**Duplicated Inferior Vena Cava: A Rare Anatomical Variation Discovered During Management of Esophageal Food Impaction**

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**Concept and design**: I.R. **Literature search**: A.S, A.A, I.R. **Literature analysis and interpretation**: K.V, A.A, I.R. **Writing the paper**: A.A, I.R, A.S., A.R, K.V. **Writing - Review & Editing**: I.R, A.A, A.S. **Figures Design**: A.A.

**Abstract**

The inferior vena cava is a crucial venous structure that originates during the first trimester of gestation. Anomalies in its development can lead to rare conditions, including duplication of the Inferior Vena Cava (DIVC). This case report describes a 26-year-old male with no significant medical history who presented with acute dysphagia after consuming a large piece of chicken. An esophagogastroduodenoscopy revealed food impaction, which was successfully managed. However, an incidental finding during a computed tomography scan revealed a DIVC, a rare anatomical variation. This case highlights the importance of recognizing such vascular anomalies, as they can have significant clinical implications, particularly in surgical and interventional procedures. While the patient remained asymptomatic concerning the DIVC, the condition requires careful monitoring to prevent potential complications, such as deep vein thrombosis, pulmonary embolism, and misdiagnosis during imaging studies. This report contributes to the growing body of literature on DIVC, emphasizing the need for awareness of this condition among clinicians to ensure accurate diagnosis and appropriate management.

**Key clinical message:**

Duplicated inferior vena cava (DIVC) is a rare vascular anomaly with critical implications in surgical and interventional procedures. A 26-year-old male treated for esophageal food impaction was incidentally found to have DIVC. Recognizing DIVC is essential to prevent complications, including thrombosis, embolism, and imaging misdiagnosis, ensuring accurate clinical management.

**Introduction**

The inferior vena cava (IVC) originates during the first trimester of gestation, particularly between the fourth and eighth weeks. This period is critical, as any developmental issues, regressions, or anastomoses can lead to anomalies in the IVC, including Persistent Left-Sided Inferior Vena Cava, Interrupted Inferior Vena Cava with Azygos Continuation, Absent Intrahepatic Inferior Vena Cava, Inferior Vena Cava Atresia, and Double Inferior Vena Cava (1).

Here, we describe the case of a previously healthy 26-year-old male who suddenly struggled to swallow after a bite of chicken. An urgent esophagogastroduodenoscopy (EGD) showed food impaction in the upper esophagus, which was successfully removed. A computed tomography scan obtained following EGD revealed a rare anatomical variation, a duplicated inferior vena cava (DIVC).

**Case History/Examination**

The patient is a 26-year-old male with no significant past medical history who presented to the emergency department with difficulty swallowing after consuming a large piece of chicken meat. The patient denied experiencing any associated symptoms, including headache, dizziness, fever, cough, chills, chest pain, shortness of breath, nausea, vomiting, diarrhea, numbness, tingling, or weakness. He reported that this was the first episode of difficulty swallowing, with no prior history of similar symptoms. He had otherwise been in good health, with no known family history of gastrointestinal or vascular conditions.

On physical examination, the patient’s vital signs were as follows: temperature 36.3°C, heart rate 129 bpm, respiratory rate 18 breaths per minute, blood pressure 118/75 mmHg, SpO2 100%, height 178 cm, weight 80 kg, and body mass index 25.25. The remainder of the physical examination was unremarkable and initial laboratory results were within normal limits.

**Methods:**

A gastrointestinal consultation was obtained, and the patient underwent EGD, which revealed food impacted in the upper third of the esophagus. The impacted food was successfully removed during the procedure. However, there was evidence of a small fungating mass partially obstructing the esophagus which was resected during the EGD. The patient was subsequently admitted for monitoring of potential bleeding or perforation and further evaluation of the mass.

A computed tomography (CT) scan of the abdomen and chest was performed as part of the evaluation, revealing an incidental finding of a DIVC. Cross-sectional CT scans showed that both IVCs ascended on either side of the abdominal aorta. The left IVC joined the left renal vein, crossed the aorta at the level of the left renal vein, and finally drained into the right IVC (See Figure 1).

