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Research Article

A Study of Anatomical Variations in the Caeco-Appendicular Position

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Abstract: The caecum and appendix are derivatives of the midgut, situated in the right iliac fossa. The caecum is a capacious sac like segment of the proximal colon. The terminal ileum empties in to the caecum through the ileo–caecal orifice, which is guarded by ileo-caecal valve. The appendix arises from the postero–medial aspect of the caecum about 2.5cm below the ileo–caecal orifice, where the three teniae coli coalesce. This anatomic relationship facilitates identification of the appendix during operation. The aim of the study is an attempt to throw a fresh light on a matter so thoroughly to collate much valuable material and to determine the incidence of the various caeco-appendicular positions, which will enable a surgeon to correlate these positions with the myriad of symptoms that are attributable to the inflamed appendix, during appendectomy. The study may also influence the present knowledge on the diagnosis and surgical interventions in complicated typical and atypical caeco-appendicular positions.
Keywords: Midgut, Teniae coli, Ileo-caecal orifice, Ileo-caecal valve, Caeco-appendicular positions, Appendicitis, Laparoscopic Appendectomy.

INTRODUCTION

Abdomen is a temple of surprises and a magic box as well. The abdomen accommodates innumerable viscera and other anatomical compliments. Thus, meticulous examination of abdomen is one of the most rewarding diagnostic procedures available, especially to the surgeons [1].

The caecum and vermiform appendix are derivatives of the midgut, situated in the right iliac fossa [2, 3]. Vermiform appendix is referred as “worm of the bowel” in ancient medical books and also known as as “abdominal tonsil” [4].

Anatomy is rightly called the father of surgery. This is made more evident in case of appendix as the variations in the position of appendix in-relation to the caecum will lead to varied clinical presentation. Hence, it is crucial to achieve full knowledge about surgical anatomy of caeco-appendicular positions, to avoid the surgical errors of misdiagnosis.

MATERIALS AND METHODS

During the period of 2008 to 2010, a search for patients with surgically confirmed appendicitis was made in the Department of Surgery, Gandhi Hospital, Secunderabad, India. Permission from ethical society was obtained to carry out the present work. 50 patients were studied prospectively, who underwent an appendectomy at the Department of Surgery at Gandhi Hospital. All cases were subjected to clinical assessment, laboratory criteria and ultrasound examination to exclude any other pathology and confirm the diagnosis in doubtful cases before the surgery. 84% of patients underwent an open Appendectomy and 16% of patients Laparoscopic Appendectomy.

RESULTS AND DISCUSSION

On observation caecal positions in 50 cases showed variability, which is included in Table 1.

Table 1: Appendicular positions in the present study

SI. No.	Caecal Position	Number of cases	Percentage
1.	Caecum in the right iliac fossa	47	94%
2.	Sub-hepatic caecum	2	4%
3.	Caecum in the left iliac fossa	1	2%

While reviewing the past literature, the present worker has come across with a study conducted by Ahmed I *et al*. in 2007 [5], mentioned that the caecum and appendix were found in right iliac fossa which was observed in 245 cases out of 303 patients with the incidence of 80.9%. In the present study normal position of the caecum and appendix that is in the right iliac fossa, was observed in 47 cases out of 50 patients, with the incidence of 94%.

Treves F [6], in the year 1885 in his lectures on the anatomy of intestinal canal, mentioned that the caecum was found touching the under surface of the liver in 11 bodies. Black CE [7], in 1912 reported a case of displacement of colon, where in sub-hepatic caecum was observed with inflammed sub-caecal appendix and the sigmoid colon was found in the right iliac fossa with adhesions. In the year 1913, Vosburgh AS [8] reported a case of non-rotation of the intestine, in which J-shaped caecum with ascending colon were found below the liver.

