

Case Report

Intraoperative diagnosis of left-sided appendicitis in a patient with partial situs inversus and levocardia: a rare case report

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ABSTRACT

Acute appendicitis is common surgical conditions, requiring an emergency operation and accounting for 4% to 8% of all emergency department visits. The diagnosis depends on clinical manifestation, radiological findings, and surgeon experience. Appendicitis causing pain in the left lower quadrant is rare and can occur with congenital abnormalities that include a true left-sided appendix or as an atypical presentation of a right-sided, but long appendix, which projects into the left lower quadrant. Left-sided acute appendicitis develops in association with two types of congenital anomalies: situs in versus and mid-gut malrotation. Here we are reporting a case of right-side lower quadrant pain presentation of left appendicitis with partial situs inversus. A 28-year-old male presented to the emergency department with a one-day history of right lower quadrant (RLQ) abdominal pain associated with nausea and vomiting. Physical examination revealed RLQ abdominal tenderness with localized guarding. Laboratory tests revealed raised levels of C-reactive protein and neutrophilic leukocytosis. Abdominal ultrasound report came as non-visualized appendix. Patient was taken for laparoscopic appendectomy where the appendix was not found on the right iliac fossa. Laparoscopic exploration was done and revealed a swollen inflamed left-sided appendix attached to a healthy mobile left sided caecum. Laparoscopic appendectomy was carried out and the postoperative period was uneventful and the patient was discharged within 24 hours. Postoperative chest and abdominal contrast-enhanced computed tomography showed a situs inversus with levocardia. Left-sided appendicitis is a rare condition characterized by the anatomical variation of the appendix with atypical presentation and is therefore easy to misdiagnose. Preoperative clinical diagnosis of left sided acute appendicitis is difficult and imaging may help determine the correct diagnosis. Laparoscopic appendectomy is far more superior to the open method in these cases as it saves the patient a formal open surgical exploration.

Keywords: Acute appendicitis, Left-sided appendicitis, Mid-gut malrotation, Situs inversus, Appendectomy, Laparoscopic appendectomy, Case report

INTRODUCTION

Situs defines the arrangement of the viscera and vessels within the body. Three types of visceral situs exist in the body including situs solitus, situs inversus, and situs ambiguous. Situs solitus refers to the normal arrangement of organs. Situs inversus (SI) refers to a mirror-image arrangement of organs to situs solitus. Situs ambiguous refers to abnormalities in the arrangements that can neither

be described as solitus nor inversus. Situs inversus and ambiguous are rare congenital anomalies that causes various diagnostic and therapeutic difficulties. The prevalence of the situs anomalies is estimated to be between 0.001 and 0.01%. In this case report we describe a case of situs inversus where the inflamed appendix was diagnosed intraoperatively during laparoscopic appendectomy.

CASE REPORT

A 28-year-old male patient presented with right lower abdominal pain associated with nausea and vomiting for one day. Initially the pain started at the center of the abdomen and after few hours it became localized to right lower quadrant. Patient was anorexic and constipated. He had no medical comorbidities nor past surgical history. The patient's family history was unremarkable. On assessment, his temperature was 37.6 C, blood pressure (BP) was 130/80 mm Hg, pulse was 94 beats/minute, and respiratory rate was 18/min. Cardiovascular and respiratory examinations were unremarkable. Abdominal examination revealed tenderness, rebound tenderness, and localized guarding at the right iliac fossa. His blood investigations revealed white blood cell count of 10.73 ($n=2.2-10$)/ μ l, neutrophils 7.12 ($n=1-4.5$) 10×3 u/l and C-reactive protein (CRP)-5.71 mg/l. Abdominal ultrasound was done and the report came as normal study and appendix cannot be visualized.

