Vasa previa

How to diagnose antenatally

by **JIE DENG, MD, AND JOSHUA COPEL, MD**

Case

A 33-year-old patient who conceived after in vitro fertilization underwent a routine anatomy scan at 18 weeks' gestation. A succenturiate lobe of placenta was identified in the posterior lower uterine segment with the main body of the placenta located anteriorly. No bridging vessel could be identified by transabdominal scan so a vaginal scan was undertaken. Bridging vessels with fetal pulse waveform were seen crossing the internal cervical os (Figure 1). The patient was admitted to the hospital at 30 weeks' gestation and had 2 courses of corticosteroids for fetal lung maturity and an uneventful cesarean delivery at 35 weeks. The placenta after delivery showed velamentous cord insertion with vessels running along the membranes (Figure 2).

QUICK TAKE

- Medical management options Velicate explibusam, simi, ipsunt untendam, commolo riatem.
- Velicate ipsunt untendam, commolo riatem explibusam, simi, ipsunt untendam, commolo riatem. Velicate ipsunt untendam, commolo riatem explibusam, simi, ipsunt untendam, commolo riatem.

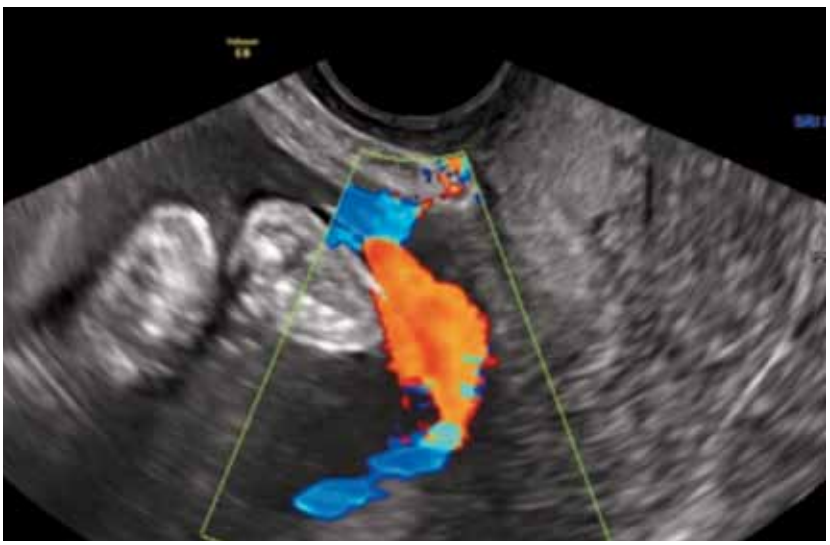

FIGURE 1 Transvaginal ultrasound with color Doppler in sagittal plane showing the fetal vessels running cross the internal cervical os.

IMAGES COURTESY OF THE AUTHORS

DR DENG is a Maternal-Fetal Medicine fellow, Department of Obstetrics, Gynecology and Reproductive Sciences, Yale University School of Medicine, New Haven, Connecticut.

DR COPEL is Professor, Department of Obstetrics, Gynecology and Reproductive Sciences, Yale University School of Medicine, New Haven, Connecticut.

THE PREVALENCE OF VASA PREVIA IS APPROXIMATELY 1:1200–1:5000 DELIVERIES BUT IS MUCH HIGHER IN PREGNANCIES CONCEIVED FOLLOWING USE OF ART.

Vasa previa is a form of velamentous cord insertion in which the umbilical vessels traverse within the fetal membranes of the lower uterine segment and overlie the cervix.[1] These vessels are at risk of rupture when the membranes spontaneously or artificially rupture, which can result in an acute fetal hemorrhage and death.

Etiology

A velamentous cord insertion is a prerequisite for vasa previa. Vasa previa can be divided into 2 main types: Type I is the occurrence of a single-lobe placenta with a velamentous cord insertion close to or over the cervical os. Type II involves a succenturiate placenta with the connecting vessels crossing over the os.[2]

It is unclear why some placentas implant in the lower uterine segment rather than in the fundus in early pregnancy. It has been postulated that with the progression of pregnancy, the placenta grows preferentially toward the better-vascularized fundus, whereas the placenta overlying the less-well-vascularized lower uterine segment atrophies (this is also termed "placental migration").[3] In some cases, this atrophy leaves vessels running through the membranes, unsupported by placental tissue or cord and resulting in vasa previa. In cases in which the atrophy is incomplete, a succenturiate lobe may develop.[3]

FIGURE 2 Placenta after delivery showing vasa previa. Vessels are seen running through the membranes.