Delatour B [9], in 1915 reported 3 cases of persistent embryonal types of large intestine, amongst which one case was related with sub-hepatic pre-caecal appendix. In the year 2008, Ting and Farely [10] reported a case of appendicitis, in which a sub-hepatic appendiceal faecolith was demonstrated by CT- scan oral and I.V. contrast. Wai Ong and Venkatesh [11], in 2009 reported a case of ascending retro-caecal appendicitis presented with right upper abdominal pain. The CT- scan showed right hypochondrial abscess and laparoscopy confirmed the retro-caecal sub-hepatic appendicitis.

In the present study sub-hepatic caecum and appendix were observed in two cases, with the incidence of 4%, out of 50 cases.

Fig. 1: Sub-hepatic caecum (4%)

In the year 1981, Griffith TW [12] reported a case of transposition of the thoracic and abdominal viscera, in which a cone-shaped caecum was occupied left iliac fossa. Collins FK [13], in 1928 reported 9 cases of non-malignant abnormalities of ascending colon. One of them was presented with transposition of viscera and appendiceal abscess found in left lower abdomen. In the year 1948, Hardy RH [14] reported two cases of congenital disease of the heart with sub-diaphragmatic Situs Inversus, which showed the caecum and appendix in left iliac fossa. Nagaratnam and Kotagama [15] in 1957 reported a case of Dextrocardia, Situs Inversus Totalis with appendicular abscess. On laparotomy they found diseased appendix in left iliac fossa.

In the present study only one case was found with left iliac fossa caecum and appendix on laparotomy, out of 50 cases, with the incidence of 2%.

Fig. 2: Caecum in the left iliac fossa (2%)

The appendicular positions in 5 different positions were observed in 50 cases are tabulated in Table 2 with their frequencies. The retro-caecal position of the appendix was observed in total 22 cases, pelvic position was found in 12 cases, sub-caecal appendix was observed in 9 cases, para-caecal or / and para-colic position of the appendix was found in 5 cases, only 2 cases out of 50 cases have shown post-ileal position.

Table 2: Appendicular positions in the present study

Sl. No.	Position of Appendix	Number of cases	Percent age
1.	Retro-caecal	22	44%
2.	Pelvic	12	24%
3.	Sub-caecal	9	18%
4.	Para-caecal or/and Para-colic	5	10%
5.	Post-ileal	2	4%

Author Bryant JD [16], examined 144 cases in the year 1893 to determine the location of appendix, where in 22.22% of cases were found with retro-caecal appendix. The first comprehensive study of position of the appendix in 3,000 anatomic dissections was completed by Gladstone and Wakeley [17], in the year 1924 and they observed 69.2% of retro-caecal appendices. The similar authors analyzed 5,000 cases in 1928, in which they mentioned that 64.38% of the cases showed retro-caecal appendix. In 1993, O'Connor and Reed [18], observed 33% of the similar position of appendix in their case study over a 6-month period. In 2006, Clegg-Lamptey JN *et al*. [19], carried out a

retrospective study, in which the retro-caecal position was seen in 67.3% of cases. The retro-caecal position of the appendix was observed in total 22 cases out of 50 cases studied in the present study during the course of appendectomy, with the incidence of 44%.

Fig. 3: Retro-caecal appendix (44%)

Collins DC [20], in the year 1932 has shown 7.90% of pelvic appendices in his study of length and position of 4,680 appendices. In 1933, Wakeley CP [21] has mentioned that the pelvic position has occurred in 31.01% of cases in his study. Denjalić A *et al.* [22], have studied variations in position of appendix in 2009, which has shown 57.71% of appendices in pelvic position. In the present study pelvic position of the appendix was found in 12 cases out of 50 cases observed, which showed 24% of incidence.

In the year 2003, Golalipour MJ *et al.* [23], studied anatomical variations of vermiform appendix in South-East Caspian Sea and the result of which showed 12.8% of sub-caecal appendices. Yabunaka K *et al.* [24], have studied different positions of appendix in 388 patients by using sonographic methods in 2007, the results have shown sub-caecal appendix in 9.5% of cases. The sub-caecal appendix was observed in 9 cases out of 50 cases observed in the present study, with the incidence of 18%. The present worker has got highest incidence (18%) of sub-caecal position of the appendix compared to the previous studies reviewed.

