

Anatomical Variations in Position of Vermiform Appendix an Anatomical Study of Aborted Fetuses

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Abstract

Background: The appendix is a vestigial organ, narrow tube-like structure lying in the right iliac fossa. It is part of the large intestine, and its base is attached to the posterolateral surface of the caecum just below ileocecal junction, the tip is free, and it may be present in retrocecal, subcecal, pre/post ileal, or pelvic positions. Knowing the exact anatomical position of vermiform appendix is important in view of surgeons for on time diagnosis and management of acute appendicitis.

Aim of the Study: The aim of the study was to determine the different characteristics of vermiform appendix in aborted fetuses.

Materials and Methods: A total of 138 aborted fetuses were subjected to dissection to identify the position of the vermiform appendix. Other parameters noted were the length of the appendix, formation of mesoappendix, and direction of the tip of the vermiform appendix.

Observations and Results: Among the 138 fetuses included in the study 89 (64.49%) were male and 49 were female fetuses (35.50%). Observing the position of the appendix, it was noted that among the male fetuses the pelvic position was seen in 52 fetuses (58.42%) followed by subcecal in 14 (15.73%), retroileal in 12 (13.48%), retrocecal in 4 (04.49%), ectopic in 4 (04.49%), and pre-ileal in 3 (03.37%). The tip of the appendix was at 2' O clock position, being the most common in 59 (%) of the male fetuses. The mean length of the appendix in fetuses between 11 and 20 weeks was 14.98 mm, in fetuses between 21 and 30 weeks was 23.65 mm, and in foetuses of 31 to –40 weeks was 35.24 mm. Mesopappendix was completely formed in 79.5% of the bodies.

Conclusions: There was no clear-cut association between the sex of the fetuses and the position of the appendix. Anterior anatomical position was the most common position for vermiform appendix which was not correlating with other reports from western countries. Most probably factors such as race, geographical location, and dietary habits play some role in determining the position of the vermiform appendix.

Key words: Appendicectomy, Appendicitis, Mesoappendix, Vermiform appendix

INTRODUCTION

The vermiform appendix is located in the right lower quadrant of abdomen appearing as a narrow, worm-shaped tube, arising from the posteromedial caecal wall, 2 cm or less below the end of the ileum.^[1] Its opening is occasionally guarded by a semicircular fold of mucous

membrane known the valve of Gerlach.^[2] The appendix is usually located at the junction of the three taenia, found on the surface of the caecum.^[1,3] The length of appendix varies from 7 to 9 cm.^[1,4] The attachment of the base of the appendix to the caecum remains constant, whereas the tip can be found in a retrocecal, pelvic, subcecal, pre-ileal, and post-ileal positions.^[1-3] The appendix is connected to the lower part of ileal mesentery by a triangular fold called as mesoappendix.^[1,2] The mesoappendix has a free border which carries the blood supply to the organ, by the appendicular artery which is a branch from the ileocolic artery.^[5] Inflammation of appendix is known as appendicitis, and usually, it is an acute condition affecting the young adults, a common cause of acute abdomen. Since the appendicular artery is an end artery, and also it's close

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proximity with the appendicular makes it more susceptible to thrombosis during inflammation. This reduces the blood supply to the tip and the cause for gangrene and rupture. Appendectomy is the treatment of choice for appendicitis. If the surgery is delayed, it leads to complications such as rupture, hemorrhage, perforation, and shock. During surgery sound knowledge of the origin of the appendicular artery, its variations, and accessory appendicular arteries is very important to avoid complications. The anatomical knowledge of position and direction of the tip are not only important to the surgeon but also to the radiologist as most of the clinical diagnoses of appendicitis are being confirmed by ultrasound or Magnetic resonance imaging scan of the abdomen nowadays. The diagnostic uncertainty by virtue of its inflamed tip not reaching up to the average length and delay can lead to early perforation and gangrene. Knowing common position(s) of the appendix helps on time diagnosis of acute appendicitis. Variable positions of the appendix may mislead physicians to make a wrong decision or diagnosis of other diseases. Hence, accurate information about the anatomical location of the appendix can improve the prognosis of the disease.^[6] In this context, the present study was conducted to study them anatomical variations in the position of the vermiform appendix and its morphology.

Institute of Study

This study was conducted at Kannur Medical College, Anjarakandy, Kannur, Kerala.

Period of Study.

The period of the study was from March 2014 to February 2018.

Duration of Study

The duration of the study was 4 years.

Type of Study

This was a cross-sectional, prospective study.

