

Retro-Psoas Appendix: A Rare Atypical Position of the Appendix Tip Radiological Images and Review of Literature

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ABSTRACT

The vermiform appendix is considered by most to be a vestigial organ. Its importance in surgery results only from its propensity for inflammation. The tip of the appendix may lie in various locations, of which, the most common is retrocecal within the peritoneal cavity. Atypical locations of appendix have often been reported in the literature. We report an unusual location of appendix in the right retro-psoas muscle space.

Key words: Appendicitis, Atypical appendicitis, Retro-psoas appendix, Cecum

INTRODUCTION

The appendix is a blind muscular tube-like structure and it has mucosal, submucosal, muscular and serosal layers. During growth in the early years of life, continued growth of the cecum causes rotation of the appendix into a retrocecal but intraperitoneal position. In approximately one quarter of the cases, rotation of the appendix does not occur, resulting in a pelvic, subcecal or paracecal position.

It is one of the most variable abdominal organs with different locations in cavity due to differential rotation of cecum or previous abdominal surgery (1, 2)

One of the earliest studies regarding the location of appendix was done by Sir Frederick Treves in which the commonest position was said to be the one in which the appendix is seen directed upwards and leftwards pointing towards the spleen (3). This was challenged by Cecil Wakley in a study of 10000 subjects where the most common location was found to be retrocecal (4). Since then, there have been numerous studies and case reports regarding varying location of appendix.

The tip of the appendix can be located in different areas of the abdominal cavity because of difference in its length and/or the changeable position of the caecum. The common locations of tip in relation to cecum are defined by De Souza et al and enumerated below in decreasing order of percentage (Table 1) (5)

Position	Description
Retrocecal/retrocolic (43.5%)	The appendix is directed upwards behind the cecum and can extend until the proximal part of the ascending colon.
Subcecal (24.4%)	The appendix is present under the cecum, in the right iliac fossa and separated from the iliac muscle by a local peritoneal lining
Post-ileal (14.3%)	The distal portion of the appendix is present postero-superiorly to the terminal ileum and is pointing towards the spleen
Pelvic (9.3%)	The appendix is directed downwards, over the psoas major muscle, with its tip crossing the upper part of the lower pelvis
Paracecal (5.8%)	The appendix is situated laterally to the cecum and ascending colon
Pre-ileal (2.4%)	The appendix is lying anterior-superior to the terminal ileum and the tip directed towards the spleen
Other ectopic positions (0.27)	The appendix does not fit in any of the positions described above

However, most common location as cited by multiple studies is retrocecal (4,5). Although, a few studies found the pelvic one to be most common (1,6). Multiple atypical locations of appendix have been previously reported including left lower abdominal quadrant, next to duodenum, scrotal as a part of content of inguinal hernia, right gluteal region, lateral abdominal pouch and retro-renal (7,8,9)

We report an atypical location of appendix in the right retro-psoas muscle space. During our literature search of published reports in the English language on PubMed and Cross Ref, we

found that it has been reported only once. It was an incidental radiological finding in a trauma patient with no evidence of inflammation (10).

CASE REPORT

Presentation

A 19-year-old female of middle eastern origin came to emergency department with abdominal pain for one day. It was acute in onset, started after fatty meal, generalized with being more severe in para-umbilical region, severe in intensity with no radiation. It was associated with nausea, vomiting and multiple episodes of watery stool.

She was in moderate pain and mildly dehydrated, afebrile, had a heart rate of 88 beats and a respiratory rate of 20 per min and her blood pressure was 102/65mm of Hg. The abdomen was soft with no rigidity but guarding in the epigastric and bilateral iliac fossae. Tenderness was observed equally in both iliac fossae with rebound. Rovsing's, obturator and psoas sign were, however, negative.

Her white cell count was 12,600 /uL (4,000 to 10,000), CRP was 323 mg/L (0 to 5) and lactic acid 4.1 mmol/L (0.5 to 2.2). All other labs were found to be within normal range.

A contrast-enhanced computed tomography (CT) scan of abdomen and pelvis showed dilated appendix with diameter of around 12mm, devoid of any intraluminal contrast, thickened and enhancing walls in the right hemipelvis. It was in a retro-psoas location both in axial and sagittal view (Fig 1-2). There was free fluid noted in the abdomen as well, mainly localized in the pelvis but tracking along bilateral paracolic gutter.