In the present study para-caecal or/and para-colic position of the appendix was found in 5 cases out of 50 cases observed, which showed 10% of incidence. The present worker has got highest incidence (10%) of para-caecal or/and para-colic position of the appendix, compared to the previous studies reviewed.

In the year 1950, Wakeley and Childs [25] mentioned in their study that the post-ileal appendix was seen in 7.6% of 171 cases. Only 2 cases out of 50 cases have shown post-ileal position of the appendix, with 4% of incidence in the present study.

The incidence of various caecal and appendicular positions observed in the present study are depicted in the form of pie charts, shown in Fig.1 & 2 respectively.

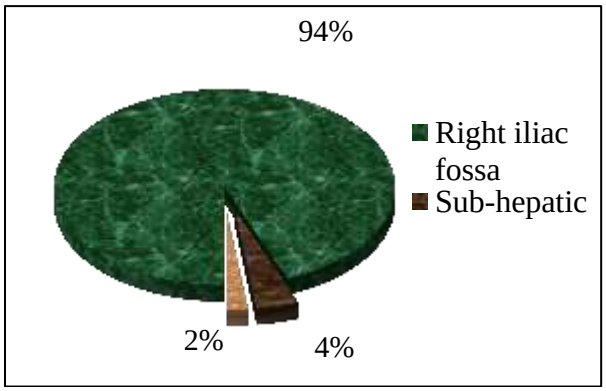

Fig. 1: Incidence of caecal positions

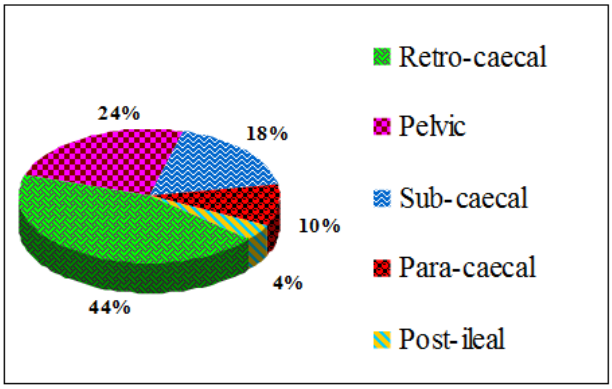

Fig. 2: Incidence of appendicular positions

CONCLUSION

The present work was an attempt to study the occurrence of variations in the caeco-appendicular positions. The available literature was reviewed. After correlating both the observations and literature, the present worker found that the most common pattern in the position of appendix was retro-caecal position in most of the previous studies as well as in the present study (44%). It showed that the present work correlates well with the work done in the past. The post-ileal appendix was being the least occurred position (4%) in this work.

However, the frequencies of different appendicular positions in the present study showed much difference with the results of previous cadaveric studies. This could be due to the chance of a particular position of the appendix to get inflammed, with which the patient reach the hospital, differs in each individual and the present study was carried out only in those patients who were surgically confirmed cases of appendicitis. The ectopic caeco-appendicular positions [Sub-hepatic (4%) & Left iliac fossa (2%)] were also occurred with an incidence of 6% in the present study, diagnosis of which was delayed because of the atypical clinical presentation.

CONCLUSION

The caeco-appendicular positions influence the clinical presentation of appendicitis, which frequently results in delayed diagnosis and increased incidence of complications. Hence, the result of the present study could be of valuable information to the surgeons as it gives a comprehensive knowledge about the varied patterns of caeco-appendicular positions which may be helpful to avoid misdiagnosis and surgical errors. Further larger studies in normal group of people as well as in patients with any clinical condition, by using imaging modalities, may be helpful to understand the possibilities of variations in caeco-appendicular position and to correlate the information, as surgical anatomy, with various clinical presentations.

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