Revealing the Rare: Prenatal Diagnosis of Inferior Vena Cava Aneurysm

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Abstract

This case report highlights the prenatal diagnosis of a rare saccular inferior vena cava (IVC) aneurysm. A 25-year-old gravida 4 para 1 patient underwent detailed ultrasonography at 20 weeks of gestation, revealing a 15 x 10 x 14 mm infrarenal IVC aneurysm. Genetic analysis identified a de novo 2p16.3 deletion of uncertain significance. Serial imaging showed progressive aneurysm dilation and mild cardiomegaly. Postnatal CT angiography confirmed the aneurysm, and anticoagulant therapy was initiated. This report underscores the importance of detailed prenatal imaging and genetic evaluation in the identification and management of rare vascular anomalies, contributing to the understanding of their clinical implications.

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Abstract

This case report highlights the prenatal diagnosis of a rare saccular inferior vena cava (IVC) aneurysm. A 25-year-old gravida 4 para 1 patient underwent detailed ultrasonography at 20 weeks of gestation, revealing a 15 x 10 x 14 mm infrarenal IVC aneurysm. Genetic analysis identified a de novo 2p16.3 deletion of uncertain significance. Serial imaging showed progressive aneurysm dilation and mild cardiomegaly. Postnatal CT angiography confirmed the aneurysm, and anticoagulant therapy was initiated. This report underscores the importance of detailed prenatal imaging and genetic evaluation in the identification and management of rare vascular anomalies, contributing to the understanding of their clinical implications.

Inferior vena cava (IVC) aneurysm, a scarce condition, presents with a diverse range of anatomical and clinical manifestations[1]. Since its initial documentation by Oh et al. in 1973, 59 IVC aneurysms have been sporadically reported in the literature, as comprehensively reviewed by Wu et al. in 2018[2,3]. These cases, spanning an age range of 2 to 89 years, underscore the unusual nature of this condition. This report discusses a unique case of IVC aneurysm identified in the prenatal period.

A 25-year-old gravida 4 para 1 patient with a history of cesarean section presented at 20 weeks of gestation for a detailed ultrasound scan. No prenatal screening tests had been conducted, and no additional features were noted in the patient's medical history. Ultrasound examination revealed a saccular IVC aneurysm measuring 15 x 10 x 14 mm, extending from the right infrarenal region to the upper border of the bladder (Figure 1) (Videoclip S1-S2). The portal veins, ductus venosus, and hepatic veins appeared normal. Fetal echocardiography identified no abnormalities except for an echogenic cardiac focus in the left ventricle. After counseling, amniocentesis was performed at 23 weeks based on the couple's decision. Microarray analysis revealed a 35.7 kB heterozygous deletion in the 2p16.3 region, classified as a variant of uncertain significance (VUS). Literature indicates partially overlapping pathogenic findings in this region [4,5]. The clinical exome panel detected no pathogenic variants or VUS. Analysis of the parents' peripheral blood samples showed no similar changes, and the deletion was deemed de novo.

Routine assessments throughout pregnancy, including Doppler parameters, TORCH serology, and oral glucose tolerance test results, were within normal limits. At 33 weeks, the fetal IVC aneurysm measured 23 x 21 x 26 mm, and the heart-to-chest circumference ratio was 65%, suggesting cardiomegaly (Figure S1). The foramen ovale flap extended distally to the mitral valve by 8.5 mm, and a foramen ovale aneurysm was observed (Figure S2). From this examination onward, the fetal abdominal circumference remained consistently above the 97th percentile. At 35 weeks, the patient presented to the emergency department in active labor and delivered a live female infant weighing 2830 g by cesarean section. On the first postnatal day, computed tomography angiography confirmed a 15 mm saccular aneurysm in the IVC, while the thoracic and abdominal aorta and branches appeared normal (Figure 2). The newborn was started on anticoagulant therapy, and follow-up is ongoing. Written informed consent was obtained from the family for publication.

IVC aneurysms, although rare, span a broad spectrum of clinical presentations, ranging from asymptomatic incidental findings to life-threatening conditions [6]. To the best of current knowledge, this case represents the first documented instance of an IVC aneurysm diagnosed in the prenatal period. Thompson et al. proposed a classification for IVC aneurysms based on etiology, categorizing them as Type 1 congenital, Type 2 acquired, and Type 3 secondary to arteriovenous fistula [7]. Gradman et al. further classified IVC aneurysms by anatomical and embryological characteristics into four types: Type 1 includes aneurysms of the suprahepatic IVC without venous obstruction; Type 2 involves aneurysms with interruptions above or below the hepatic vein; Type 3 represents infrarenal IVC aneurysms without venous obstruction; and Type 4 includes all other IVC aneurysms [8]. In this case, the IVC aneurysm was infrarenal and congenital. Types 2-4 are associated with higher complication rates, including aneurysm rupture, thrombosis in the deep leg veins or the IVC, and pulmonary embolism [3,9]. Treatment options for IVC aneurysms include conservative management, ligation, endovascular stent-graft, and end-to-end anastomosis; however, due to the rarity of IVC aneurysms, no consensus has been reached regarding treatment strategies [6,9]. Decisions on conservative

or surgical management should consider thromboembolism risk, associated conditions, clinical scenarios, surgical risks, and patient preferences holistically.

None of the authors have any conflicts of interest to declare.

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Figure 1. Prenatal Ultrasound Images of IVC Aneurysm

(a) Sagittal bicaval view, transabdominal 2D ultrasound image showing the IVC aneurysm highlighted by a red rectangle.

(b) Axial view, transabdominal 2D ultrasound image illustrating the IVC aneurysm highlighted by a red rectangle.

Figure 2. Postnatal CT Angiography Images of IVC Aneurysm

(a, b) Coronal views displaying the IVC aneurysm located in the distal segment, highlighted by a red rectangle.

(c) Coronal view showing the proximal IVC near the heart, appearing normal without signs of aneurysm.

Supplementary Figure S1 . Axial view obtained through transabdominal 2D fetal echocardiography demonstrating cardiomegaly. The image shows measurements of the fetal thoracic circumference (ThC) and a cardiothoracic ratio (HrtC/ThC) of 65%.

Supplementary Figure S2 . Axial view obtained through transabdominal 2D fetal echocardiography illustrating a foramen ovale aneurysm. The image shows the distal extension of the foramen ovale flap towards the mitral valve.

Supplementary Videoclip S1 . Sagittal view obtained through transabdominal 2D fetal echocardiography. The videoclip reveals a prominent IVC aneurysm, with the normal course of the aorta observed between 6 and 8 seconds.

Supplementary Videoclip S2. Sagittal view in Doppler mode obtained through transabdominal 2D fetal echocardiography, illustrating venous blood flow within the inferior vena cava (IVC), highlighting the aneurysmal dilation.