Contrast enhanced ultrasound (CEUS) in the prenatal evaluation of suspected invasive placenta percreta

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Abstract

Background: Morbidly adherent placentation now complicates approximately 1 in 500 pregnancies. Our group and others have demonstrated that antenatal diagnosis of invasive placentation and team-based delivery reduce severe morbidity. Ultrasound and magnetic resonance imaging (MRI) are both employed in the antenatal evaluation of pregnancies with suspected placenta increta/percreta. Accurate diagnosis in this context is essential to direct resources appropriately. Ultrasound methods, including colour and power Doppler, are the mainstays of screening at-risk women, whereas MRI is reserved for diagnostic purposes because of its cost and limited accessibility. In current practice, both methods are significantly limited by an inability to accurately define aberrant utero-placental blood flow, the definitive sign of deeply invasive placentation. We describe here an adjunctive method to define aberrant blood flow using ultrasound.

Case: We employed contrast-enhanced ultrasound (CEUS) in the antenatal evaluation of suspected extensive invasive placentation in a woman at 18 weeks' gestation. Invasive placentation was confirmed following hysterectomy.

Conclusion: CEUS, a technique that has been established as safe and well tolerated in the non-pregnant setting, has the potential to be deployed as a powerful adjunct to ultrasound to enhance both the screening and diagnostic components of care for women with suspected invasive placentation.

Résumé

Contexte : À l'heure actuelle, environ 1 grossesse sur 500 est compliquée par l'adhérence pathologique du placenta. Notre équipe ainsi que d'autres chercheurs ont démontré que le diagnostic prénatal du placenta envahissant et l'accouchement par une équipe réduisent la morbidité grave. L'évaluation prénatale des grossesses pour lesquelles on soupçonne un placenta increta ou percreta se fait par échographie et par imagerie par résonance magnétique (IRM). Dans ce contexte, un diagnostic juste est essentiel à une bonne répartition des ressources. Les examens échographiques, comme les Doppler couleur et de puissance, sont à la base du dépistage des femmes à risque, tandis que l'on a habituellement recours à l'IRM à des fins diagnostiques seulement vu le coût élevé de cette méthode et son accessibilité limitée. À l'heure actuelle, les deux méthodes présentent une limite considérable, soit leur inefficacité à détecter un débit sanguin utéro-placentaire aberrant, signe définitif d'un envahissement profond par le placenta. Nous décrivons ici une méthode complémentaire visant à utiliser un type d'échographie pour repérer un débit sanguin aberrant.

Cas : Nous avons utilisé l'échographie de contraste dans l'évaluation prénatale d'un cas soupçonné d'envahissement profond par le placenta chez une femme enceinte de 18 semaines. La placentation envahissante a été confirmée par hystérectomie.

Conclusion : Utilisée de concert avec l'échographie classique, l'échographie de contraste, dont la sécurité et la tolérabilité ont été établies dans des contextes autres que la grossesse, pourrait améliorer considérablement les volets dépistage et diagnostic des soins aux femmes enceintes chez qui on soupçonne un placenta envahissant.

Key Words: Placenta, invasive, ultrasound, contrast

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INTRODUCTION

Invasive placentation is characterized by abnormal placental growth into maternal myometrium. There have been many reports of antenatal diagnosis of invasive placentation using two-dimensional ultrasound, three-dimensional ultrasound, Doppler ultrasound, and magnetic resonance imaging.[1] To our knowledge, this is the first report of the use of contrast-enhanced ultrasound in the antenatal evaluation of invasive placentation.

Figure 1. Colour Doppler ultrasound. Arrow indicates neo-vascularity at the myometrial–bladder interface