MATERIALS AND METHODS

A cross-sectional prospective study was conducted including 138 aborted fetuses which were dissected to study the morphology and position of the vermiform appendix. An Institutional Ethical Committee clearance certificate was obtained before starting the study.

Inclusion Criteria

1. Aborted fetuses belonging to the gestational ages of 11 and 40 weeks were included.
2. Aborted fetuses of both the gender were included.
3. Aborted fetuses belonging to urban, rural, and tribal areas were included.

Exclusion Criteria

1. Aborted fetuses not immediately transferred to the department of anatomy were excluded.
2. Aborted fetuses which are for any reason might change the anatomical position of the appendix were excluded from the study.

The fetuses were obtained from the labor room and operation theater of the department of obstetrics and gynecology of the institute. Keeping the ethical standards in view, all the fetuses were embalmed using 10% formalin. The gestational age was calculated by the available obstetric history and the ultrasonographic reports from the donor department. Determination of sex was done by observing the external genitalia. The dissection was done *in situ* within 24 h of obtaining the specimen. The abdomen of the fetuses was opened by a long midline incision, and all the layers of abdomen (skin, anterior abdominal wall, and peritoneum) were reflected for good view of the abdominal cavity along with its contents. The organs were separated from the right iliac fossa and the taenia coli were visualized; the anterior caecal taenia coli act as the best guide for the vermiform appendix. Although the relation of the base of the appendix to the caecum is constant, the position of the vermiform appendix was studied in relation to the caecum, the terminal parts of ileum and the direction of the tip of the appendix. Accordingly, the position of the vermiform appendices was noted. The length was measured using a standard metal scale in millimeters to include the distance between the tip and the base of the appendix. The direction of the tip of the appendix was noted by lifting the caecum without disturbing base of the appendix. The presence of fully formed mesoappendix was observed by one of the authors to upkeep the standardization. All the data were analyzed using standard statistical methods.

OBSERVATIONS AND RESULTS

Among the 138 fetuses included in the study 89 (64.49%) were male and 49 were female fetuses (35.50%). Among the male, the fetuses belonging to the gestational age of 11–20 weeks were 37 (41.57%), 21–30 weeks were 28 (31.46%), and 31–40 weeks were 24 (26.96%). Among the female, the fetuses belonging to the gestational age of 11–20 weeks were 12 (24.48%), 21–30 weeks were 21 (42.85%), and 31–40 weeks were 16 (32.65%), [Table 1].

Observing the position of the appendix, it was noted that among the male fetuses the pelvic position was seen in 52 fetuses (58.42%) followed by subcecal in 14 (15.73%), retroileal in 12 (13.48%), retrocecal in 4 (04.49%), ectopic in 4 (04.49%), and pre-ileal in 3 (03.37%). Among the female fetuses, the pelvic position was seen in 26 fetuses

(53.06%) followed by subcecal in 7 (14.28%), retroileal in 5 (10.20%), retrocecal in 4 (08.16%), ectopic in 3 (06.12%), and pre-ileal in 4 (08.16%) [Table 2].

Table 3 shows the direction of the tip of the appendix in the present study, the 2’O clock position being the most common in 59 (%) of the male fetuses followed by 2’O clock in 15 (16.85%), 5’ O clock in 6 (06.74%), 7’ O clock in 5 (05.61%), and 11’ O clock in 4 (08.16%) fetuses [Table 2].

The fully formed mesoappendix is shown in Figure 1. In 49/138 (35.50%) fetuses, the mesoappendix was found to be well-formed in this study.

The mean length of the appendix in fetuses between 11 and 20 weeks was 14.98 mm, in fetuses between 21 and 30 weeks was 23.65 mm, and in fetuses of 31–40 weeks was 35.24 mm.

DISCUSSION

In the present study the position of the appendix, it was noted that among the male fetuses the pelvic position was seen in 52 fetuses (58.42%) followed by subcecal in 14 (15.73%), retroileal in 12 (13.48%), retrocecal in 4 (04.49%), ectopic in 4 (04.49%), and pre-ileal

