HDlive Flow with HDlive Silhouette for Diagnosis of Velamentous Cord Insertion

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ABSTRACT

Velamentous cord insertion is often associated with various complications during pregnancy and labor. Color Doppler ultrasound is a useful diagnostic tool for the prenatal diagnosis of velamentous cord insertion. HDlive flow with HDlive silhouette is the latest imaging modality consisting of power Doppler and grayscale technologies, and it provides additional information on normal and abnormal placental and umbilical cord blood flow. In the first case of velamentous cord insertion, HDlive flow with HDlive silhouette clearly showed a fork-like attachment of the umbilical cord on the fetal membrane near the placenta. In the second case of accentuate placenta with velamentous cord insertion, HDlive flow with HDlive silhouette clearly revealed the number and direction of aberrant vessels on the fetal membrane connected to both placentas (mangrove-like attachment of umbilical cord). HDlive flow with HDlive silhouette may be a useful diagnostic modality for the precise prenatal diagnosis of velamentous cord insertion.

Keywords: Accentuate placenta, Fork-like attachment of umbilical cord, HDlive flow, HDlive silhouette, Mangrove-like attachment of umbilical cord, Velamentous cord insertion.

Donald School Journal of Ultrasound in Obstetrics and Gynecology (2021): 10.5005/jp-journals-10009-1809

INTRODUCTION

Prenatal diagnosis of velamentous cord insertion may help to prevent various perinatal complications such as fetal growth restriction, preterm delivery, intrapartum nonreassuring fetal heart rate pattern, low Apgar scores, neonatal death, and abruptio placenta during pregnancy and labor.¹ Two-dimensional (2D) sonography and color Doppler ultrasound can reliably detect velamentous cord insertion prenatally, whereas three-dimensional (3D) ultrasound (3D rendering mode) can provide only limited information to evaluate the placental cord insertion.²

HDlive flow with HDlive silhouette is the latest power Doppler and grayscale technologies, and it provides useful additional information to diagnose fetal blood vessel and tumor vascularity,^{3,4} and normal and abnormal placental and umbilical cord blood flow.⁵ In this study, we assess the usefulness of HDlive flow with HDlive silhouette for the evaluation of velamentous cord insertion.

CASE 1

A 32-year-old pregnant Japanese woman, gravida 1, para 0, received routine early third-trimester screening at 28 weeks and 2 days of gestation, and marginal or velamentous cord insertion was suspected. Two weeks later, cross-examination was performed to assess the exact cord insertion site. 2D sonography and power Doppler ultrasound confirmed the velamentous cord insertion near the placenta (Figs 1 and 2). HDlive flow with HDlive Silhouette clearly showed fork-like attachment of the umbilical cord on the fetal membrane, and three aberrant vessels were noted (Fig. 3).

At 40 weeks and 4 days of gestation, emergency cesarean section was performed due to a nonreassuring fetal heart rate

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How to cite this article: Hata T, Kawahara T, Konishi M, *et al.* HDlive Flow with HDlive Silhouette for Diagnosis of Velamentous Cord Insertion. *Donald School J Ultrasound Obstet Gynecol* 2021;15(4):326–329.

Source of support: Nil

Conflict of Interest: None

pattern, resulting in a single male newborn weighing 2776 gm, with a length of 50 cm. The umbilical artery pH was 7.37. The Apgar score was 9/10 at 1 and 5 minutes, respectively. Total blood loss during the operation was 598 gm. Placental examination revealed its weight to be 669 gm, and it showed fork-like attachment of the umbilical cord on the fetal membrane with three very short aberrant vessels (Fig. 4).

