



Laparoscopic Para-Aortic Lymphadenectomy for Metastatic Colon Cancer in a Patient with Left-Sided Inferior Vena Cava: a Case Report

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Abstract

Transposition of inferior vena cava, or, left-sided inferior vena cava (LS-IVC) is a rare clinical entity, in which the inferior vena cava ascends along the left side of the abdominal aorta. Literature contains mainly clinical case reports. Although it is usually not associated with clinical symptomatology, this anomaly should be detected during preoperative planning to avoid iatrogenic injuries intraoperatively. We present a case of left-sided inferior vena cava encountered during laparoscopic lymphadenectomy in a 45-year-old man with previous laparoscopic hemicolectomy due to colon adenocarcinoma. Preoperative CT abdomen revealed the left-sided location of infrarenal IVC and laparoscopic trans-peritoneal aortic lymphadenectomy was decided. Intraoperatively, transposition of inferior vena cava was confirmed in accordance with the CT findings. Resection of lymph node block was conducted with no complications and with minimal blood loss. The postoperative course was uneventful, and the patient was discharged from the hospital the day following surgery. In conclusion, transposition of the inferior vena cava, although rare, constitutes an anatomical variant that should be identified preoperatively to decrease intraoperative risks. Several anatomical variants have been associated with left-sided inferior vena cava.

Keywords

left-sided inferior vena cava, laparoscopic lymphadenectomy, inferior vena cava transposition, inferior vena cava anomalies, case report

INTRODUCTION

Transposition of the inferior vena cava (IVC), also known as left-sided inferior vena cava (LS-IVC), is encountered in 0.2%-0.5% of the general population.^[1] The literature contains mostly individual case reports. This condition is usually asymptomatic. However, when symptoms are present, they usually include thrombosis and thromboembolic events.^[2] Preoperative diagnosis of LS-IVC is fundamental in planning and performing surgical procedures with participation of anatomical structures in close proximity to

vena cava in order to diminish the risk of vascular injury.^[1] In preoperative planning, CT imaging evaluation holds a key role in identifying the aforementioned vascular variant. We report a case of left-sided inferior vena cava in a patient who presented with colon adenocarcinoma metastasis in para-aortic space, adjacent to the vascular variant. The following case report is presented in accordance with Surgical CAse REport (SCARE) guidelines.^[3] The patient was fully informed, and written informed consent for publication of the current case report and accompanying images was obtained. Copies of the written consent are available

for review by the Editor-in-Chief of this journal. We also review the relevant literature regarding the clinical significance and management of LS-IVC during minimally invasive procedures.

CASE DESCRIPTION

A 45-year-old man underwent laparoscopic left hemicolectomy due to adenocarcinoma of the left colic flexure two years ago. The stage of the neoplasia was T3N0M0 according to the eighth edition of the Union for International Cancer Control (UICC) / TNM system and none of the total of 35 lymph nodes harvested revealed a metastatic disease. However, adjuvant chemotherapy followed due to high-level microsatellite instability. The patient's past medical and surgical history was unremarkable. In the routine 1-year follow-up, a metastatic lymph node block lesion was noticed in the retroperitoneal para-aortic region, finding confirmed to be hot in the positron emission tomography - computed tomography (PET-CT). The abdominal computed tomography (CT) revealed also transposition of the inferior vena cava, ascending on the left side of the abdominal aorta up to the left renal vein (Figs 1, 2). Above that level, IVC crosses the abdominal aorta anteriorly and ascends to its right side as a normal prehepatic segment. Conjunction of left and right common iliac veins formed the left-sided inferior vena cava. Anatomy of the inferior mesenteric vessels, sigmoidal vessels and left ureter presented no variations. Bearing the rare vascular variant presented in this patient, therapeutic laparoscopic trans-peritoneal aortic lymphadenectomy was performed using a 3-port technique in our academic institution (Figs 3, 4). A camera Hasson port was inserted above the umbilicus using an open technique. Then, pneumoperitoneum was established using a pressure of up to 13 mmHg of carbon dioxide. The surgeon mainly stood between legs, with the patient



Figure 1. Abdominal CT scan (coronal plane). The presence of left-sided inferior vena cava is noted, ascending on the left side of the subrenal segment of the inferior vena cava.