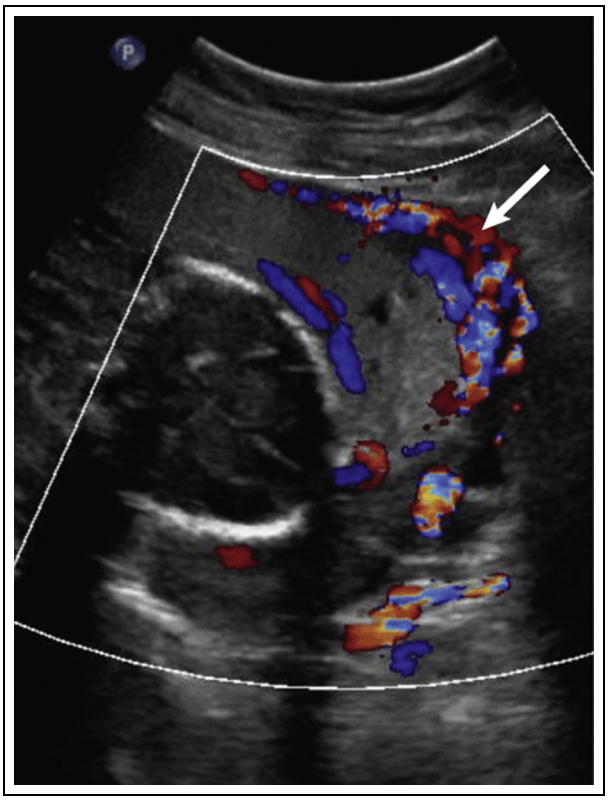
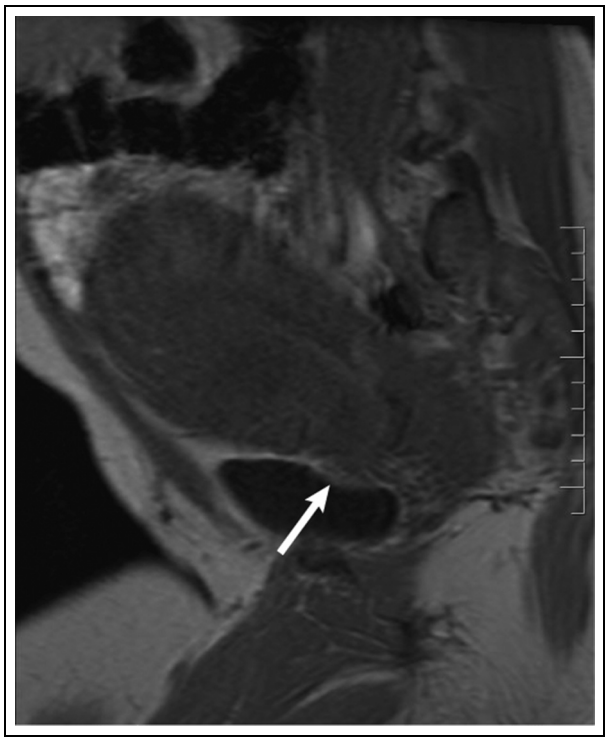


Figure 2. Placental MRI. Arrow indicates the abnormal myometrial–bladder interface



THE CASE

A healthy, 38-year-old woman, gravida 2 para 1, presented with preterm premature rupture of membranes at 18 weeks' gestation. Her first pregnancy resulted in delivery by CS. Ultrasound after presentation demonstrated a live 18-week sized live fetus with normal anatomy but severe oligohydramnios. The placenta was low-lying and anterior, with features suggestive of invasive placenta increta/percreta. These included multiple elongated dark bands, loss of the normal placental-myometrial interface, and hypervascularity of the myometrium adjacent to the maternal bladder (Figure 1). MRI was performed, without gadolinium contrast, and confirmed the diagnosis of placenta increta (Figure 2). Maternal-fetal medicine and neonatology consultants counselled the patient extensively regarding the diagnoses of PPROM at 18 weeks' gestation and placenta increta. After multiple counselling sessions and discussion of management options, the patient chose to undergo termination of pregnancy and hysterectomy.

ABBREVIATIONS

CEUS contrast-enhanced ultrasound

PPROM preterm premature rupture of membranes

Prior to surgery, the patient was offered CEUS to optimize the imaging of placental invasion and to advance the potential for developing a safe alternative to gadolinium. She was counselled that CEUS is a risk-free intervention used in non-pregnant subjects to define abnormally enhanced areas of blood flow, as seen for example in malignant disease.[2] The patient agreed to undergo CEUS, and informed consent was signed.

The CEUS procedure was carried out using a Philips IU-22 ultrasound system (Philips Canada, Markham, ON) in low mechanical index contrast mode. Definity (Lantheus Medical Imaging Inc., Billerica, MA) was injected in a 0.2 mL bolus and enhancement imaged in real time. Bubble replenishment after disruption was imaged at five minutes, revealing the perfusion morphology. Real-time visualization of abnormally enhanced placental blood flow in association with abnormal myometrial invasion was noted (Figure 3 A–D). CEUS also enhanced visualisation of the vascular tree of the abnormal placentation (Figure 4), most easily appreciated in real time as seen in the linked online videos. Importantly, no bubbles were visualized within the fetal umbilical circulation during the ultrasound (Figure 5), suggesting that they do not cross the placenta. On the following day, hysterectomy was performed without complication by the invasive placentation