Case Report

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Usefulness of Magnetic Resonance Imaging in Antenatal Diagnosis of Vasa Previa: A Case Report

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Abstract

Vasa previa is a condition in which vessels unprotected by the umbilical cord or placenta reside on the amniotic membranes and run in the vicinity of the internal cervical os. Antenatal diagnosis is extremely important for the prognosis of the fetus. The patient was a 27 year-old primiparous woman. At 33 weeks of gestation, ultrasonography showed vessels were between the fetal head and the internal cervical os, the placenta was implanted on the posterior wall, and the vessels could be followed to the posterior surface of the bladder along the anterior uterine wall. The site of umbilical cord insertion was difficult to assess by ultrasonography. MRI showed a velamentous insertion that attached to the lower anterior wall near the internal os, and the vessels were on the internal os. The fetal umbilical cord vessels, which were not covered by Walton's jelly, were within 2 cm of the internal cervical os. Vasa previa was diagnosed. At 33 weeks and 3 day of gestation, the uterine contractions increased, and the patient underwent an emergency cesarean section to prevent rupture of the vasa previa. The membranes were ruptured by avoiding the vessels, and an 1872-g girl infant was delivered with Apgar scores of 7 and 8. Macroscopic assessment of the placenta and membranes demonstrated vasa previa and velamentous insertion of the umbilical cord. MRI is useful not only for the definitive diagnosis of the vasa previa but also for determining the position of the uterine incision at the time of cesarean section.

Keywords: Vasa previa; Cord prolapse; Velamentous insertion; Magnetic Resonance Imaging

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Introduction

Vasa previa is a condition in which vessels unprotected by the umbilical cord or placenta reside on the amniotic membranes and run in the vicinity of the internal cervical os. The incidence is reported to be 1 per 2500 deliveries [1]. The rate of survival of fetuses without antenatal diagnosis is approximately 40% [2,3]; the most important prognostic factor is whether the condition is diagnosed antenatally. In our patient, vasa previa was suspected because of umbilical cord prolapse, and magnetic resonance imaging (MRI) was useful for diagnosis.

Case Report

The patient was a 27-year-old primiparous woman with no past or family history. After pregnancy was established spontaneously, the pregnant course was uneventful. At 29 weeks of gestation, the umbilical cord was found to be near the internal cervical os, and vasa previa was suspected; the patient was referred to our department at 33 weeks of gestation. On the initial examination, transvaginal ultrasonography showed a cervical canal length of 22 mm and vessels between the fetal head and the internal cervical os **(Figure 1)**. Umbilical cord prolapse and vasa previa were included in the differential diagnoses. During transvaginal ultrasonography, the fetal head was pushed up, but the vessels did not migrate, and so vasa previa was determined to be the likely diagnosis. Transabdominal ultrasonography further showed that the placenta was implanted on the posterior wall of the uterine body and the vessels could be followed to the posterior surface of the bladder along the anterior wall of the uterus. The site of umbilical cord insertion was difficult to assess by ultrasonography, and so MRI was performed. MRI showed a

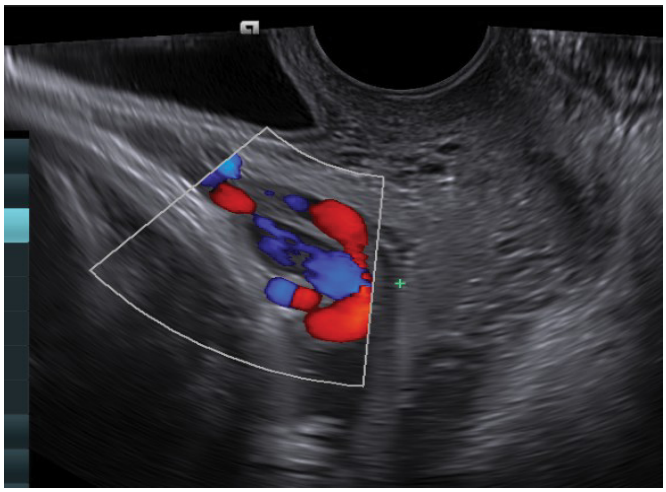

Figure 1 Transverse transvaginal color Doppler US image shows sub-membranous, large, tortuous fetal vessels between the fetal head and the internal cervical OS.

velamentous insertion of the umbilical cord that attached to the lower anterior wall near the internal cervical os, and the vessels were on the internal os **(Figure 2)**. The fetal umbilical cord vessels, which were not covered by Walton's jelly, were within 2 cm of the internal cervical os. On the basis of these findings, vasa previa was diagnosed.