In view of the clinical and ultrasound findings, patient was counselled and consent taken for laparoscopic appendicectomy on clinical suspicion of acute appendicitis. As the patient was categorized in ASA I, no further imaging was requested. Umbilical port was inserted using open method, camera inserted and in the right iliac fossa, small intestines were noted to be crowded. Suprapubic port was inserted and formal exploration was done. This revealed that the whole colon was on the left side with a mobile caecum, a left-sided inflamed appendix, swollen (1 cm in diameter), 10.5 cm in length with the tip crossing the midline from left to right. The stomach, spleen noted on the right side, the larger liver lobe on the left side and small intestine on the right side. An additional port was introduced on the left iliac fossa and was used for proper exploration of the right iliac fossa with the crowded small intestines. Then, after confirming the diagnosis and confirming the absence of other pathology, the surgeon moved to the right side of the patient, an additional port inserted in the right iliac fossa and the appendix was removed as usual. Anesthesiologist was informed about the findings intraoperatively.

Postoperative course was uneventful and the patient was discharged with stable condition on the next day of surgery. After surgery, the patient was further evaluated with chest X-ray, contrast-enhanced computed tomography of the chest, abdomen, and an echocardiogram as a workup of situs inversus.

The upright posterior-anterior chest radiograph showed a gastric air shadow within the right hemi-abdomen with the apex of the heart on the left side (Figure 1). On the chest X-ray, an azygous vein denoted a false impression of aortic knuckle on the right side which was an actual direct continuation of IVC.

A computed tomography (CT) scan of the abdomen (Figure 2) showed a midline liver with the larger lobe on

the left, the spleen and stomach in the right upper quadrant, the whole colon on the left side, and the abdominal aorta to the left of the midsagittal plane. His ECG and echo were a normal heart and no rhythm abnormalities.



Figure 1: Plain chest X-ray showing gastric air bubble on the right side and apex of the heart on the left side.

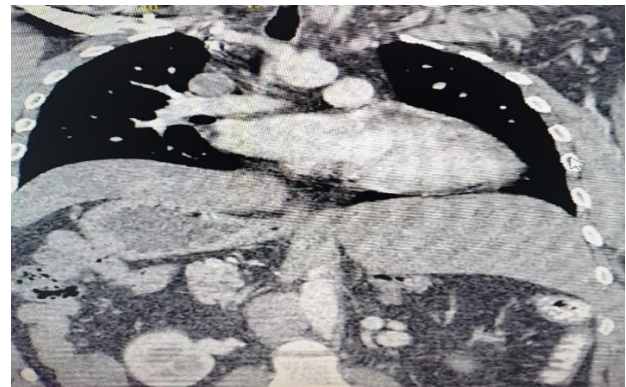


Figure (2): CT scan showing apex of the heart on left, larger lobe of the liver on the left and stomach on right side.

A CT scan of the chest (Figure 3) showed normal anatomical structures except for a prominent azygous vein, which in this patient represented an azygous continuation of the inferior vena cava and heart seen toward the left side with the apex pointing to left (levocardia).

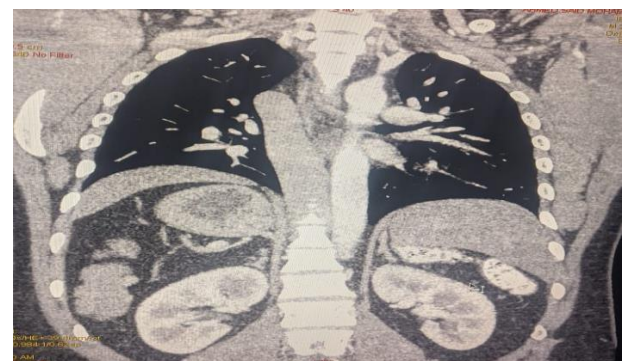


Figure 3: Prominent azygous vein, which represented an azygous continuation of the inferior vena cava.

