Clinical Case Report

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Electronic fetal monitoring characteristics of a patient with sudden onset of placental abruption and intrauterine fetal demise

A case report

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Abstract

Introduction: Placental abruption (PA) is a serious complication of pregnancy, associated with significant perinatal complications, including intrauterine fetal demise (IUFD). Continuous electronic fetal monitoring (EFM) has been widely applied in China in recent decades. Exploration of potentially PA-specific patterns of EFM contributes to early detection of PA occurrence.

Patient concerns and diagnosis: A 33-year-old woman (gravida 3, para 1) was referred to our hospital at 33^{+3} weeks gestation due to non-reassuring fetal heart rate (FHR) pattern, and suffered sudden onset of severe PA and subsequent intrauterine fetal demise.

Interventions: We analyzed the characteristics of her non-stress tests (NSTs) 1 day and 10 min before the detection of PA, aiming to explore potentially PA-specific patterns of EFM and provide reference for early detection of asymptomatic PA occurrence in obstetric practice.

Outcomes: Unfavored characteristics of FHR patterns before PA onset are analyzed.

Conclusion: For those who sense decreased fetal movements (DFMs), a NST and a biophysical profile (BPP) are recommended for exclusion of potential adverse maternal and fetal complications.

Abbreviations: BPP = biophysical profile, DFM = decreased fetal movement, EFM = electronic fetal monitoring, FHR = fetal heart rate, IUFD = intrauterine fetal demise, NST = non-stress tests, PA = placental abruption.

Keywords: electronic fetal monitoring, intrauterine fetal demise, non-stress test, placental abruption

1. Introduction

Placental abruption (PA) is a serious and life-threatening complication of pregnancy, associated with significant maternal morbidity and perinatal morbidity and mortality. Despite the efficacy of fetal evaluation such as the continuous electronic fetal monitoring (EFM) and biophysical profile (BPP), fetal demise is occasionally encountered in patients with PA. Sometimes occurrence of PA may be asymptomatic. In such cases, identification and interpretation of characteristics potentially related to PA occurrence will contribute to immediate treatment and lower maternal and fetal risks.

Continuous EFM has been widely applied and almost universal in hospitals in China in recent decades. Although the international standardization of EFM interpretation has been proposed, controversy exists whether the interpretation of EFM patterns as well as the interpretation-based clinical decisions help improve fetal outcomes.[1,2] Most cohort and case-control studies in recent years focus on the association between certain EFM patterns and different types of pregnancy complications.[3,4] There is a lack of detailed interpretation of EFM characteristics of cases with specific obstetric emergencies, such as PA. This article provides EFM information of a patient with sudden onset of PA and intrauterine demise, aiming to explore potentially PA-specific patterns of EFM and provide reference for early detection of asymptomatic PA occurrence in obstetric practice.

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Written, informed consent was obtained from the patient for publication of this case report and any accompanying images.

The authors declare that they have no conflict of interest.

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2. Case presentation

A 33-year-old woman (gravida 3, para 1) was referred to our hospital at 33^{+3} weeks gestation due to non-reassuring fetal heart rate (FHR) pattern at a regular prenatal visit. The FHR baseline was at 165 bpm with normal variations, no sensible abnormality of fetal movement, and normal on-admission obstetric ultrasonography findings. The patient has a history of embryo damage and a third trimester induction due to severe pre-eclampsia. Six weeks after the induction and during the whole process of this pregnancy, the patient showed normal results in all urine tests and blood pressure monitoring. After admission, treatments included intravenous infusion to improve placental perfusion, dexamethasone injection to accelerate fetal lung maturation, and non-stress test (NST) on a daily basis. The patient was discharged 3 days after admission.

However, since the evening of the discharge day, the patient felt decreased fetal movement (DFM). The second day she was referred to the hospital again with the chief complaint of "Fetal movement disappearance for 16 hours." On-admission EFM showed a non-reactive pattern: the FHR baseline was at 140 bpm, no indication of fetal movement, weak but frequent uterine contractions (intervals: 2 min; strength: 30–50 mm Hg), and no accelerations after uterine contraction (Fig. 1B). An immediate obstetric ultrasonography only detected weak valvular rhythms of the fetal mitral value and tricuspid valve, and there was no detectable rhythmic thickening of the fetal myocardium, indicating a fetal state of impending death (Fig. 1C). A