Cardiotocography demonstrated uterine contractions at 33 weeks and 1 day of gestation, and ritodrine infusion was started. Two days later, however, the uterine contractions increased, and the patient underwent an emergency cesarean section to prevent rupture of the vasa previa. Intraoperative ultrasonography confirmed that vasa previa was on the left side of the lower uterine segment. The incision was made from the right side of the lower uterine segment and was expanded manually. The attachment of the vessels to the amniotic membranes was confirmed **(Figure 3)**. The membranes were ruptured by avoiding the vessels, and a 1872-g girl infant was delivered with Apgar scores of 7 and 8 and a cord pH of 7.274. The estimated total blood loss was 1755g. Macroscopic assessment of the placenta and membranes demonstrated vasa previa and velamentous insertion of the umbilical cord **(Figure 4)**.

Discussion

This case demonstrated that [1] MRI is useful in diagnosing the vasa previa and [2] vasa previa should be included in the differential diagnoses when umbilical cord prolapse is found.

Antenatal diagnosis is extremely important for the prognosis of the fetus because the neonatal mortality rate can be as high as 60% if vasa previa is not diagnosed antenatally [4]. On the other hand, the diagnosis is not always easy. The diagnosis is made mainly through plain and color Doppler ultrasonography, but it is sometimes difficult to ascertain the course of the umbilical cord vessels. Identifying the site of cord insertion is difficult particularly during the third trimester of pregnancy, when the volume of the fetus in the amniotic fluid cavity increases [5]. The key to ultrasound diagnosis of vasa previa is that the umbilical vessels near the internal cervical os are not covered by Walton's jelly, and their position does not shift when the mother's abdomen is compressed by the probe. However, many cases are not diagnosed, and missing such a diagnosis is still considered acceptable [3,6]. Although the umbilical cord in our patient was depicted on ultrasonography near the internal cervical os, it was difficult to determine whether the problem was umbilical cord prolapse or vasa previa.

Because identification of the site of the umbilical cord insertion was also difficult, we performed MRI, which demonstrated the umbilical cord vessels running from the lower edge of the placenta to the internal cervical os, forming a velamentous insertion near the internal cervical os, and going toward the fetus as an umbilical cord. We were able to diagnose the vasa previa with confidence and offer cesarean section for delivery. Intraoperative ultrasonography demonstrated that the umbilical vessels were running on the left side of the lower uterine segment, and so we were able to avoid the umbilical vessels and perform cesarean section safely. MRI can also be particularly useful in making

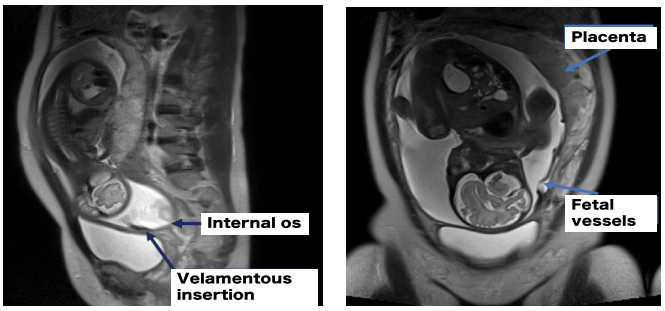

Figure 2 Magnetic resonance imaging T2-weighted images show a velamentous insertion of the umbilical cord that attached to the lower anterior wall near the internal cervical OS, and the vessels are on the internal OS.

