

# MORPHOLOGICAL VARIATIONS OF CAECUM AND APPENDIX IN THE CENTRAL INDIA: A CADAVERIC STUDY

Shilpa Sonare <sup>1</sup>, Prafulla Nikam <sup>2</sup>, Namdeo Kamdi <sup>3</sup>.

<sup>\*1</sup> Assistant Professor, Department of anatomy Anatomy, Government Medical College, Nagpur, Maharashtra, India.

<sup>2</sup> Associate Professor, Department of Anatomy, Government Medical College, Rajnandgaon, Chhattisgarh, India.

<sup>3</sup> Professor and Head, Department of Anatomy, Government Medical College, Nagpur, Maharashtra, India.

## ABSTRACT

One of the important reasons of acute abdomen is appendicitis and emergency surgery is needed many times to treat the condition. Different clinical presentations of appendicitis are observed because of the variations in anatomical location of the appendix. Anatomical and topographical variations of the caecum are also known. These unusual positions and presentations land the surgeon in diagnostic and surgical challenges. In this study, the anatomical variations of the caecum and appendix have been observed. The present study is aimed to study the variations in the size, shape, position and arterial supply of the caecum and appendix in individuals of different ages and sex, a thorough knowledge of which will aid surgeons in performing various abdominal operations. The study was carried out on 30 adult cadavers in the department of Anatomy, Government medical college, Nagpur, Maharashtra, India. Out of which 20 were male cadavers and 10 were female cadavers. The Anatomy of 30 caecum and 30 appendix was studied in detail. In most of the cadavers, the caecum and appendix were found in the right iliac fossa. The commonest shape of the caecum found, was adult (ampullary) type. The commonest position of the appendix found, was retro-caecal, followed by pelvic. This information is certainly helpful to the surgeons in locating the caecum and appendix during surgical interventions.

**KEY WORDS:** Caecum, appendix, anatomical variations.

**Corresponding Author:** Dr. Shilpa Sonare, Assistant Professor, Department of anatomy Anatomy, Government Medical College, Nagpur, Maharashtra, India. **E-Mail:** [drshilpasonare@gmail.com](mailto:drshilpasonare@gmail.com)

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## INTRODUCTION

Caecum is a large blind sac forming the commencement of the large intestine. Vermiform appendix is a worm like diverticulum arising from the posteromedial wall of the caecum, about 2 cm below the iliocaecal orifice. Both are situated normally in the right iliac fossa in adults [1].

Caecum is 6 cm long and 7.5 cm broad. Its shape varies like foetal, infantile and exaggerated due

to the developmental arrest in the shift of the appendix. Its position differs from the right iliac fossa to the sub-hepatic region [2].

Similarly, size, shape and position of appendix also varies. Its length varies from 5-15 cm and its position in the body also differs like right iliac fossa, left iliac fossa, sub-hepatic region etc. Its position is classified according to the direction of the tip of the appendix like the retrocaecal, pre-ileal, post-ileal, pelvic positions

etc. It is suspended by the small fold of mesentery called meso-appendix [3].

The appendix and caecum are developed from the midgut. So they receive their blood supply from the branches of inferior division of ileocolic artery which in turn is branch of superior mesenteric artery (the artery of midgut)[4].

“Acute appendicitis” is a common cause for acute abdomen in young adults. Delay in the diagnosis results in increased morbidity and mortality. Several conditions like diverticulae, mucocoele, carcinoid tumours, intussusception of the appendix mimic acute appendicitis. Therefore, the diagnosis of acute appendicitis remains a challenge despite advanced radiographic and diagnostic laboratory investigation techniques and ultimately left with the art of surgical diagnosis [5].

Therefore, the surgeons performing abdominal operations in adults as well as in children and infants should be well versed with the knowledge of normal as well as variable positions of the caecum and appendix which will help them to diagnose the cases of appendicitis when there is no typical presentation of pain and tenderness over Mc Burney’s point in the right iliac fossa. During emergency appendicectomy operations, the knowledge of variations will be helpful to localize the appendix.

## MATERIALS AND METHODS

The study was conducted on 30 adult cadavers in the department of Anatomy, Government medical college, Nagpur during routine Anatomy dissection. Out of 30 cadavers, 20 were male cadavers and 10 were female cadavers. During dissection, the position of caecum, appendix and their peritoneal relations were noted. The length and width of the caecum and appendix were measured with a digital caliper. The length of the caecum was measured from a horizontal line at the level of the ileo-caecal orifice to its lowest point and the width was taken arbitrarily at mid region. The shapes of the caecum were described as per the standard textbooks. Similarly the length of appendix was measured from its base to the tip and width was measured at its base. The position of the appendix was confirmed by the direction of its tip. Also special focus was given on its blood supply.

**Fig. 1:** Showing the Pelvic type appendix with meso-appendix and adult type caecum.



**Fig. 2:** Showing the retro caecal type appendix.



**Fig. 3:** Showing the blood supply to appendix and caecum.



## RESULTS

The following observation were made on the caecum as shown in table 1

**Table 1:** Morphology of Caecum in Male and Female cadavers.

Morphological features	male	Female	Significance
Length	6.475 (0.462)	5.27 (0.606)	t=6.068, p<0.0001 (statistically significant)
Width	7.205 (0.411)	6.41 (0.582)	t=4.341, p=0.0002 (statistically significant)

The length of the caecum in 20 adult male cadavers was 6.4cm (0.46 SD) [range 5-9 cm] and width was 7.2(0.41 SD) [range 4-10 cm].

The length of the caecum in 10 adult females was 5.3cm (0.60 SD) [range 5.5-8cm] and the

breadth was 6.41cm (0.58 SD).