Figure 2. Abdominal CT scan (axial plane) revealing the para-aortic lymph node mass and the transposition of inferior vena cava, as well as the conjunction of the left renal vein to the left-sided inferior vena cava. White arrow indicates the left-sided inferior vena cava.

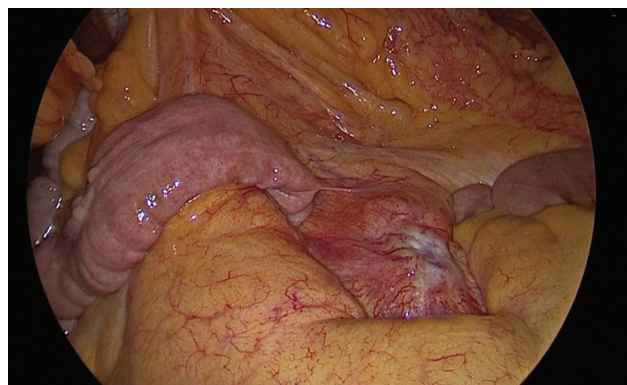


Figure 3. Para-aortic lymph node metastasis. Intraoperative image prior to excision.

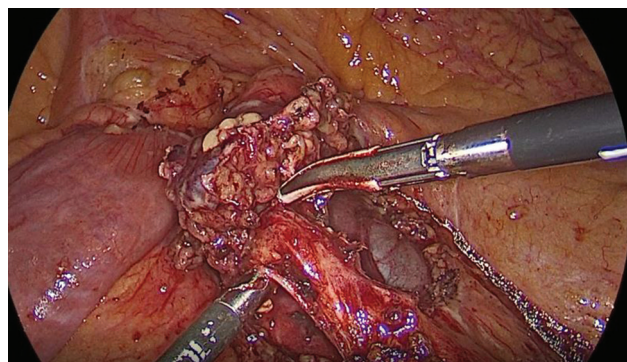


Figure 4. Para-aortic lymph node metastasis. Close relationship of the lymph node mass with the great vessels.

in split leg position, for mobilization of lymph node tissue. Intraoperatively, the left-sided IVC was identified, together with other retroperitoneal structures, including the infrarenal segment of the aorta, the left ureter, and the left gonadal vessels (Fig. 5). No intra-operative complications were noticed. The estimated blood loss was less than 100 ml and operative time was 60 minutes. Postoperative course was uneventful

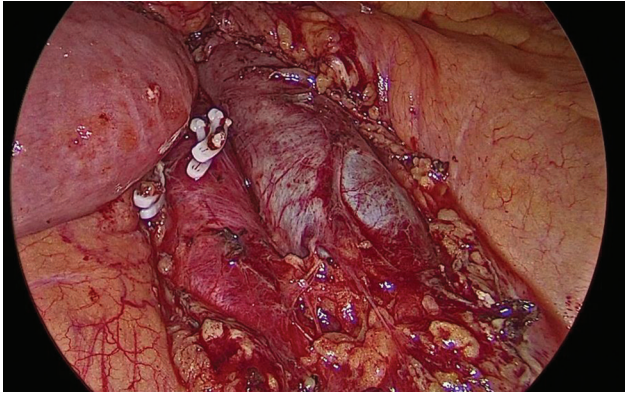


Figure 5. Intraoperative result after excision of lymph node metastasis. Transposition of inferior vena cava, known from preoperative imaging, is confirmed.

and the patient was discharged from hospital the day following surgery with satisfactory recovery. Histology confirmed metastatic lymph nodes derived from colon adenocarcinoma. After 6 months, the follow-up abdominal CT revealed absence of local recurrence or distal metastasis.