CASE 2

A 38-year-old pregnant Japanese woman, gravida 3, para 1, received routine obstetric examination at 32 weeks and 2 days of gestation. 2D sonography revealed an anterior-implanted accentuate placenta and velamentous cord insertion between the anterior and

Fig. 1: Two-dimensional sonographic image of velamentous cord insertion (arrow) at 30 weeks and 2 days of gestation (AV: aberrant vessel; P: placenta; UA: umbilical artery; UC: umbilical cord; UV: umbilical vein)

Fig. 2: Power Doppler ultrasound image of velamentous cord insertion (arrow) at 30 weeks and 2 days of gestation. Two aberrant vessels (AV) on the fetal membrane are noted (P: placenta; UA: umbilical artery; UC: umbilical cord; UV: umbilical vein)

Fig. 3: Velamentous cord insertion (arrow) depicted by HdLive flow with HdLive silhouette at 30 weeks and 2 days of gestation. Three aberrant vessels (AV) on the fetal membrane are clearly identified (CSV: chorionic surface vessel; P: placenta; UA: umbilical artery; UC: umbilical cord; UV: umbilical vein)

posterior implanted placentas (Fig. 5). Power Doppler ultrasound showed the umbilical cord attached to the fetal membrane and aberrant vessels connected to both placentas (Fig. 6). HdLive flow with HdLive silhouette clearly revealed the number and direction of aberrant vessels on the fetal membrane connected to the anterior and posterior placentas (mangrove-like attachment of umbilical cord) (Fig. 7).

One female newborn was vaginally delivered at 39 weeks and 1 day of gestation with a body weight of 3100 gm and length of 49 cm. The umbilical artery pH was 7.32. She had an Apgar score of 8/9 at 1 and 5 minutes, respectively. Placental examination revealed a weight of 555 gm, accentuate placenta, and velamentous cord insertion between the main and accentuate placentas (mangrove-like attachment of umbilical cord) (Fig. 8).

DISCUSSION

Conventional 3D power Doppler ultrasound had limited clinical value for the diagnosis of velamentous cord insertion.⁶ Regarding HdLive flow with HdLive silhouette, however, HdLive silhouette delineates

Figs 4A and B: Gross examination of velamentous cord insertion (arrows). Three aberrant vessels on the fetal membrane are clearly noted (A: Fetal surface; B: Maternal surface)

Fig. 5: Two-dimensional sonographic image of velamentous cord insertion (arrow) at 32 weeks and 2 days of gestation (AP: accenturiate placenta; P: placenta; UA: umbilical artery; UC: umbilical cord; UV: umbilical vein)

Fig. 6: Power Doppler ultrasound image of velamentous cord insertion (arrow) at 32 weeks and 2 days of gestation. Two aberrant vessels (AV) on the fetal membrane are connected to anterior and posterior implanted placentas (AP: accenturiate placenta; P: placenta; UA: umbilical artery; UC: umbilical cord; UV: umbilical vein)

Figs. 7A and B: Velamentous cord insertion (arrows) depicted by HDlive flow with HDlive silhouette at 32 weeks and 2 days of gestation. The number and direction of aberrant vessels (AV) on the fetal membrane connected to accenturiate (AP) and main placentas (P) is clearly noted using HDlive flow with HDlive silhouette (CSV: chorionic surface vessel; UA: umbilical artery; UV: umbilical vein; (a=A: Frontal; b=B: Posterior))

Figs. 8A and B: Gross examination of velamentous cord insertion (arrows) between the main (P) and accenturiate (AP) placentas (mangrove-like attachment of umbilical cord) (A: Fetal surface; B: Maternal surface)

the contour of the fetus and placenta with semitranslucency, and HDlive flow can demonstrate 3D reconstruction of fetal and placental vasculature when combined with an HDlive silhouette image.³⁻⁵ Both techniques allow marked depth perception with valid shadowing effects. In the present study, HDlive flow with HDlive silhouette clearly showed fork-like attachment of the umbilical cord on the fetal membrane near the placenta in the first case of a velamentous cord, and revealed the number and direction of aberrant vessels on the fetal membrane connected to the main and accenturiate placentas (mangrove-like attachment of umbilical cord) in the second case. These features might not be visualizable on using conventional 3D power Doppler ultrasound. HDlive flow with HDlive silhouette may be a useful diagnostic technique for the comprehensive diagnosis of velamentous cord insertion *in utero*. Further studies involving a larger sample size are needed to confirm the clinical value of HDlive flow with HDlive silhouette for the diagnosis of abnormal placental cord insertion involving velamentous cord insertion.

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