The observations were found to be statistically significant.

**Position of the caecum:** In all the 30 cadavers, the caecum was found in right iliac fossa.

**Shape of the caecum:** The percentage of different types of shapes of caecum in all 30 cadavers is shown in table number 2 given in table 2.

**Table 2:** Shape of Caecum in male and female cadavers.

Shape	No of males (%)	No of females (%)	Total (%)	Significance
Adult	17 (85%)	7 (70%)	24 (80%)	Chi-square test value=0.938 Degree of freedom= 3 p value=0.816 (statistically not significant)
Exaggerated	2 (10%)	2 (20%)	4 (13.33%)	
Fetal	0	0	0	
Infantile	1 (5%)	1 (10%)	2 (6.66%)	
Total	20 (100%)	10 (100%)	30 (100%)	

Out of 20 adult male cadavers, 17 were of normal adult type i.e., Ampullary (85%), 2 cases were of exaggerated variety (10%) and one case was of conical type (5%).

Out of 10 adult females cadavers, 7 were ampullary (70%), 2 are exaggerated (20%), and 1 case was conical (10%).

**Arterial supply of the caecum:** In all the 30 cadavers, the caecum was supplied by anterior and posterior caecal branches which were branches of the inferior division of ileocolic artery.

**External measurements of the appendix:** The following observations were made on appendix as shown in table 3.

**Table 3:** Morphology of Appendix in Male and Female cadavers.

Morphological feature	Male	Female	Significance
Length (cm)	10.02 (4.56)	8.32 (1.13)	t =1.15, p =0.259 (statistically not significant)
Breadth (cm)	0.5 (0.172)	0.38 (0.103)	t =2.02, p =0.05 (statistically not quite significant)

The length of the appendix in 20 adult male cadavers was 10.02cm (4.56SD) [range 4-20cm] and the breadth was 0.5cm (0.17 SD) [range 0.3-1cm].

The length of the appendix in 10 adult females was 8.32cm (1.13 SD) and the breadth was 0.38cm (0.10 SD).

Table 4 explains various positions of the appendix according to the direction of its tip.

**Table 4:** Position of Appendix in Male and Female cadavers.

Position	No of males (%)	No of females (%)	Total (%)	Significance
Retrocaecal 12	10 (50%)	4 (40%)	14 (46.66%)	Chi-square test value =2.643 Degree of freedom= 5 p value=0.755 (statistically not significant)
Pelvic 4	5 (25%)	4 (40%)	9 (30%)	
Pre ileal 2	2 (10%)	2 (20%)	4 (13.33%)	
Post ileal 2	1 (5%)	0	1 (3.33%)	
Promonteric 3	1 (5%)	0	1 (3.33%)	
Mid inguinal 6	1 (5%)	0	1 (3.33%)	
Total	20 (100%)	10 (100%)	30 (100%)	

According to the table number 4, the commonest position of the appendix in males is retrocaecal or 12 o'clock position while second commonest position is pelvic or 4 o'clock.

In females, the retrocaecal (12 o'clock) and pelvic (4 o'clock) positions are observed in same number of cases.

**Mesoappendix** was complete in 6 cases. In the remaining 24 cases the mesoappendix remained short of the apex.

**Arterial supply of the appendix** - In all the 30 cadavers, the appendix was supplied by the appendicular artery which was a branch of the lower division of ileocolic artery. In two specimens, in addition to appendicular artery, the appendix was found to be receiving an additional supply from the artery of Seshachalam which was seen arising from posterior caecal branch of ileocolic artery.

## DISCUSSION

Acute appendicitis, a common intraabdominal surgical pathology requires a comprehensive understanding of its presentation, evaluation, diagnosis and overall operative management. The morbidity and mortality are related to the present stage of the disease and are substantially higher in cases of perforation.

In the present study, the adult type of caecum was highest in both males (85%) and females (70%). The commonest position of the appendix was found to be retrocaecal in both males (50%) and females (50%). This is followed by pelvic (males 25%, females 30%), preileal (males 10%, females 20%), postileal (males 5%, females nil),



promonteric (males 5%, females nil), midinguinal (males 5%, females nil).

Arvindam B and others studied 25 adult cadavers over a period of 3yrs and found adult type shape of the caecum in 88% cases and retrocaecal position of the appendix in 68% cases. Singh R and others studied 38 cadavers and they also found the commonest position of the caecum was adult type (71%), followed by exaggerated (18%) and commonest position was pelvic (21%) [6].

Wakely has described the positions of vermiform appendix as retrocaecal and retrocolic (65.28%), pelvic (31%), subcaecal (2.26%), pre-ileal (1%), and postileal (0.4%) [7].

Other researchers like Golalipur [8] and Geethanjali [9] however have reported a lower incidence of retrocaecal and pelvic positions than the present and above studies.

A successful outcome of laparoscopic appendicectomy requires great skills from the operating surgeons. The result of many comparative studies have shown that outcome of laparoscopic appendicectomy was influenced by the experience and technique of operating surgeons. Minimally access surgery require different skills and technical knowledge about appendix [9].

## CONCLUSION

The study of gross anatomy and arterial supply of caecum and appendix had been undertaken and this determines the most common position, length and other parameters of the caecum and the appendix. In all the specimens, the caecum and appendix was found to be located in right iliac fossa. The commonest shape of the caecum was found to be adult type and the commonest position of the appendix was retrocaecal followed by pelvic. The information therefore is expected to be helpful for surgeons in the localization of the caecum and appendix during various abdominal operations.

**Conflicts of Interests: None**

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