DISCUSSION

Inferior vena cava is the main venous route for blood return from the pelvis, abdomen, and lower extremities.^[4] It is formed by the conjunction of right and left iliac veins at the level of L5 vertebrae, ascending to the right of the aorta and the right anterolateral aspect of the vertebral column, reaching finally the right atrium after passing through the diaphragm.^[5] During the fourth week of gestation, three pairs of venous systems named common cardinal, umbilical, and vitelline veins are responsible for the venous return of the embryo. In the following weeks, anastomosis and regression of paired subcardinal, supracardinal, and posterior cardinal veins give rise to inferior vena cava. Congenital variations of IVC are found in 3% of the population.^[6] Main anatomic variants of IVC include duplication of IVC, left-sided IVC or transposition of IVC, retroaortic IVC, absence of infrarenal IVC, and interrupted IVC with azygos. A combination of regression of the right supracardinal vein with retention of left supracardinal vein gives rise to left-sided inferior vena cava.^[4]

The prevalence of left-sided inferior vena cava in the general population is as high as 0.5%, while the true prevalence of IVC is likely to be underestimated.^[7] Typically, left-sided inferior vena cava ascends at the left side of the aorta up to the level of the left renal vein. Afterwards, it passes usually anteriorly to the aorta and continues as a right-sided IVC.^[8] Transposition of IVC can be found incidentally during intra-abdominal imaging investigation of other pathologies, such as in the present case, or may be encountered during retroperitoneal abdominal surgery, which involves the hazard of iatrogenic hemorrhage.^[6] A complete transposition of the IVC to the left both in its sub-

renal and suprarenal segments with hemiazygos continuation has been rarely reported.^[9] Inferior vena cava has been presented in association with several anatomical variations, including persistent descending mesocolon^[8], right isomerism, asplenia^[9], as well as other IVC variations.

Transposition of inferior vena cava is usually asymptomatic and is encountered as an incidental finding during abdomen imaging or laparoscopic procedures for other pathologies. However, patients with IVC variants face an increased risk for deep vein thrombosis^[8], so inferior vena cava transposition should be included in the differential diagnosis of vein thrombosis of unknown origin.^[2] Pathophysiological mechanisms of thromboembolic events include changes in blood flow and vascular compression.^[7] Many authors highlight the possible benefit of anticoagulant therapy in young patients with anomalies of IVC system, since up to 5% of acute idiopathic DVT in young patients may be caused by IVC abnormalities.^[10] Rarely, left-sided IVC can be presented as nutcracker syndrome due to compression of IVC between the aorta and the superior mesenteric artery.^[11] Many patients with left-sided IVC also report symptoms of lower back pain and lateral displacement of the right ureter.^[10] In addition, rupture of abdominal aortic aneurysm into a left-sided IVC has been reported in the literature.^[10]

The meticulous study of preoperative images by both radiologists and surgeons may minimize the potentially fatal injuries a left IVC may entail.^[5] Contrast-enhanced coronal and axial CT images provide a useful tool for visualizing the route of left inferior vena cava and its relationships with renal veins^[8] and CT has been proved superior to ultrasound for identification of IVC abnormalities, while MRI offers similar outcomes to CT while overwhelming the risk of contrast-induced nephropathy^[9].

The clinical significance of transposition of inferior vena cava is profound, since a left-sided IVC not diagnosed preoperatively entails a risk for iatrogenic injuries. Particularly, a left-sided IVC could be misdiagnosed as left-sided para-aortic lymphadenopathy, neoplasia, or a dilated gonadal vein, leading to fatal injuries. Procedures during which left-sided inferior vena cava is an inherent hazard include portosystemic shunt placement, IVC ligation, abdominal aortic aneurysm repair, left-sided nephrectomy, and renal transplantation, oblique lumbar fusion or IVC filter placement, as well as procedures performed in retroperitoneal space or organ retrieval surgery for transplantation.^[4,8] In addition, staging or therapeutic aortic lymphadenectomy is a standardized procedure commonly performed by general surgeons, urologists, and gynecologists; thus, the route and presence of congenital anomalies, such as transposition of the IVC, should always be kept in mind during preoperative evaluation and should be followed by cautious manipulations in the preaortic area.^[1]