A close-up of an x-ray

Description automatically generated

***Figure 1:*** *A CT abdomen with contrast was performed, revealing the following:* ***Image a:*** *Axial view of the abdomen demonstrates a duplicated left inferior vena cava.* ***Image b:*** *Coronal view shows the duplicated inferior vena cava ascending on the left side of the aorta.* ***Image c:*** *Coronal view shows the left IVC crossing anterior to the aorta at the level of the left renal vein to join the right IVC.*

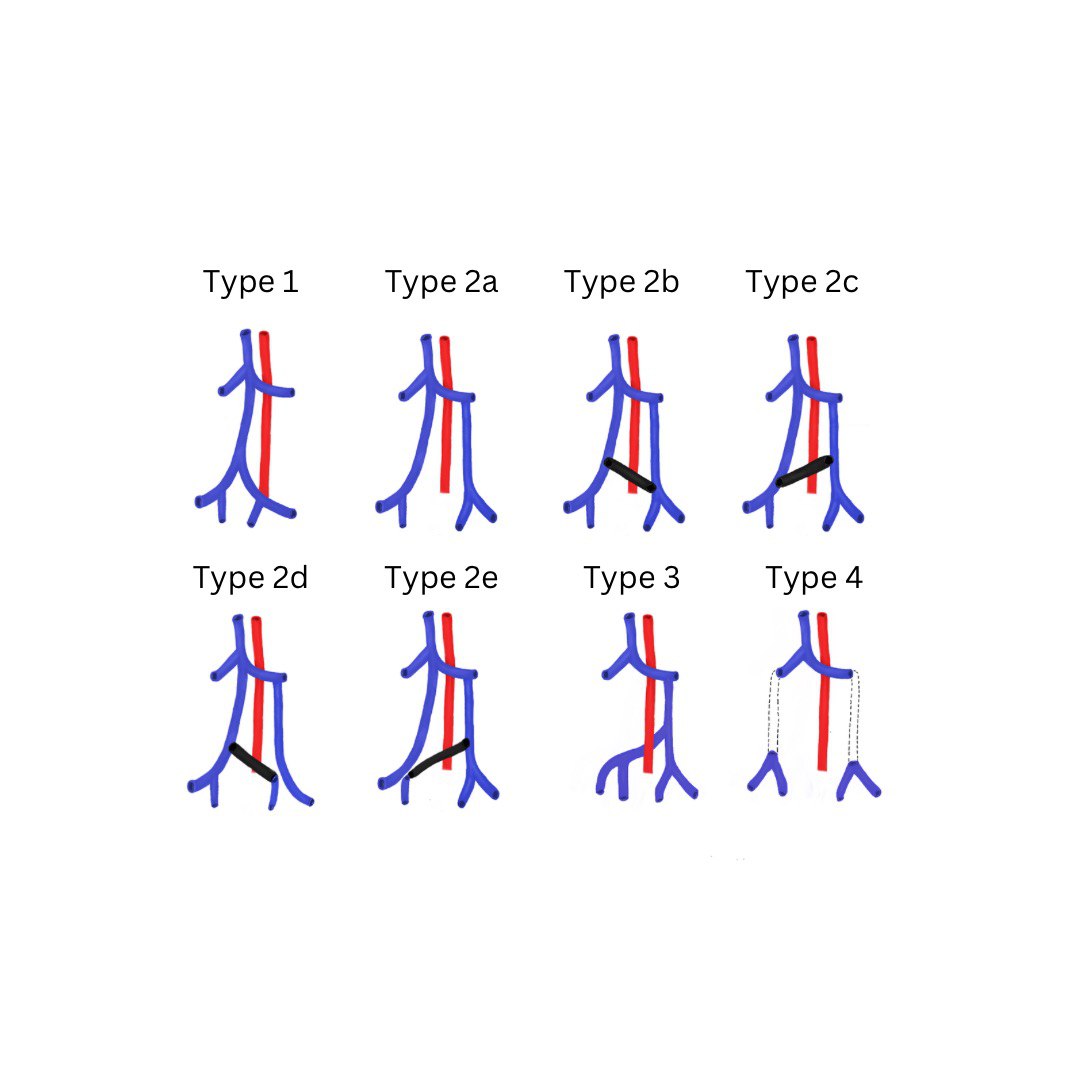
**Conclusion and Results:**

Given the incidental finding, the patient was informed about the DIVC, and it was determined that no immediate intervention was required. The patient was scheduled for follow-up with vascular surgery to monitor this anatomical variant and to rule out any associated vascular anomalies or complications.

