

1Prenatal ultrasound diagnosis of fetal giant left ventricular aneurysm : A case report

2**Short running title:** Prenatal diagnosis of fetal ventricular aneurysm

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13**Abstract:** Fetal ventricular aneurysm is a rare congenital cardiac malformation that can

14occur in various cardiac cavities and often exists in isolation without other

15malformations. Modern ultrasound technology can assist the prenatal diagnosis of

16ventricular aneurysm. Herein, we will present a rare case of a giant left ventricular

17aneurysm detected by prenatal ultrasonography.

18**Keywords:** Ventricular aneurysm, fetus, prenatal diagnosis

19**Introduction:** We read an article by Duong PH et al. on “Fetal right ventricular

20aneurysm caused by chronic progressive myocardial ischemia” with great interest.

21 They reported antenatal ultrasound (US) findings of fetal right ventricular aneurysm,
22 and they have gained novel insight into the pathological mechanism¹. Ventricular
23 aneurysm is an extremely rare congenital cardiac malformation, and its incidence has
24 not been reported yet. It can occur in various cardiac chambers, with the left ventricle
25 as the common site². However, we would like to highlight a few important points. The
26 inversion of the “a” wave in the pulmonary vein spectrum may be related to pulmonary
27 congestion. Besides, this case was also possibly caused by the ventricular aneurysm due
28 to myocardial ischemia.

29 A 26-year-old pregnant woman (gravida 1, para 0) underwent fetal
30 echocardiography in our hospital at 24 weeks of gestation due to abnormal cardiac
31 structure. Fetal echocardiography showed that the left ventricular apical wall was
32 visibly convex during systole, with a size of 20×14 mm at the four-chamber view
33 (Fig. 1a). In the four-chamber view, the left ventricular apical muscle wall was thin in
34 part of the diastolic bulge, and the thinnest part was 1.4 mm. The mitral orifice
35 spectrum showed a single peak, and the left pulmonary vein spectrum exhibited a
36 reverse “a” wave, which revealed that the fetus had left ventricular dysfunction (Fig.
37 1b). The spatiotemporal image correlation M-mode (Fig. 1c) combined with speckle
38 tracking technique (Fig. 1d) revealed marked decrease in the amplitudes of the left
39 ventricular apical and lateral wall motions. Ultrasonography suggested that dynamic
40 observation of the left ventricular aneurysm might be feasible. On follow-up, the VA
41 increased in size (23×16 mm) at 26⁺¹ weeks of gestation, and the left ventricular apical

42muscle wall was thinner than before (1.2 mm). Following consultation with cardiac
43surgeons, the risk of thromboembolism and heart failure were fully evaluated, and the
44parents opted for termination of pregnancy at 26⁺³ weeks of gestation. A male infant
45was delivered following induced labor. Autopsy confirmed fetal left ventricular
46aneurysm, thinning of the left ventricular apical myocardium (Fig. 2a), fetal left lung
47congestion (Fig. 2b), thinning of the microscopic left ventricular apical myocardial
48bundles, disordered arrangement (Fig. 2c), and normal right ventricular wall (Fig 2d).
49Thinning of the left coronary artery origin which was closely associated with the
50aneurysm showed significant luminal narrowing due to fibrointimal hyperplasia and
51medial hypertrophy (Figure 2e), and the right coronary artery was normal (Fig. 2f).

52 Color Doppler ultrasonography is a simple and extremely valuable imaging
53method for fetal ventricular aneurysm: it cannot only show the size, structure, and
54thrombus in the aneurysm, but can also detect changes in myocardial thickness and
55cardiac function. Ventricular aneurysm should be differentiated from ventricular wall
56diverticulum, pericardial cyst, and atrial aneurysm. Ahiel et al. pointed two possible
57mechanisms in the pathogenesis of congenital ventricular aneurysm. The first theory is
58related to the partial cessation of embryonic ventricular development, which can appear
59at the earliest in the fourth week of embryonic development. The second theory is
60related to “anemia” caused by insufficient myocardial blood supply, leading to the
61occurrence of ventricular aneurysm due to myocardial insufficiency³. Pathological
62examination confirmed that the right ventricular aneurysm was related to coronary

63stenosis and in situ thrombosis¹. In the presented case, compared with the right
64coronary artery, the left coronary artery of the fetus was clearly narrowed; there was
65pulmonary congestion, but no thrombus formation in the coronary artery. This case was
66possibly caused by the ventricular aneurysm due to myocardial ischemia.

67 No special intervention is generally required for asymptomatic patients with
68isolated left ventricular aneurysm. If there were obvious complications or rapid
69enlargement of the aneurysm in the short term, surgery should be performed.⁴ Rupture
70of a ventricular aneurysm can lead to pericardial tamponade and death. In the presented
71case, the fetus was small for its gestational age, the tumor was larger than before, the
72muscle wall became thinner, and the cardiac function changed during the follow-up
73dynamic observation. In addition, the fetus had a larger ventricular aneurysm, so
74pregnancy was terminated after comprehensive consideration and request of the
75parents. Autopsy revealed significant left pulmonary congestion, suggesting that the
76inversion of the “a” wave in the pulmonary vein spectrum may be related to pulmonary
77congestion, providing a reference for the prognosis of a left ventricular aneurysm.

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95Figure legends

96**Figure 1:** Prenatal imaging findings of a ventricular aneurysm. (a) Four-chamber view
97of the fetal heart showing a left ventricular (LV) aneurysm. The LV free wall is thin
98and aneurysmal. (b) The spatiotemporal image correlation M-mode suggests reduced
99left apical motion. (c) Reverse “a” waves are visible in the pulmonary vein spectrum.
100(d) Speckle tracking showed a decrease in the left ventricular free motion. LV, left
101ventricle; LA, left atrium; RV, right ventricle, RA, right atrium.

102**Figure 2:** Postpartum imaging findings of a ventricular aneurysm. (a) Gross
103examination showed a thin free wall of the left ventricle. (b) The gross specimen
104showed evident congestion in the left lung. (c-d) On pathological examination, the

105number of the left ventricular myocardium was significantly reduced compared with
106that of the right ventricle. (e-f) Moreover, the left coronary artery was significantly
107narrower than the right coronary artery.