

HDlive Flow with Spatiotemporal Image Correlation for Assessment of Fetal Goiter

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ABSTRACT

Case description: We present our experience of diagnosing fetal goiter using radiant flow and HDlive flow with spatiotemporal image correlation (STIC). A 39-year-old pregnant Japanese woman, gravida 3, para 1, with Graves' disease was referred to our ultrasound clinic at 37 weeks and 1 day of gestation because of suspected fetal goiter. Two-dimensional (2D) sonography revealed enlarged thyroid glands (left lobe, 29.5 × 22 mm; right lobe, 32.9 × 21.2 mm). Radiant flow showed abundant blood flow on both lobes. HDlive flow with STIC clearly demonstrated spatial relationships of pulsatile dilated blood vessels in the fetal goiter. Our results suggest that HDlive flow with STIC shows precise spatial vascularity with pulsation of fetal goiter *in utero*.

Keywords: 3D ultrasound, Fetal goiter, HDlive flow, Radiant flow, Spatiotemporal image correlation.

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INTRODUCTION

Radiant flow is a novel form of color Doppler that generates three-dimensional (3D) data to produce a two-dimensional (2D) gray-scale image utilizing shading determined by the color Doppler signal's amplitude.¹ HDlive flow is made of 3D color Doppler with an adjustable light source to realize lighting and shadowing effects, which means that depth perception is possible on fetal 3D blood flow examination.²

Several reports are available on the antenatal diagnosis of fetal goiter using 2D color/power and 3D power Doppler ultrasound,³⁻⁶ however, to the best of our knowledge, this is the first report on HDlive flow with spatiotemporal image correlation (STIC) for the prenatal diagnosis of fetal goiter.

CASE DESCRIPTION

A 39-year-old pregnant Japanese woman, gravida 3, para 1, with Graves' disease was referred to our ultrasound clinic at 37 weeks and 1 day of gestation because of suspected fetal goiter (Fig. 1).

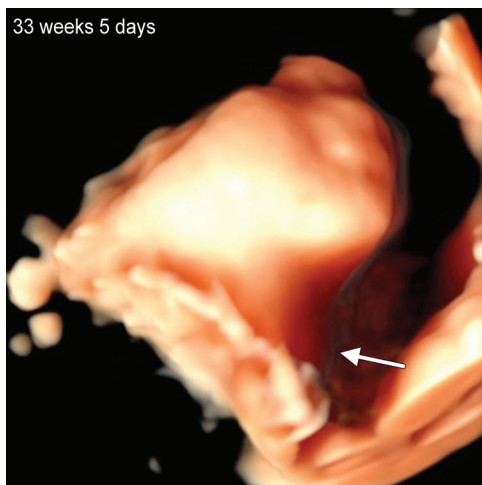


Fig. 1: HDlive image of fetal neck at 33 weeks and 5 days of gestation. Fetal neck swelling (arrow) is noted

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She has been treated with levothyroxine sodium hydrate, potassium iodide, and propylthiouracil, and her thyroid status was euthyroid. The 2D sonography revealed enlarged thyroid glands (left lobe, 29.5 × 22 mm; and right lobe, 32.9 × 21.2 mm) (Fig. 2). The fetal trachea was not compressed by either lobe. Radiant flow showed abundant blood flow on both lobes, especially on the left lobe (Fig. 3). HDlive flow with STIC clearly demonstrated precise spatial relationships of pulsatile dilated blood vessels in the fetal goiter (Fig. 4).

Elective cesarean section was performed on the next day (37 weeks and 2 days), and a female infant weighing 2811 g was delivered with an umbilical artery pH of 7.348 and Apgar score of 8/9 at 1 minute and 5 minutes, respectively. Thyroid-stimulating hormone (TSH), FT3, and FT4 levels in the cord blood were 203.7 μIU/mL (0.35 to 3.73), 2.71 pg/mL (2.2 to 4.1), and 0.54 ng/mL (0.88-1.81), respectively. Neonatal goiter was confirmed (Fig. 5),