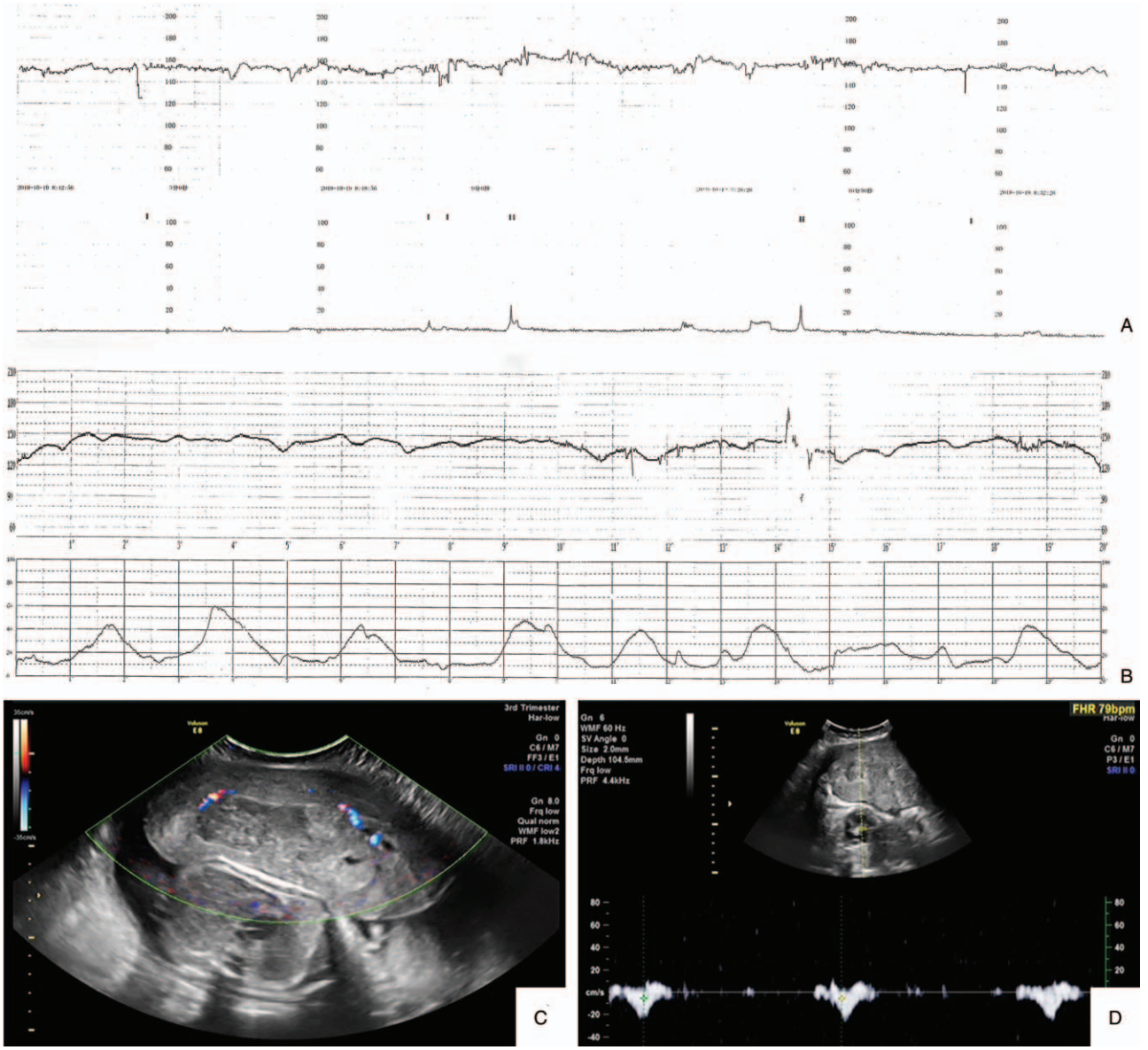

Figure 1. A: NST pattern captured 1 day before the onset of placental abruption (PA). Fetal heart rate (FHR) baseline was at 150 bpm with normal and irregular variabilities. No acceleration in FHR was recorded after fetal movement bursts (black spots). Over 50% of variation decelerations are seen at fetal movement bursts (black spots). B: NST pattern captured approximately 10 min before the onset of PA. The FHR baseline was at 140 bpm. No fetal movement was detected (fetal movement had disappeared for 16 h when this NST was captured). Weak but frequent uterine contractions were detected, with no accelerations after uterine contractions. C: Sonography findings: FHR was 79 bpm at the time of observation. Weak valvular rhythms of the fetal mitral value and tricuspid valve, and there was no detectable rhythmic thickening of the fetal myocardium. D: Sonography findings: abdominal ultrasonography indicating PA; M = mass, PL = placenta.

hypoechoic mass of 9 × 4 cm in size was detected in subplacental space, indicating PA (Fig. 1D).

An emergency cesarean section was performed, and a dead female fetus was delivered, weighing 2050 g. The placenta had been completely abrupted from the uterine wall, leading to approximately 500 mL of hematometra and clots. Uteroplacental apoplexy was diagnosed due to the marbled uterus with numerous violet areas. Oxytocin and hemabate were injected to prevent uterine inertia-induced postpartum hemorrhage. After the surgery the patient recovered uneventfully and was discharged on the fifth postoperative day.