Risk factors

The prevalence of vasa previa is approximately 1:1200–1:5000 deliveries but is much higher in pregnancies conceived following use of assisted reproductive technologies, with a prevalence in these pregnancies as high as 1:202.[1,4-6] Other risk factors include second-trimester low-lying placentas or placenta previa (even if resolved), bilobed or succenturiate lobe placentas in the lower uterine segment, and multiple gestations.[6-9]

Diagnosis

Before the wide use of transvaginal ultrasound, vasa previa was commonly diagnosed when rupture of membranes was accompanied by vaginal bleeding and fetal distress or death.[1,10,11] Numerous reports have demonstrated that vasa previa can be diagnosed antenatally with ultrasonography.[2,4] A recent systematic review demonstrated that the accuracy of ultrasound in the prenatal detection of vasa previa is high when performed transvaginally and combined with color Doppler, with a median prenatal detection rate of 93% and specificity between 99% and 100% in recruited studies.[12] In 2 pro-

spective studies with a total of 33,795 patients including 11 cases of vasa previa, second-trimester transvaginal color Doppler detected all cases of vasa previa, with 100% sensitivity and 99.0%–99.8% specificity.[2,13]

Diagnostic criteria for vasa previa using transvaginal ultrasound include the presence of a linear sonolucent area over the internal os of the cervix.[4] Blood flow can be demonstrated through these umbilical vessels with color Doppler, and the spectral Doppler waveforms are typical of umbilical cord Doppler flow waveforms. Differential diagnoses include funic presentation and normal cord loop. Thus it may be necessary to attempt to shift the position of the umbilical cord by gently tapping with the ultrasound transducer over the area in question or by adjusting the maternal position and ascertaining that the vessel is not displaced with maternal movement. Other differential diagnoses include marginal placental vascular sinus and vessel of maternal origin, and a comparison with the maternal pulse will aid in differentiation.

Several studies have prospectively evaluated the use of ultrasonography in routinely screening for vasa previa in large populations.[2,4,13,14] These studies found that sonographic identification of the placenta cord insertion was accurate and sensitive and added little or no extra time to the duration of the obstetric sonographic examination. The underlying assumption is that in the case of a single-lobed placenta, as long as the cord inserts into the body of the placenta, there cannot be a vasa previa. In a large number of cases in one study, more than 60% of those with vasa previa were associated with a second-trimester placenta previa or low-lying placenta. In only 20% of these did the placenta remain low-lying at the time of delivery.[11] Approximately one-third of patients with vasa previa had either a bilobed placenta or a succenturiate lobe. In this study, neonatal survival rates were 97% for women who were diagnosed antenatally and 44% for those who were not diagnosed antenatally, and neonatal blood transfusion rates were 3.4% and 58.5%, respectively.[11] The authors concluded that placental cord insertion should be evaluated in every second-trimester ultrasound examination, and transvaginal ultrasound should be performed for all women at high risk for vasa previa, including those with second-trimester low-lying placenta or placenta previa, regardless of whether the placenta remains low-lying at the time of delivery.

IN ONE STUDY, MORE THAN 60% OF THOSE WITH VASA PREVIA WERE ASSOCIATED WITH A SECOND-TRIMESTER PLACENTA PREVIA OR LOW-LYING PLACENTA

IN ONLY 20% OF THESE DID THE PLACENTA REMAIN LOW-LYING AT THE TIME OF DELIVERY.

The use of color Doppler at all transabdominal ultrasound examinations of singleton pregnancies to identify the placental cord insertion and selected use of transvaginal ultrasound for women with one or more risk factors including IVF pregnancies, accessory placenta lobes, low-lying placenta, or velamentous cord was shown to be cost-effective in a cost-utility analysis.[15] The analysis demonstrated that universal transvaginal ultrasound screening of singleton pregnancies is not cost-effective compared with selected screening. In the same study, however, in twin pregnancies, universal screening for vasa previa with transvaginal ultrasound was shown to be cost-effective.[15]

Detection of vasa previa by trans-

PLANNED CESAREAN DELIVERY BEFORE THE ONSET OF SPONTANEOUS RUPTURE OF MEMBRANES AND LABOR APPEARS TO BE GENERALLY SUPPORTED.

vaginal ultrasound earlier than the second trimester has been explored by looking for the cord insertion site in the first trimester. Hasegawa et al visualized the placental cord insertion site in 93.5% of patients at the time of nuchal translucency scan.[16] However, more studies are needed to evaluate the additional advantage in seeking to establish the cord insertion and the accuracy of vasa previa diagnosis in the first trimester, especially given that currently a detailed second-trimester ultrasound has been the standard of care and a diagnosis made in the second trimester still allows for preventive measures to be taken in time to improve the prognosis for the fetus. Also, as noted above, "placental migration" may result in a lower uterine segment velamentous cord insertion in some pregnancies, which would not be detected in a first-trimester scan.

Not all vasa previa can be diagnosed before the onset of labor. Maternal obesity, abdominal wall scarring, and an incompletely filled bladder may limit the detection of velamentous vessels. Vasa previa has gone undetected when ultrasound evaluation did not involve color Doppler, was transabdominal, and/or was performed only in the third trimester.