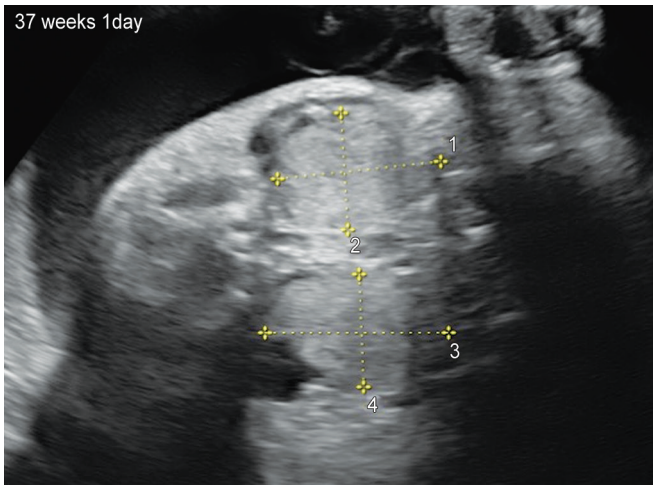


Fig. 2: Transverse two-dimensional sonographic image of fetal neck at 37 weeks and 1 day of gestation. Enlarged thyroid glands (left lobe, 29.5 × 22 mm; and right lobe, 32.9 × 21.2 mm) are noted. Fetal trachea is not compressed by either lobe

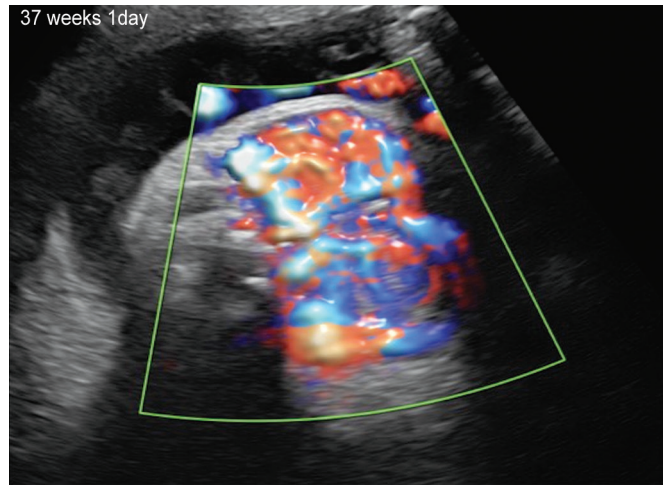


Fig. 3: Radiant flow image of fetal goiter at 37 weeks and 1 day of gestation. Abundant blood flow on both lobes, especially the left lobe

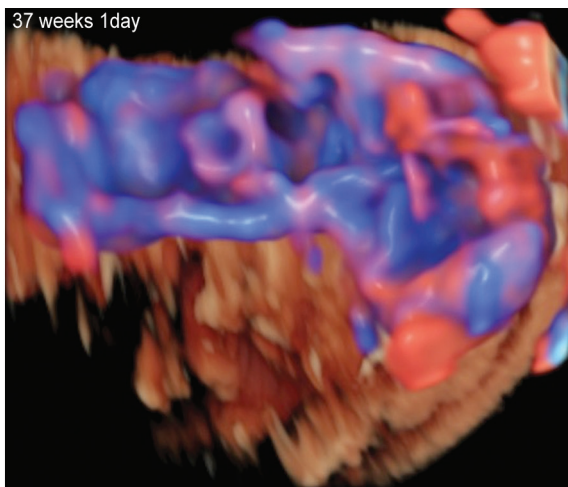


Fig. 4: Precise spatial relationships of pulsatile dilated blood vessels in the fetal goiter are clearly depicted with HDlive flow with spatiotemporal image correlation at 37 weeks and 1 day of gestation



Fig. 5: Neonatal neck just after delivery. Mild swelling of the fetal neck is noted

and levothyroxine sodium hydrate was administered for 3 days. On the first neonatal day, atrial flutter (200–230 bpm) was noted. Electrical defibrillation with 2 joules was performed and the atrial flutter disappeared. Thereafter, the neonate showed a favorable course. The mother also followed a favorable course after delivery.

DISCUSSION

A unique characteristic of fetal goiter is the rich vascularity of the thyroid gland.^{3,4} In our case, radiant flow clearly showed abundant blood flow in the fetal goiter using the 3D color Doppler information on a 2D grayscale image. Only two reports are available regarding the 3D power Doppler ultrasound diagnosis of fetal goiter.^{5,6} However, spatial relationships of the vascularity of fetal goiter were still poor. In this study, HDlive flow with STIC clearly demonstrated precise spatial relationships of dilated thyroid blood vessels in real-time. HDlive flow with STIC was a useful diagnostic modality for the assessment of congenital heart anomaly, especially

great vessel abnormalities.^{7–11} Tenkumo et al.¹² reported that HDlive flow showed the characteristic vascular pattern of fetal hepatic hemangioma. Therefore, the current study also suggests that this technique provides additional diagnostic information on the assessment of fetal peripheral vascular abnormality. Further studies involving a larger sample size are needed to assess the true usefulness of HDlive flow with STIC for the diagnosis of fetal peripheral vascular abnormalities.

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