were calculated through one way ANOVA and P value of < 0.05 was taken as significant.

RESULTS

The morphology of vermiform appendix was studied in forty cases and the following observations were noted.

Table: 1: Age Distribution

S. No	Age	Sex		Total
		Male	Female	

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1	11 - 20yrs	10	6	16
2	21 - 40yrs	12	7	19
3	41 - 60yrs	2	1	3
4	> 60yrs	2	-	2
Total		26	14	40

Table: 2: Location Of The Appendix

S.No	Location of Appendix	No of cases	Frequency %
1.	Right Iliac Fossa	22	55
2.	Right Lumbar	4	10
3.	Umbilical	3	7.5
4.	Inguinal	11	27.5

Normally the appendix was located in right iliac fossa but also presents in left iliac fossa, sub hepatic or inguinal region.

In the present study 12 o'clock position (45%) was the commonest followed by 5 o'clock position (25%), 11 o'clock position (10%), 2 o'clock position (12.5%) and 6 o'clock position (7.5%). The occurrence of 12 o'clock position in 18 cases was higher followed by pelvic position in 10 cases.

Table: 4 Direction Of Tip

S.No	Direction of Tip	No of cases	Frequency %
1.	Oblique	4	10
2.	Upwards	24	60
3.	Downwards	12	30

In the present study, direction of the tip was vertically upwards in 24 cases, oblique upwards in 4 cases and downwards in 12 cases.

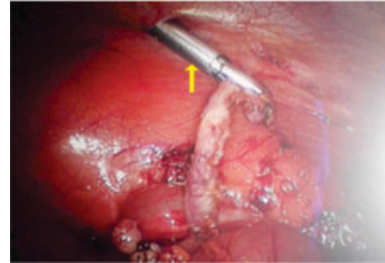


Fig: 3 Tip Directed Upwards.



Fig: 4 Tip Directed Downwards

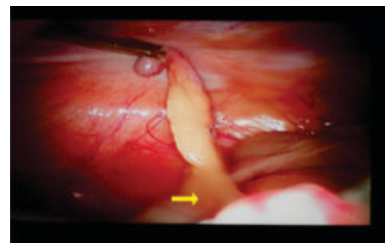


Fig: 5 Retrocaecal Appendix

DISCUSSION

Human vermiform appendix shows extreme anatomical variations and this has implications on the diagnosis and management of appendicitis [15]. The postileal position was the commonest position seen in adults with the retrocaecal position being the next commonest position. Most studies report the retrocaecal and retrocolic position as the commonest, while the post ileal position is reported as the second commonest [16-20]. However some studies report the pelvic appendix as the second commonest position [17]. In studies done on appendectomy patients the retrocaecal position is described as being the commonest [18]. In the current study the base of the appendix was commonly situated on

the postero-medial wall of the caecum. This is the classical position of the base described in books and do not give details about the other positions of the base. We found that 30% of the cases had the base at the lower pole of the caecum. Some studies report the lower pole as the commonest position of the base of the appendix [16]. The distance between the ileocaecal valve and the base of the appendix was 2.8 cm and is consistent with published data [21, 16, 17, 19]. The length of the appendix is reported as being between 2- 25 cm with the average being around 9 cm [22, 20]. In Majority of the cases the appendix was located in right iliac fossa. According to Arindom Banerjee who studied 25 cases, found appendix in RIF in 96% and Subcaecal in 4% Reshma et al stated in her study of 60 fetuses, higher incidence of sub- hepatic position in less than 30 weeks and right iliac fossa position in more than 30 weeks and an equal incidence of right lumbar location. There was also higher incidence of sub-hepatic position in males, right iliac fossa position in females and equal incidence of right lumbar position in both sexes.

According to Bailey & love (2013) the mesoappendix which extends from terminal ileum to vermiform appendix subjects to great variation. Sometimes even the whole extent of appendix was devoid of mesoappendix. The appendicular artery present in the mesoappendix, which is an end artery may not reach the tip leading to ischaemic necrosis and subsequent gangrenous appendicitis. According to Dutta and gray, the mesoappendix is up to the tip of appendix whereas per Hollinshead and last, the mesoappendix was of variable length. It is apparent that the appendicular position and its morphology and blood supply is highly variable. Therefore a good knowledge about the appendix and its morphology is necessary for the clinicians to make a clear diagnosis and to perform a surgery with least complications.

CONCLUSION

The vermiform appendix was taken up for study in view of its different positions, changing anatomical relations and the clinical complication when inflamed. Acute appendicitis is still one of the most common reasons for emergency admission in hospitals. Life time risk for appendicitis is 8.6% for males and 6.7% for females with increased risk in 2nd decade of life. So good knowledge about its morphology and its vascular supply is mandatory for interventional surgeons. Knowledge about the extent of mesoappendix and vascular variation is also useful in many reconstructive surgeries. Knowledge about duplication of appendix was necessary, otherwise missed second appendix leads to medico legal consequences.

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