in 3 (03.37%). Among the female fetuses, the pelvic position was seen in 26 fetuses (53.06%) followed by subcecal in 7 (14.28%), retroileal in 5 (10.20%), retrocecal in 4 (08.16%), ectopic in 3 (06.12%), and pre-ileal in 4 (08.16%). This finding was similar to studies of Katzarski *et al.*,^[7] Ojeifo *et al.*,^[8] Rahman *et al.*,^[9] and Paul *et al.*^[6] Similarly the pre-ileal position was observed in 07 (07.86%) foetuses, [Table 2], in this study similar to the reports observed in the references from 6 to 9.^[6-9] However, the studies by L. Ajmani and Ajmani in India,^[10] Ojeifo *et al.* in Bosnia,^[8] and Clegg-Lampthey *et al.* in Ghana^[11] have reported that the most common position of the appendix is retrocecal and pelvic. The studies by Denjalić *et al.*^[12] and Gotalipour *et al.* conducted in Iran,^[13] were evaluated in the patients undergoing appendicectomy. The study by Yabunaka *et al.*^[14] was undertaken by evaluating the size of the appendix by ultrasonography. Whereas the study of Rahman *et al.*^[9] was undertaken during surgery to measure the size of the appendix. All these studies even though were undertaken by different methods were substantially similar to the present study. If the position of the appendix was viewed in relation to the caecum, then it could be divided into anterior: (Pelvic and pre- and retro-ileal) or posterior: (Retrocecal and para-caecal) locations.^[15] In such a situation, the anterior location of the appendix was observed in 107/138 (77.53%) fetuses. Hence, early diagnosis of appendicitis and shorter duration of surgery and hospitalization are expected among such patients. This can reduce the complications of appendicitis surgery.^[15] In the present study, pelvic position is the most common location of the appendix in both 52 (58.42%) in males and 26 (53.06%) in females. The mean length of the appendix in fetuses between 11 and 20 weeks was 14.98 mm, in fetuses between 21 and 30 weeks was 23.65 mm, and in fetuses of 31–40 weeks was 35.24 mm. The length was more in males compared to females by

Table 1: The gender incidence of the fetuses included in the study (n=138)

Gestational age (weeks)	Male - 89 (64.49%)	Female - 49 (35.50%)
11–20	37 (41.57)	12 (24.48)
21–30	28 (31.46)	21 (42.85)
31–40	24 (26.96)	16 (32.65)

Table 2: The position of the appendix in males and females (n=138)

Position of appendix (%)	Male- 89 (%)	Female- 49 (%)
Pelvic - 78 (56.52)	52 (58.42)	26 (53.06)
Subcecal - 21 (15.21)	14 (15.73)	07 (14.28)
Retro-ileal- 17 (12.31)	12 (13.48)	05 (10.20)
Retrocecal - 8 (05.79)	04 (04.49)	04 (08.16)
Ectopic - 7 (05.07)	04 (04.49)	03 (06.12)
Pre ileal - 7 (05.07)	03 (03.37)	04 (08.16)

Table 3: The direction of the appendix in males and females (n=138)

Direction of the tip of the appendix	Male - 89 (%)	Female - 49 (%)
12’ O clock	59 (66.29)	20 (40.81)
2’ O clock	15 (16.85)	17 (34.69)
5’O clock	06 (06.74)	06 (06.74)
7’O clock	05 (05.61)	02 (04.08)
11’O clock	04 (08.16)	04 (08.16)

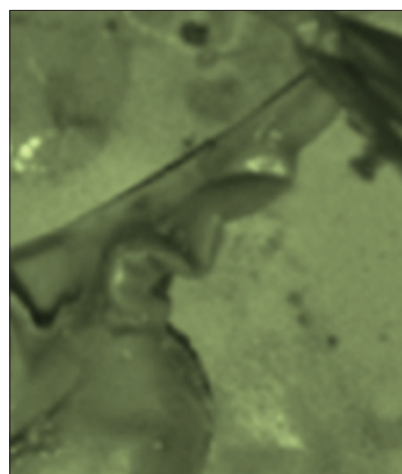


Figure 1: Photograph of appendix in ileocecal region with fully formed mesoappendix

2.35 ± 1.25 mm. In similar studies by Katzarski *et al.*,^[7] Gholalipour *et al.*,^[13] and Ajmani and Ajmani,^[10] it was shown that the size of the appendix was longer in males when compared to females. However, the studies of Bakheit and Warille^[6] and Rahman *et al.*^[9] reported the length to be more in females. Searle *et al.* believe that after an initial growth period during early infancy up to about 3 years, the appendix achieves its adult proportions and does not continue to grow throughout childhood.^[17,18] In 49/138 (35.50%) fetuses the mesoappendix was found to be well-formed in this study. It is recorded in literature that the frequency of incomplete mesoappendix is highest in the age group below 10 years. Incomplete mesoappendix may reduce blood supply to the tip of the appendix and make it prone to gangrene and perforation.

CONCLUSIONS

The incidence of the pelvic position of appendix (anterior position) was higher. Complete mesoappendix was observed in 35.50% of the fetuses. The mean length of the appendix was 24.62 mm.

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