3. Discussion

Among various types of EFMs, NST is the most commonly used modality for assessment of fetal well-being for its convenient, fast, and safe nature. As for this case, a NST needs to be noticed is the one on the discharge day ((Fig. 1A). This record was regarded as normal and the patient was then discharged home. Specifically, the recording has an FHR baseline at 150 bpm with normal and irregular variabilities. There are many fetal movement bursts (movement or the clusters of movement spikes, black spots in the tracing pattern) whereas no acceleration in FHR is recorded. Over 50% of variation decelerations are seen at fetal movement bursts (black spots). Currently the 3-tier classification scheme proposed in 2008 is the most widely adopted standard for interpreting FHR patterns.[1] Category I refers to those patterns that are strongly predictive of a normal fetal acid-base balance at the time of observation, whereas category III signals a high probability of fetal acidemia at the time of observation. All other FHR patterns fall into category II. Category II, also known as the atypical type, remains to be the most heterogenous and controversial part of FHR patterns interpretation. Collectively, when taken a second look, the aforementioned NST record should be classified into Category II, other than normal type. On seeing this Category II-NST, what will be the proper triage for the patient in our case? One day after this NST, the patient suffered sudden occurrence of PA and fetal loss with no indicated incentives. Although whether NST has the diagnostic value for maternal and neonatal outcomes still remains unclear, we recommend a conservative attitude and close monitoring, such as a BPP for all patients before discharge, in order to avoid unfavored fetal outcomes.

Another NST needs to be focused on is the one just before the detection of PA (Fig. 1B). The FHR baseline was at normal range (140 bpm). However, no fetal movement was detected during the 20-min monitoring. Weak but frequent uterine contractions were captured, with no accelerations after uterine contractions. These features together indicated a category-III FHR pattern, a high probability of fetal acidemia at the time of observation. Actually, only 10 min after this NST, PA and fetal demise were detected, both of which ensured the severity of the case and the diagnostic value of the NST.

Fetal bradycardia is the most common variant FHR pattern connected with severe type of PA and neonatal acidemia among women confirmed with abruption.[5] As for FHR patterns that precede fetal demise, reports were available depicting loss of beat-to-beat variability and an unstable baseline followed by a profound bradycardia.[6] Loss in variability and a stable baseline is believed to be caused by the effect of severe acidemia on central nervous system, while bradycardia is attributed to acidemia-induced myocardial depression. Features in our case including severe PA, subsequent intrauterine fetal demise, and the emergency ultrasonography findings of the fetal myocardium confirm with identified effect of severe acidemia on central nervous system and myocardial depression. While no characteristics of bradycardia, loss in variability and a stable baseline in the NST of death-impeding fetus were shown in the case, which modified and broadened our knowledge of severe abruption and impeding fetal demise.

Decreased fetal movements are commonly recognized as fetal response to decreased placental perfusion for energy conservation.[7] For pregnant women with/without risk factors for adverse perinatal outcomes, daily monitoring of fetal movements is recommended to start at 26/28 gestation weeks. Similar to our case, a pregnant woman with no comorbidities was referred with the chief complaint of DFM, and was discharged home after a normal NST. One day after the discharge she presented to the labor ward triage and was diagnosed with an IUFD, with no explanation found.[8] Although most DFMs are false alarms, when DFM is noted, it is indeed necessary to refer to the nearest hospital for a complete assessment of fetal well-being.[9] Current common triage for those with DFM includes a NST and a BPP to exclude potential adverse fetal outcomes. This is in also agreement with the UK, Canada, and Australian guidelines.[8]

In brief, here we report a case of sudden onset of PA and intrauterine fetal demise, and analyzed the EFM characteristics of the NSTs just before the onset of PA. For those who sense DFM, a NST and a BPP are recommended for exclusion of potential adverse maternal and fetal complications.

Author contributions

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Supervision: Yue Teng.
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Writing – original draft: Yan Zhang.
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References

[1] Macones GA, Hankins GD, Spong CY, et al. The 2008 National Institute of Child Health and Human Development workshop report on electronic fetal monitoring: update on definitions, interpretation, and research guidelines. Obstet Gynecol 2008;112:661–6.
[2] Haws RA, Yakoob MY, Soomro T, et al. Reducing stillbirths: screening and monitoring during pregnancy and labour. BMC Pregnancy Childbirth 2009;9(Suppl 1):S5.
[3] Schnettler WT, Goldberger AL, Ralston SJ, et al. Complexity analysis of fetal heart rate preceding intrauterine demise. Eur J Obstet Gynecol Reprod Biol 2016;203:286–90.
[4] Pinas A, Chandraharan E. Continuous cardiotocography during labour: analysis, classification and management. Best Pract Res Clin Obstet Gynaecol 2016;30:33–47.
[5] Usui R, Matsubara S, Ohkuchi A, et al. Fetal heart rate pattern reflecting the severity of placental abruption. Arch Gynecol Obstet 2008;277:249–53.
[6] Fahey JO. The recognition and management of intrapartum fetal heart rate emergencies: beyond definitions and classification. J Midwifery Womens Health 2014;59:616–23.
[7] Bocking AD. Assessment of fetal heart rate and fetal movements in detecting oxygen deprivation in-utero. Eur J Obstet Gynecol Reprod Biol 2003;110(Suppl 1):S108–12.
[8] Awad NA, Jordan T, Mundle R, et al. Management and outcome of reduced fetal movements-is ultrasound necessary? J Obstet Gynaecol Can 2018;40:454–9.
[9] Tveit JV, Saastad E, Stray-Pedersen B, et al. Reduction of late stillbirth with the introduction of fetal movement information and guidelines—a clinical quality improvement. BMC Pregnancy Childbirth 2009;9:32.