DISCUSSION

Primarily, there are two different types of anatomic anomalies attributed to the left-sided appendix: SI and malrotation of the midgut loop. In normal development, the midgut rotates in a 270-degree counterclockwise direction and the position of the appendix lies in the right lower quadrant of the abdomen. SI develops when the rotation is made at a 270-degree clockwise direction and results in a complete reversal of all abdominal viscera and the left-sided appendix.^{4,5} Malrotation develops when there is a non-rotation or incomplete rotation of the midgut loop around the axis of the superior mesenteric artery. Because of the unusual displacement of the abdominal viscera in SI, the symptom of acute appendicitis can involve left lower-quadrant pain, making diagnosis difficult in these patients.^{5,6} Concerning the pain location of left-sided appendicitis, Akbulut et al reported that 62% of the patients presented with left lower quadrant pain, 14% with right lower quadrant pain, and 7% with bilateral pain. Because the nervous system may not show corresponding transposition, pain location may be confusing, so preoperative diagnosis has been made in only 51% of the patients.^{6,7} Also, in our particular patient, he presented with right iliac fossa pain and tenderness due to the relatively long appendix (10.5 cm), crossing the midline to the right iliac fossa.

The preoperative diagnosis of SI was possible based on plain chest X-ray; abdominal ultrasound or abdominal CT. X-ray chest was not ordered because patient was ASA I. The ultrasound in our case to identify the appendix in the left iliac fossa. The crowding of the small intestines in the right iliac fossa gave the impression of non-visualization rather than absence of appendix, and no further effort was done to search for the appendix in the left iliac fossa, nor to notice the spleen on the right side. CT was not ordered as the protocol in our hospital was to order CT for suspected appendicitis cases if the clinical, laboratory and ultrasound results were not consistent.

Laparoscopic appendectomy in SI was reported first by Contini et al in 1997, but the technical procedure was not described.^{8,9} Regarding the port site, Palanivelu et al used a 10 mm suprapubic port as the working port and a 5 mm umbilical port as the camera port in left-sided appendicitis, but there were no standard port positions and they adopted a tailored approach to modify the port placements according to the basic principles of laparoscopy triangulation and ergonomics.⁹ Golash used a 10 mm port in the left iliac fossa as a working port and a 5 mm port in the suprapubic region.^{9,10} In our case, we put three standard ports: a 10-mm supra umbilical camera port, a 5-mm left-sided working port, and a 5-mm suprapubic trocar as a supplementary port. After findings of situs inversus and left-sided appendicitis, a fourth 5-mm port was adjusted on the right side of the abdomen. These trocar placements were mirror image placements of the surgical instruments for right-sided appendectomy, so a right-handed operator used their left hand as the dominant. As a result, the

operative time was 45 minutes; slightly longer than that of routine right-sided appendectomy. Oms and Badia reported that handedness could influence the performance of the operation of SI, and we speculate that a left-handed operator could perform the surgery more conveniently. We used monopolar diathermy for securing the mesoappendix.¹⁰⁻¹² This case is a classic example about how beneficiary laparoscopic surgery is. Once we did not find the appendix in the right iliac fossa, a laparoscopic exploration was done and we were able to identify the pathology and the SI. If this case was done by open method, it would have been impossible to identify the appendix, and the patient would have been ended up with an open exploration. Laparoscopy is considerably beneficial both in terms of diagnosis and as a definitive surgery in appendicitis in SI patients because the diagnosis is difficult and the location of the appendix varies.

Postoperatively the patient was further evaluated by chest X-ray, contrast-enhanced CT abdomen, chest, and echocardiography and ECG. In our case, the cardiac assessment was within normal limits. The patient was diagnosed as partial situs inversus with left-side appendicitis and levocardia without cardiac anomaly.

CONCLUSION

Left-sided appendicitis is a rare condition that must be kept in mind in the differential diagnosis of left-sided abdominal pain. The approach to these patients is still challenging; therefore, detailed physical examination, laboratory and imaging investigation including plain chest X-ray, abdominal ultrasound and CT scans are the key to a correct diagnosis and safe management and treatment.

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