Intrapartum diagnosis and confirmation of HbF

When pregnancy is complicated by vasa previa, vessel rupture may occur at the time of spontaneous rupture of membranes or at amniotomy. Fetoplacental blood volume is only about 150 mL/kg, so loss of even a small amount of blood can prove disastrous to the fetus. When bleeding occurs in pregnancy or in labor, a test to detect fetal hemoglobin, such as the Apt test (alkali denaturation test), hemoglobin electrophoresis, or the Kleihauer-Betke test, may aid in the diagnosis of vasa previa.[17] However none of these tests is typically available acutely in labor units. When bleeding occurs in a patient with known vasa previa, or if the diagnosis is suspected during labor when vaginal bleeding accompanies rupture of the membranes and fetal heart rate (FHR) decelerations, fetal bradycardia, or a sinusoidal FHR pattern, there may be no time to test for fetal blood cells and immediate cesarean delivery is most frequently indicated.[18]

VASA PREVIA HAS GONE UNDETECTED WHEN ULTRASOUND EVALUATION DID NOT INVOLVE COLOR DOPPLER, WAS TRANSABDOMINAL, AND/OR WAS PERFORMED ONLY IN THE THIRD TRIMESTER.

Management of vasa previa

No large prospective studies of management of vasa previa exist, and it would be difficult to perform a randomized controlled trial. When vasa previa is diagnosed antenatally, a planned cesarean delivery before the onset of spontaneous rupture of membranes and labor appears to be generally supported. One suggested management scheme for patients with vasa previa includes administration of corticosteroids for fetal lung maturation at 28–30 weeks to promote fetal lung maturity, hospitalization at about 30-32 weeks and planned cesarean section at 35-36 weeks' gestation, as recommended by Oyelese et al[19,20] and the Vasa Previa Foundation.

The optimal gestational age at delivery is difficult to establish. Some authors have advocated a risk-adapted treatment in which the timing of delivery is based on individual patient assessment including patient history and clinical signs for preterm birth. In one retrospective study, patients were evaluated weekly for risk factors for preterm delivery and were admitted to the hospital between 32 and 34 weeks' gestation. Steroids were administered to women only when they were at risk for preterm birth. Elective cesarean delivery was performed between 35 and 37 weeks with risk adaption. Delaying the cesarean up to 2 weeks beyond the conventionally recommended date of 35 weeks in 78% of cases in the study resulted in no lethal fetal, neonatal, and maternal complications.[21] Nevertheless, because of the high fetal mortality rate, delivery by cesarean at 35–36 weeks' gestation to avoid the risk of membrane rupture and fetal exsanguination has been considered justifiable in most situations.

If necessary women admitted with diagnosed vasa previa who are

clinically stable and not bleeding should be transferred for delivery in a facility where an appropriate level of pediatric care for the gestational age and sufficient blood for neonatal transfusion are immediately available. Aggressive resuscitation of the neonate even when there has been significant fetal hemorrhage may improve the prognosis considerably.[11] When bleeding from fetal vessels occurs, the safest and quickest form of delivery is usually an immediate cesarean. The surgeon should be aware of the position of the fetal vessels before surgery to avoid lacerating them when making the uterine incision.

Summary

Looking for umbilical cord insertion in all patients and screening for vasa previa in patients with risk factors when performing ultrasound scans have made it possible to diagnose vasa previa in the second and third trimesters. Prenatal diagnosis allows appropriate early management planning and delivery by cesarean to avoid rupture of fetal vessels and exsanguination. Health professionals caring for pregnant women must be aware of the risk factors, diagnosis, and management of vasa previa.

More data are needed to review screening and optimal timing of delivery to best identify and treat this potentially tragic complication of childbirth. ■

FOR REFERENCES VISIT
contemporaryobgyn.net/vasa-previa

TOP 5 ARTICLES OF 2015 ON contemporaryobgyn.net

1 Recurrent vulvovaginitis: Tips for treating a common condition
Merida Miller, MD
Vaginal itching, discharge, and odor are among the most common complaints in gynecologic and primary care offices. Women often call their practitioners after self-treating at home. Self-diagnosis has been shown to be correct less than one-third of the time, leading to millions of dollars wasted on treating the wrong entity.
contemporaryobgyn.net/recurrent-vulvovaginitis

2 Amniotic fluid volume: When and how to take action
Alessandro Ghidini, MD; Marta Schillrò, MD; and Anna Locatelli, MD
The correct response to oligohydramnios and polyhydramnios hinges on timing, severity, and comorbidity.
contemporaryobgyn.net/amniotic-fluid-volume