As previously reported, literature contains numerous reports of abdominal surgical procedures in patients with left IVC. However, they mainly include surgical procedures for urological diseases, such as left renal cell carcinoma,

primary aldosteronism, and donor nephrectomy. On the contrary, little is known about gastrointestinal surgical procedures in patients with left-sided inferior vena cava.^[12] Fujiwara et al. reported a case of a patient with a left-sided IVC who underwent laparoscopic-assisted sigmoidectomy with D2 lymphadenectomy and preservation of the inferior mesenteric artery. No intraoperative complications were reported, except for awkwardness in handling the surgical laparoscopic instruments for lymph node dissection along the IMA due to the presence of the right-left inversion. No difficulty was described during colon mobilization, lymph node dissection or specimen extraction. In addition, no modification of trocar locations, operator position or surgical technique differed from those in orthotopic patients. However, for D3 lymph node dissection or para-aortic lymph node dissection, authors suggest to change the distance from the trocar to the target tissue and the axis of the surgeon's instruments and the operator position between patient's legs, as performed in our case, in order to achieve negative margins.^[12] In addition, Dimitru and colleagues reported a case of left open colectomy for a moderately differentiated (G2) sigmoid adenocarcinoma in a patient with a left accessory inferior vena, with no intraoperative or postoperative complications.^[13] Similarly, Matsunaga et al. reported an uncomplicated case of open sigmoidectomy in a patient with incidental finding of the left-sided inferior vena cava. Finally, Furutani and his team report the case of a 66-year-old woman with duplication of the inferior vena cava that underwent high anterior laparoscopic resection for rectal cancer and lung metastasis. Intraoperatively, blood loss was minimal and the duplicated inferior vena cava was not visualized since the pre-hypogastric nerve fascia was preserved, and the surgery was performed safely.^[14]

CONCLUSIONS

Transposition of inferior vena cava, or left-sided inferior vena cava, is a rare congenital vascular anomaly that is usually an incidental finding in computed tomography. In addition, in cases of preaortic recurrence or metastasis, laparoscopic aortic lymphadenectomy is a skill-demanding and complex treatment option that requires knowledge of retroperitoneal anatomy and relevant variants, since vascular anomalies not diagnosed precisely could be fatal. We highlight the safety and feasibility of laparoscopic aortic lymphadenectomy for the treatment of metastatic colon cancer in patients with a left-sided IVC, given the preoperative imaging confirmation of vascularization variation and the careful planning and performance of the surgical procedure.

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Conflicts of interest

All authors declare that they have no conflict of interest.

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Лапароскопическая парааортальная лимфаденэктомия по поводу метастатического рака толстой кишки у пациента с левосторонней нижней поллой веной: клинический случай

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Резюме

Транспозиция нижней поллой вены, или левосторонней нижней поллой вены (LS-IVC), является редкой клинической формой, при которой нижняя поллая вена поднимается вдоль левой стороны брюшной аорты. Литература содержит в основном описания клинических случаев. Хотя это обычно не связано с клинической симптоматикой, эту аномалию следует выявить во время предоперационного планирования, чтобы избежать ятрогенных повреждений во время операции. Мы представляем случай левой нижней поллой вены, обнаруженный во время лапароскопической лимфаденэктомии у 45-летнего мужчины, перенёсшего ранее лапароскопическую гемиколэктомию по поводу аденокарциномы толстой кишки. На предоперационной КТ брюшной полости было выявлено левостороннее расположение инфраренальной НПВ, и было принято решение о лапароскопической трансперитонеальной аортальной лимфаденэктомии. Интраоперационно по данным КТ подтверждена транспозиция нижней поллой вены. Резекцию блокады лимфатического узла провели без осложнений и с минимальной кровопотерей. Послеоперационное течение протекало без осложнений, пациент был выписан из стационара на следующий день после операции. В заключение, транспозиция нижней поллой вены, хотя и встречается редко, представляет собой анатомический вариант, который следует выявить до операции, чтобы снизить интраоперационные риски. Несколько анатомических вариантов связаны с левой нижней поллой веной.

Ключевые слова

левосторонняя нижняя поллая вена, лапароскопическая лимфаденэктомия, транспозиция нижней поллой вены, аномалии нижней поллой вены, клинический случай