

13-week Pulmonary Sonoangiogram by 3D HDlive Flow

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ABSTRACT

Recent development of three-dimensional (3D)/four-dimensional (4D) sonography has revealed structural and functional early human development *in utero* and 3D/4D sonography moved prenatal diagnosis of fetal anomalies from the second to the first trimester of pregnancy. HDlive flow is a recent application of 3D ultrasound technology generating a 3D-view of the blood flow and providing a realistic rendering of fine vascular structure. Combination of HDlive silhouette and flow can be described as a 'see-through fashion', because of its comprehensive orientation and persuasive localization of inner structure as well as of fetal angiostructure inside the morphological structure.

The picture of this month demonstrates normal intracorporeal angiostructure by 3D HDlive silhouette/flow imaging with bidirectional power Doppler at 13 weeks of gestation. The umbilical arteries, umbilical vein, ductus venosus, inferior vena cava, descending aorta as well as rich pulmonary vascularity are clearly demonstrated in a single 3D reconstructed image. This image indicates existence of rich pulmonary vascularity from even before lung maturation in the first trimester.

Prenatal prediction of neonatal prognosis in cases with still remains a challenge but previous trials have been done after 20 weeks of gestation. Nowadays, many of pulmonary lesions, such as congenital diaphragmatic hernia (CDH) and congenital cystic adenomatoid malformation (CCAM), have been diagnosed in the first or early second trimesters. Recent advanced imaging technology of HDlive flow showing pulmonary vasculature from the first trimester in this article may have a great potential to investigate fetal lung development and maturity from early gestation and lead to scheduling of prenatal fetal treatment and proper management.

Keywords: Fetus, HDlive flow, Prenatal diagnosis, Pulmonary, Sonoangiogram, Three-dimensional ultrasound.

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PULMONARY SONOANGIOGRAM AT 13 WEEKS

Recent development of three-dimensional (3D)/four-dimensional (4D) sonography has revealed structural

and functional early human development *in utero*^{1,2} and 3D/4D sonography moved prenatal diagnosis of fetal anomalies from the second to the first trimester of pregnancy.³ HDlive flow⁴⁻⁶ is a recent application of 3D ultrasound technology generating a 3D-view of the blood flow and providing a realistic rendering of fine vascular structure. Combination of HDlive silhouette and flow can be described as a 'see-through fashion',^{5,6} because of its comprehensive orientation and persuasive localization of inner structure as well as of fetal angiostructure inside the morphological structure.⁵

The picture of this month (Fig. 1) demonstrates normal intracorporeal angiostructure by 3D HDlive silhouette/flow imaging with bidirectional power Doppler at 13 weeks of gestation. The umbilical arteries, umbilical vein, ductus venosus, inferior vena cava, descending aorta as well as rich pulmonary vascularity are clearly demonstrated in a single 3D reconstructed image. This image indicates existence of rich pulmonary vascularity from even before lung maturation in the first trimester.

Mahieu-Caputo et al⁷ suggested the number of bifurcations of the pulmonary vessels in the lung contralateral to the diaphragmatic hernia evaluated by conventional 2D power Doppler imaging. Thereafter Dubiel et al⁸ performed the quantitative analysis of 3D power Doppler angiography signal after 24 weeks of gestation and showed an increase in fetal pulmonary 3D power Doppler angio-intensity until 33 weeks and

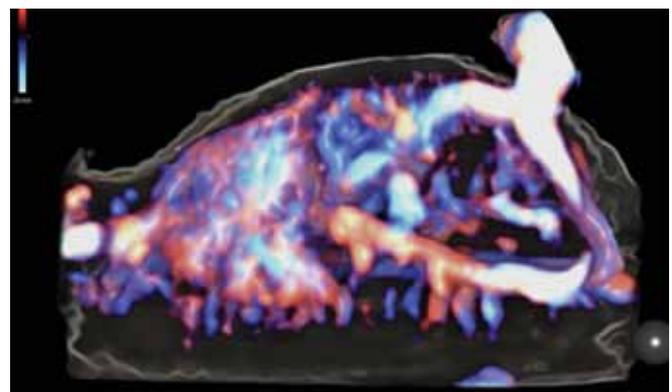


Fig. 1: Fetal pulmonary sonoangiogram at 13 weeks of gestation. Fetal intracorporeal angiostructure is demonstrated by 3D HDlive silhouette/flow imaging with bidirectional power Doppler at 13 weeks of gestation. The umbilical arteries, umbilical vein, ductus venosus, inferior vena cava, descending aorta as well as rich pulmonary vascularity are clearly demonstrated in a single 3D reconstructed image. This image indicates existence of rich pulmonary vascularity from even before lung maturation in the first trimester

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a decrease after 38 weeks. Ruano et al⁹ utilized the 3D power Doppler histogram after 20 weeks to determine the vascular indices and evaluate the pulmonary vasculature quantitatively in cases of congenital diaphragmatic hernia (CDH) using a combined method of 3D imaging and 3D power Doppler assessing the volume and quantifying the power Doppler signal. Thus, prenatal prediction of neonatal prognosis in cases with pulmonary hypoplasia still remains a challenge and all of previous trials have been done after 20 weeks of gestation.

Nowadays, many of pulmonary lesions, such as CDH and congenital cystic adenomatoid malformation (CCAM), have been diagnosed in the first or early second trimesters. Recent advanced imaging technology of HDlive flow showing pulmonary vasculature from the first trimester in this article may have a great potential to investigate fetal lung development and maturity from early gestation and lead to scheduling of prenatal fetal treatment and proper management.

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