Treatment

Patient underwent laparoscopic exploration and intra operative findings included inflamed, perforated appendix but a healthy base. The inflamed tip was located inside a defect in the peritoneum at the inferior part of the cecum and on the medial edge of the right psoas muscle, revealing a tract which was traversing posterior to the psoas muscle. There was frank pus in the whole abdomen including epigastric and pelvic regions and paracolic gutters. Fecolith found in between bowel loops. Appendectomy was done by ligating the base by PDS loop and peritoneal cavity was washed with saline.

Postoperatively, patient had an uneventful recovery. She was treated with IV antibiotics (cefuroxime and metronidazole) due to the peritonitis and was discharged on the third post-operative day. Histopathological examination confirmed acute gangrenous appendicitis with perforation. She was followed up in the outpatient clinic after 10 days and 30 days and was found to be recovering steadily with no complications.

DISCUSSION

Embryological development

The development of cecum and appendix, which usually happens in between 6th and 10th week of gestation, is related to the development of midgut and its rotation. The preliminary structures of the cecum and appendix first appear as the "bud of the cecum." or cecal diverticulum (11). During rotation of midgut, the caecum bud migrates to lie just beneath the liver in the right side of the upper abdominal cavity. Later it descends inferiorly (also known as descensus of the caecum) and elongates in such a way that proximal end grows more quickly than its distal end, thus assuming a conical shape. Later cecum and its neighboring regions undergo extensive changes to finally occupy its position in right iliac fossa. Because of the origin of the vermiform appendix from the cecum, the final position of the appendix is greatly

influenced by the changes which the caecum undergoes during development and growth (4). This is the primary reason for the various positions, in which, it may be found.

Another major part in the final position of appendix is played by the urogenital ridge which can persist to some extent as fold which is called genito-mesenteric fold. The appendix, when it follows the caecum in upwards and leftwards direction, comes into close proximity of this ridge and tends to be deflected downwards thereby, towards the ovary (pelvic cavity) in the female, or towards the abdominal inguinal ring in the male (4).

Variations during development and rotation of the midgut, can lead to atypical positions of the caecum, which ultimately cause atypical position of appendix. Nonrotation of cecum can cause left-sided colon and caecum (thus appendix also lying on left side), malrotation causing caecum to lie below the pylorus, lack of descensus can lead to a subhepatic caecum, and mobile caecum resulting from lack of fixation in the right iliac fossa (11). All these will result in atypical location of appendix due to atypical location of cecum.

Another interesting postulation in regard to the position of appendix was given by Nayak et al (12). They hypothesized that appendix is also a policeman of abdomen just like the omentum as it also has lymphoid tissue. It is mobile due to the presence of mesoappendix and it probably tries to move in the direction of any infection in the abdomen. Its position may not be fixed in the living person. It may keep changing according to the immunological needs of the abdominal cavity (12).

However, in our patient, the appendix was found to be lying in a retro-psoas position entering this space through a peritoneal defect found at the medial & posteroinferior aspect of the cecum and the medial border of the right psoas muscle. This could have been a congenital defect and a track was formed to accommodate the abnormally placed appendix.

Atypical appendicitis

Acute appendicitis is the most common cause of acute abdomen with appendectomy being the most commonly performed general surgery procedure. Thus, knowledge of its surgical anatomy, and the atypical locations it can be present in, is paramount to make the right diagnosis.

The different and atypical locations of appendix may cause a misdiagnosis in case of acute appendicitis. In literature, there have been numerous reports of atypical presentations due to atypical location of appendix. A left sided appendix due to either malrotation or situs-inverses can present as left side abdominal pain and tenderness (13, 14). A subhepatic retrocecal ascending appendicitis can present as right upper quadrant pain which can be confused with acute cholecystitis (13, 15). Computed tomography is a reliable diagnostic modality for delineating the position and associated inflammation in the appendix and it can be useful in exclusion of appendicitis by showing the normal appendix (7). The features suggesting appendicitis in CT can be an appendiceal diameter > 6.5 mm, periappendiceal fat stranding, fluid around appendix, and an appendicolith (7).

Although many atypical locations have been reported, this is the first report of a retro-psoas appendix causing acute appendicitis. Laparoscopy is very useful in dealing with these cases of atypical locations, and effectively treats its associated complications.

CONCLUSION

- Acute appendicitis is the most common cause of acute abdomen with appendectomy being the commonest general surgery procedure. Thus, knowledge of the surgical anatomy, embryology and atypical locations or orientation of the appendix tip is paramount to make the right diagnosis.
- A preoperative CT scan may help in anticipating an appendix with atypical location and will help the surgeon in operative planning
- The relatively fixed position compared to the tip of the appendix may help the surgeon in locating the appendix in difficult cases.

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