CASE REPORT

Vasa Previa Depicted by Simple Clear Flow

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ABSTRACT

We present our experience of diagnosing vasa previa using Simple Clear Flow (SCF) at 32 weeks and 1 day of gestation. A 32-year-old pregnant Japanese woman was reexamined using transvaginal SCF due to suspected vasa previa on previous routine obstetric examination. Simple Clear Flow clearly depicted a small velamentous artery and vein at the periphery of the posterior low-lying placenta near the internal cervical os. At 37 weeks of gestation, emergency cesarean section was performed due to irritable uterine contractions, resulting in a viable, single female newborn weighing 2,795 g. Placental examination showed velamentous insertion of the umbilical cord with aberrant vessels. Transvaginal SCF can clearly demonstrate small aberrant vessels of the umbilical cord without Doppler blooming and may become a useful modality for the antenatal diagnosis of vasa previa.

Keywords: Antenatal diagnosis, Low-lying placenta, Power Doppler, Simple Clear Flow, Vasa previa.

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INTRODUCTION

The recent incidence of vasa previa is 0.08%.¹ An accurate antenatal diagnosis of vasa previa is the most important to reduce perinatal fetal death.^{2,3} However, accurate prenatal diagnosis of vasa previa using conventional color Doppler is still controversial.⁴

Simple Clear Flow is a novel flow imaging mode based on power Doppler ultrasound. It can optimize ultrasound scanning and image signal processing for small blood flow. Simple Clear Flow can be set at a higher line density than the power Doppler mode to visualize small blood flow. Simple Clear Flow achieves high resolution and sensitivity by adjusting some image signal processing such as spatial smoothing and line density to achieve appropriate signal-to-noise ratio even with a few repeats of transmission and reception. Small blood flow tends to be slow with weak signals. However, SCF can detect even small and slow blood flow more clearly by improving the resolution and sensitivity. It also maintains almost the same frame rate as the power Doppler mode. In this report, we present our experience of diagnosing vasa previa using SCF at 32 weeks and 1 day of gestation.

CASE DESCRIPTION

A 32-year-old pregnant Japanese woman, G (1), P (0), was reexamined using transvaginal SCF at 32 weeks and 1 day of gestation due to suspected vasa previa based on a previous routine obstetric examination at 30 weeks and 1 day of gestation using conventional color Doppler (Voluson P8, GE Healthcare Japan, Tokyo, Japan) (Fig. 1). In this case, placenta marginalis was suspected at 18 weeks and 3 days of gestation. Two-dimensional sonography (SONOVISTA GX30, KONICA MINOLTA, Tokyo, Japan) with a transvaginal probe (EC9-3, 3–9 MHz) clearly showed two small tubular structures at the periphery of the low-lying placenta near the internal cervical os (Fig. 2). Simple Clear Flow revealed that these structures were small velamentous blood vessels at the periphery of the posterior low-lying placenta near the internal cervical os (Fig. 3). Pulsed Doppler ultrasound revealed that the lower vessel was a vein and another vessel was an artery with arterial blood flow consistent with the fetal heart rate (Fig. 4).

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At 37 weeks of gestation, emergency cesarean section was performed due to irritable uterine contractions, resulting in a viable, single female newborn weighing 2,752 g, with a height of 49 cm. The Apgar scores were 9 (1 minute) and 10 (5 minutes), and the umbilical artery blood pH was 7.3. Placental examination showed velamentous insertion of the umbilical cord with aberrant vessels (Fig. 5). The mother and neonate followed a favorable course after delivery.

DISCUSSION

There are two novel modalities: superb microvascular imaging and SlowflowHD, to detect slow blood flow in peripheral small vessels of the fetus and placenta.^{5–9} Simple Clear Flow is another modality to depict small and slow blood flow. In this study, SCF clearly showed aberrant velamentous umbilical vessels near the cervical os compared with conventional color Doppler ultrasound. Especially, SCF could show small blood vessels without blooming. Moreover, SCF could be used with a transvaginal probe and a high-

Figs 1A and B: Suspected vasa previa using conventional color Doppler at 30 weeks and 3 days of gestation. (A) A sagittal view of the cervical canal. A low implanted placenta is evident; (B) Pulsed Doppler findings. Arterial blood flow consistent with the fetal heart rate is noted near the internal cervical os. IO, internal cervical os; P, placenta

Figs 2A and B: Two small tubular structures (small and large arrows) at the periphery of the low-lying placenta (P) near the internal cervical os at 32 weeks and 1 day of gestation. (A) Sagittal view; (B) Transverse view. IO, internal cervical os