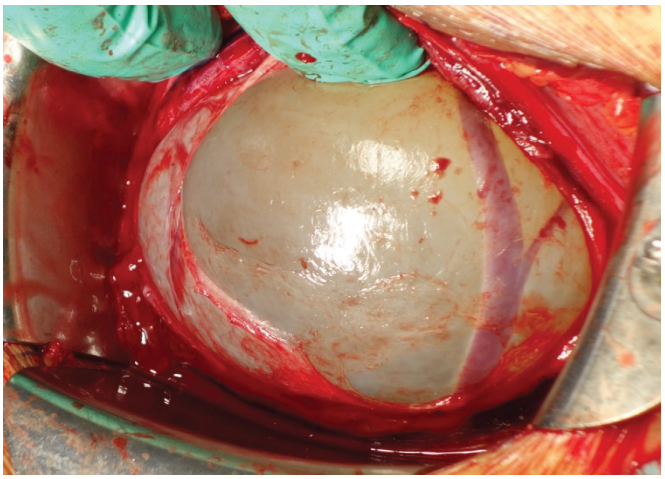

Figure 3 A transverse incision of lower uterine segment reveals an intact amniotic membrane with fetal blood vessels crossing over the membrane.

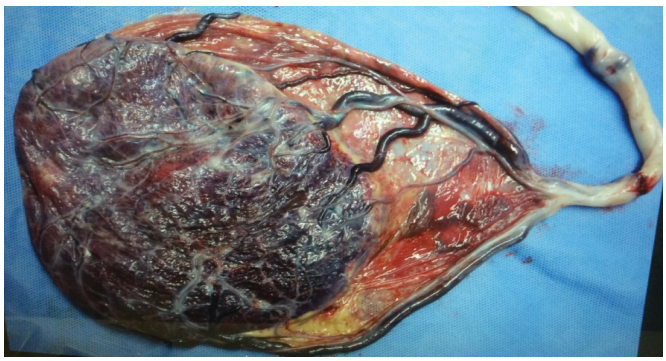

Figure 4 Macroscopic finding of the placenta reveals membranous vessels that merged to form the umbilical cord, confirming the presence of velamentous cord insertion.

these discriminations or in the setting of a posterior placenta [6]. The clinical significance of MRI in antenatal diagnosis of vasa previa was shown in a woman with bilobed placentas [7], and noncontrast time-of-flight magnetic resonance angiography may be used in addition to MRI for antenatal identification of the precise vascular distribution in patients with vasa previa [8].

For screening of the vasa previa, it is helpful to recognize the presence of placenta previa, low-lying placenta, and velamentous insertion of the umbilical cord [9]. Recognizing the site of the umbilical cord insertion early in pregnancy has been informative in diagnosing vasa previa [10]. Furthermore, in midpregnancy, particularly in patients with maternal and placental risk factors for vasa previa, such as low-lying placenta, velamentous insertion, accessory placenta, bilobed placenta, multiple pregnancy, and advanced maternal age, and cases of *in vitro* fertilization (IVF), ultrasound screening is helpful for the diagnosis [9,10]. However, it may be difficult for clinicians to keep vasa previa in mind when performing routine screening. Both umbilical cord prolapse and vasa previa are characterized by umbilical vessels in the vicinity of the internal cervical os.

Conclusion

In our patient, constant and persistent umbilical prolapse reminded us of vasa previa and led to the diagnosis. If the site of umbilical cord insertion has not been identified in mid-pregnancy, or if ultrasonography is performed for the first time at a hospital in late pregnancy, vasa previa may be more easily missed. The observation of umbilical cord prolapse or umbilical vessels near the internal cervical os should trigger MRI investigation for the diagnosis of vasa previa. MRI was useful in the definitive diagnosis of the vasa previa in our patient. If an umbilical cord prolapse is seen, an evaluation of the umbilical cord vessels, including color Doppler imaging, is necessary. MRI is useful not only for the definitive diagnosis of the vasa previa but also for determining the position of the uterine incision at the time of cesarean section.

Contributions

NY, TK, and YA drafted the manuscript. HM, KM, YO, YK, YC, NH, and YA contributed to review and editing of the manuscript. All authors contributed equally to creation of this case report.

Conflict of Interest

The authors declare that they have no conflict of interest regarding the publication of this case report.

Patient Consent

Obtained.

Acknowledgment

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