**Discussion:**

The IVC originates from four venous systems during embryological development: the vitelline, subcardinal, supracardinal, and posterior cardinal veins. Most of these veins regress, except for the right supracardinal vein, which develops into the infrarenal IVC, and the distal part of the posterior cardinal vein, which forms the iliac confluence. In cases of DIVC, an embryological anomaly occurs where the left supracardinal vein fails to regress during fetal development. Typically, the right supracardinal vein persists to form the IVC, while the left one regresses. However, in duplication cases, both veins persist, resulting in two parallel venous channels on either side of the aorta (1,2).

The DIVC can be classified into eight distinct types based on the pattern of the interiliac communicating vein. **Type 1** features an azygous continuation with a normal connection to the bilateral common iliac veins (CIV). **Type 2a** describes a double IVC without any interiliac communication, while **Type 2b** and **Type 2c** involve interiliac communication from the left and right CIV, respectively. **Type 2d** and **Type 2e** involve interiliac communication from the left and right internal iliac vein (IIV), respectively. **Type 3** is characterized by a left IVC that has symmetrical-to-normal connections to the bilateral CIV. Lastly, **Type 4** describes the absence of the infrarenal IVC, which results in no connection to the CIV (see Figure 2). Understanding these variations is crucial for clinical procedures, as they have significant implications for retroperitoneal surgeries and venous interventional radiology (3).



**Figure 2 illustrates the various types of DIVC categorized by the pattern of the interiliac communicating vein. This figure is copyright-free as it was created by the authors of this article.**

Patients with DIVC are typically asymptomatic, with the condition often discovered incidentally during imaging for other reasons, such as a CT scan or ultrasound. The appearance of a DIVC can be mistaken for other pathologies, including para-aortic lymphadenopathy or a mediastinal mass, potentially leading to misdiagnosis. However, recognizing a DIVC is crucial due to its significant clinical implications, particularly in medical and surgical contexts. Understanding the possible complications, such as increased risk of thromboembolism, renal vein thrombosis, pelvic congestion syndrome, and surgical complications, is essential for accurate diagnosis and management (See Table 1) (4–9).

**Table 1: Outlines the potential complications associated with DIVC.**

|  |  |  |
| --- | --- | --- |
| **Complication** | **Description** | **Clinical Significance** |
| **Deep Vein Thrombosis (DVT)** | Increased risk of thrombus formation due to altered venous return and turbulent blood flow. | May lead to pulmonary embolism, requiring anticoagulation therapy and close monitoring. |
| **Pulmonary Embolism (PE)** | Thrombi originating in the duplicated vena cava may embolize to the lungs. | Can cause significant morbidity and mortality; necessitates prompt diagnosis and treatment. |
| **Renal Vein Thrombosis** | Duplicated vena cava may complicate renal venous drainage, leading to thrombosis. | Can impair kidney function and potentially lead to renal infarction or acute kidney injury. |
| **Varicose Veins** | Venous stasis due to abnormal venous drainage patterns may lead to the development of varicosities. | May cause discomfort, swelling, and require surgical intervention or sclerotherapy. |
| **Hydronephrosis** | Compression of the ureter due to altered anatomy, potentially leading to urine outflow obstruction. | May result in renal damage if untreated, requiring surgical intervention. |
| **Misdiagnosis During Imaging** | Duplicated vena cava can be mistaken for pathological masses or other conditions on imaging studies. | May lead to unnecessary invasive procedures or mismanagement; requires careful interpretation of imaging. |
| **Pelvic Congestion Syndrome** | Altered venous drainage may contribute to chronic pelvic pain and venous congestion. | Causes chronic pain and discomfort, often requiring intervention such as embolization or medication. |
| **Increased Surgical Risk** | Abnormal venous anatomy increases the complexity and risk of vascular surgery or interventions. | May lead to increased blood loss or complications during surgery; requires preoperative planning and imaging. |

**Conclusion:**

Finally, we emphasize the clinical significance of recognizing anatomical variants such as a DIVC. Although often asymptomatic, these anomalies can have serious implications for patient management, particularly in the context of surgical interventions and vascular procedures. The incidental discovery of a DIVC in this patient, who initially presented with food impaction, underscores the importance of imaging in uncovering clinically relevant anatomical variations. Awareness and understanding of such vascular anomalies are crucial to avoiding potential complications, including thromboembolic events, misdiagnosis, and surgical challenges.

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Not applicable.

**Consent:**

A written informed consent was obtained for the publication of this case report and accompanying images. A copy of the written consent is available for review by the Editor-in-Chief of this journal upon request.

**Ethical approval:**

Ethical approval is exempt/waived at our institution.

**Availability of data and materials**

The dataset supporting the conclusions of this article is included within the article.

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