Figs 3A and B: Two small tubular structures (large and small arrows) at the periphery of the low-lying placenta (P) near the internal cervical os at 32 weeks and 1 day of gestation using SCF. The large arrow shows an artery, and the small arrow shows a vein. (A) Sagittal view; (B) Transverse view. IO, internal cervical os

Fig. 4: Two small tubular structures (large and small arrows) at the periphery of the low-lying placenta (P) at 32 weeks and 1 day of gestation using SCF and pulsed Doppler ultrasound. The large arrow shows an artery, and the small arrow shows a vein. Arterial blood flow consistent with the fetal heart rate is evident

Fig. 5: Cross-examination of the placenta after delivery. Velamentous insertion of the umbilical cord and aberrant vessels are noted

frequency transducer (3–9 MHz). To the best of our knowledge, this is the first report of diagnosing vasa previa using transvaginal SCF. Transvaginal SCF may be a useful diagnostic modality for the clear depiction of aberrant umbilical vessels near the cervical os in clinical practice.

In our clinic, two cervical length measurements were performed at 18–21 and 28–31 weeks of gestation. Consequently, placenta marginalis was suspected based on the first scan, and vasa previa was suggested based on the second scan. Vasa previa is usually defined as cord vessels present in the membranes covering the internal cervical os.¹⁰ In our case, however, aberrant cord vessels ran horizontally within 2 cm of the internal cervical os, not covering the os. In another definition, the distance between the internal cervical os and aberrant vessels should be less than 2 cm.¹¹ Therefore, cross-examination using transvaginal SCF around the internal cervical

os may be mandatory for the accurate prenatal diagnosis of vasa previa to prevent perinatal fetal loss.

REFERENCES

1. Zhang W, Geris S, Beta J, et al. Prevention of stillbirths: Impact of a two-stage screening for vasa previa. *Ultrasound Obstet Gynecol* 2020;55(5):605–612. DOI: 10.1002/uog.21953.
2. Oylese Y, Catanzarite V, Perfumo F, et al. Vasa previa: The impact of prenatal diagnosis on outcomes. *Obstet Gynecol* 2004;103(5 Pt 1):937–942. DOI: 10.1097/01.AOG.0000123245.48645.98.
3. Swank ML, Garite TJ, Maurel K, et al. Obstetrix collaborative research network. Vasa previa: Diagnosis and management. *Am J Obstet Gynecol* 2016;215(2):e1–e6. DOI: 10.1016/j.ajog.2016.02.044.
4. Kagan KO, Moopmann M, Sonek J. Vasa previa: Easy to miss. *Ultrasound Obstet Gynecol* 2018;51(2):283–284. DOI: 10.1002/uog.17532.
5. Hata T, Kanenishi K, Yamamoto K, et al. Microvascular imaging of thick placenta with fetal growth restriction. *Ultrasound Obstet Gynecol* 2018;51(6):837–839. DOI: 10.1002/uog.18837.
6. Hasegawa J, Kurasaki A, Hata T, et al. Sono-histological findings of the placenta accrete spectrum. *Ultrasound Obstet Gynecol* 2019;54(5):705–707. DOI: 10.1002/uog.20207.
7. Hata T, Koyanagi A, Yamanishi T, et al. Superb microvascular imaging with Doppler luminance using an 18 MHz probe to visualize fetal intra-abdominal blood vessels and organ microvasculature. *J Perinat Med* 2020;48(2):184–188. DOI: 10.1515/jpm-2019-0411.
8. Hata T, Mori N, Yamamoto K, et al. SlowflowHD for detection of small fetal peripheral vasculature. *Donald school J Ultrasound Obstet Gynecol* 2019;13:155–158. DOI: 10.5005/jp-journals-10009-1603.
9. Hernandez-Andrade E, Romero R. Visualization of fetal tongue circulation using Doppler ultrasound. *Ultrasound Obstet Gynecol* 2020;55(4):559–560. DOI: 10.1002/uog.20393.
10. Catanzarite V, Maida C, Thomas W, et al. Prenatal sonographic diagnosis of vasa previa: Ultrasound findings and obstetric outcome in ten cases. *Ultrasound Obstet Gynecol* 2001;18(2):109–115. DOI: 10.1046/j.1469-0705.2001.00448.x.
11. Society of Maternal-Fetal (SMFM) Publications Committee, Sinkey RG, Odebo AO, et al. #37: Diagnosis and management of vasa previa. *Am J Obstet Gynecol* 2015;213(5):615–619. DOI: 10.1016/j.ajog.2015.08.031.