SlowflowHD for Detection of Small Fetal Peripheral Vasculature

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ABSTRACT

SlowflowHD (GE Voluson E10, BT 19) is a new Doppler technology, which can visualize blood flow of smaller vessels in the branching vascular bed of the fetus and placenta. Its main characteristics are a high-display frame-rate, high-line density (high-resolution), and good sensitivity. In this article, we present our first experience of using SlowflowHD for the detection of small fetal peripheral vasculature.

Keywords: Color Doppler, Fetus, SlowflowHD, Small peripheral vessels.

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INTRODUCTION

SlowflowHD (GE Voluson E10, BT 19, GE Healthcare Japan, Tokyo, Japan) is a new Doppler technology, which can visualize slow flow of smaller vessels in the branching vascular bed of the fetus and placenta. Its unique characteristics are a high-display frame-rate, high-line density (high-resolution), and good sensitivity. On applying it, we can detect slow-velocity flow of fetal peripheral small vessels. In this article, we present our first experience of using SlowflowHD for the detection of small fetal peripheral vessels in various organs.

FETAL HEAD

Small intracranial vessels can be clearly identified using SlowflowHD during pregnancy (Figs 1 to 3). The orbital vasculature can also be clearly visualized using this technique (Fig. 4).

FETAL BODY

Small fetal thoracic and intra-abdominal vessels can be clearly identified using SlowflowHD (Figs 5 to 14). Especially, the adrenal artery can be visualized using this technique (Figs 9 and 13).

FETAL EXTREMITIES

Arm and leg arteries can be clearly noted using SlowflowHD (Figs 15 and 16).

DISCUSSION

Superb microvascular imaging (SMI) is a new color Doppler technology which can detect slow-velocity blood flow in the fetus and placenta.¹⁻⁸ Superb microvascular imaging with Doppler luminance is the latest Doppler technology. It generates a gray-scale image (two-dimensional) to show SMI data (three-dimensional) utilizing shading to represent amplitudes of signals.⁹ SlowflowHD is almost the same technology as SMI with Doppler luminance.

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Fig. 1: Circle of Willis depicted by SlowflowHD at 30 weeks and 1 day of gestation. ACA, anterior cerebral artery; Achor, anterior choroidal artery; Acomm, anterior communicating artery; MCA, middle cerebral artery; OA, ophthalmic artery; PCA, posterior cerebral artery; Pcomm, posterior communicating artery

Fig. 2: Circle of Willis depicted by SlowflowHD at 36 weeks of gestation. ACA, anterior cerebral artery; Acomm, anterior communicating artery; MCA, middle cerebral artery; PCA, posterior cerebral artery; Pcomm, posterior communicating artery

Fig. 3: Intracranial vessels depicted by SlowflowHD at 30 weeks and 1 day of gestation. LSA, lenticulostriate artery; MCA, middle cerebral artery

Fig. 4: Fetal orbital vasculature depicted by SlowflowHD at 30 weeks and 1 day of gestation. EB, eyeball; LA, lacrimal artery; PCA, posterior ciliary artery

Fig. 5: Fetal pulmonary vessels depicted by SlowflowHD at 30 weeks and 1 day of gestation. RL, right lung

Fig. 6: Fetal pulmonary vessels depicted by SlowflowHD at 33 weeks and 4 days of gestation. RL, right lung

Fig. 7: Fetal pulmonary vessels depicted by SlowflowHD at 36 weeks of gestation. RL, right lung

Fig. 8: Fetal splenic vessels depicted by SlowflowHD at 28 weeks and 5 days of gestation. AG, adrenal gland; L, liver; S, spleen; SA, splenic artery; Sp, spine; St, stomach

Fig. 9: Fetal intra-abdominal vessels depicted by SlowflowHD at 30 weeks and 1 day of gestation. DAo, descending aorta; L, liver; RAG, right adrenal gland; RK, right kidney

Fig. 10: Fetal hepatic vessels depicted by SlowflowHD at 30 weeks and 1 day of gestation. L, liver

Fig. 11: Fetal hepatic vessels depicted by SlowflowHD at 30 weeks and 1 day of gestation. GB, gallbladder; L, liver; RL, right lung

Figs 12A to C: Fetal renal vessels depicted by SlowflowHD at 33 weeks and 4 days of gestation. RA, renal artery. (A) Longitudinal view; (B) Transverse view; (C) Transverse view

Fig. 13: Fetal intra-abdominal vessels depicted by SlowflowHD at 30 weeks and 1 day of gestation. AA, adrenal artery; AG, adrenal gland; DAo, descending aorta; RA, renal artery; RK, right kidney

Fig. 14: Fetal intercostal arteries (LA) depicted by SlowflowHD at 30 weeks and 1 day of gestation. Sp, spine

Fig. 15: Fetal arm arteries depicted by SlowflowHD at 30 weeks and 1 day of gestation. AA, axillary artery; BA, brachial artery; RSA, right subclavian artery

In the present study, we had the first experience of using SlowflowHD for the detection of fetal peripheral small vessels. As a result, very small intracranial, intrathoracic, and intraabdominal vessels could be clearly depicted in fetuses using this technology. Moreover, small vessels of the extremities could also be noted. Further studies involving a larger sample size are needed to ascertain the actual usefulness of SlowflowHD for the detection of small peripheral vessels of fetuses. Moreover, quantitative assessments of SlowflowHD signals are indispensable to assess the relevance of this technology for future clinical use and research.

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Fig. 16: Fetal leg arteries depicted by SlowflowHD at 28 weeks and 5 days of gestation. FA, femoral artery; PFA, profundal femoris artery

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