3 Common pediatric vulvar complaints
Rachel K Casey, MD, and Veronica Gomez-Lobo, MD
Vulvovaginal complaints in prepubertal girls are common and account for up to 80% of childhood visits to gynecologists. Vulvovaginal complaints encompass a wide variety of conditions. contemporaryobgyn.net/pediatric-vulvar-complaints

4 Pelvic floor spasm: The missing link in chronic pelvic pain
Patrice M Weiss, MD; Jennifer Risk, MS, PT; Eric Swisher, MD
Acute or chronic pelvic pain is often due to musculoskeletal disorders, which may go unrecognized during a traditional pelvic examination. Proper evaluation facilitates the diagnosis of spasm or trigger points, and physical therapy often achieves a major improvement in quality of life for these women. contemporaryobgyn.net/pelvic-floor-spasm

5 The transcervical Foley balloon
Sarah J Kilpatrick, MD, PhD, and Tania F Esakoff, MD
How to use a common clinical tool when labor induction is recommended. contemporaryobgyn.net/transcervical-Foley

OVERSET PAGE

REFERENCES

1. Oyelese KO, et al. Vasa previa: an avoidable obstetric tragedy. *Obstet Gynecol Surv.* 1999;54(2):38-45.

2. Catanzarite V, et al. Prenatal sonographic diagnosis of vasa previa: ultrasound findings and obstetric outcome in ten cases. *Ultrasound Obstet Gynecol*. 2001;109-115.

3. Monie IW. Velamentous Insertion of the Cord in Early Pregnancy. *Am J Obstet Gynecol.* 1965;93:276-281.

4. Lee W, et al. Vasa previa: prenatal diagnosis, natural evolution, and clinical outcome.*Obstet Gynecol*. 2000;95(4):572-576.

5. Baulies S, et al. Prenatal ultrasound diagnosis of vasa praevia and analysis of risk factors. *Prenat Diagn*. 2007;27(7):595-599.

6. Oyelese Y, et al. Second trimester low-lying placenta and in-vitro fertilization? Exclude vasa previa*. J Matern Fetal Med*. 2000;9(6):370-372.

7. Fung, TY, Lau TK. Poor perinatal outcome associated with vasa previa: is it preventable? A report of three cases and review of the literature. *Ultrasound Obstet Gynecol*.1998;12(6):430-433.

8. Schachter M, et al. In vitro fertilization is a risk factor for vasa previa. *Fertil Steril*. 2002;78(3):642-643.

9. Hasegawa J, et al. Analysis of the ultrasonographic findings predictive of vasa previa. *Prenat Diagn*. 2010;30(12-13):1121-1125.

10. Oyelese KO, et al. A strategy for reducing the mortality rate from vasa previa using transvaginal sonography with color Doppler. *Ultrasound Obstet Gynecol.* 1998;12(6):434-438.

11. Oyelese Y, et al. Vasa previa: the impact of prenatal diagnosis on outcomes. *Obstet Gynecol.* 2004;103(5 Pt 1):937-942.

12. Ruiter L, et al. Systematic review of accuracy of ultrasound in the diagnosis of vasa previa. *Ultrasound Obstet Gynecol.* 2015;45(5):516-522.

13. Nomiyama M, Toyota Y, Kawano H. Antenatal diagnosis of velamentous umbilical cord insertion and vasa previa with color Doppler imaging.*Ultrasound Obstet Gynecol*. 1998;12(6):426-429.

14. Sepulveda W, et al. Prenatal detection of velamentous insertion of the umbilical cord: a prospective color Doppler ultrasound study.*Ultrasound Obstet Gynecol*. 2003;21(6):564-569.

15. Cipriano LE, Barth Jr WH, Zaric GS. The cost-effectiveness of targeted or universal screening for vasa praevia at 18-20 weeks of gestation in Ontario. *BJOG*. 2010;117(9):1108-1118.

16. Hasegawa J, et al. Cord insertion into the lower third of the uterus in the first trimester is associated with placental and umbilical cord abnormalities.*Ultrasound Obstet Gynecol*. 2006;28(2):183-186.

17. Odunsi K, et al. Evaluation of chemical tests for fetal bleeding from vasa previa.*Int J Gynaecol Obstet.* 1996;55(3):207-212.

18. Gantt PA, Bird Jr JS, Randall GW. Sinusoidal fetal heart rate pattern with vasa previa. *J Tenn Med Assoc.* 1990;83(8):393-394.

19. Oyelese Y, Smulian JC. Placenta previa, placenta accreta, and vasa previa. *Obstet Gynecol*. 2006;107(4):927-941.

20. Gagnon R, et al. Guidelines for the management of vasa previa. *J Obstet Gynaecol Can.* 2009;31(8):748-760.

21. Golic M, et al. Vasa praevia: risk-adapted modification of the conventional management--a retrospective study. *Ultraschall Med*. 2013;34(4):368-376.

STATS: