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ORIGINAL ARTICLE

The predictive value of the uterine artery pulsatility index during the early third trimester for the occurrence of adverse pregnancy outcomes depending on the maternal obesity[☆]



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KEYWORDS

Uterine artery;
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Summary

Purpose: To identify the correlation between the pre-gravid maternal obesity and the uterine artery pulsatility index (UtA-PI) at 28–34 weeks' gestation, and to evaluate the predictive value of the UtA-PI for the occurrence of adverse outcomes depending on the maternal obesity.

Methods: Between January 2010 and December 2011, 229 pregnant women were prospectively observed and analyzed. The UtA-PI during 28–34 weeks' gestation was estimated, with abnormal UtA-PI defined if the value was above the 95th centile for gestational age. The patients were classified, using a cut-off value for body mass index (BMI) of 25 kg/m², into obese (pre-gravid BMI \geq 25 kg/m²) and non-obese (pre-gravid BMI < 25 kg/m²) groups. We analyzed the association between the pre-gravid BMI and occurrence of abnormal UtA-PI and estimated their contributions to adverse outcomes using regression analyses.

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Results: The occurrence of abnormal UtA-PI in the women with pre-gravid BMI over 25 kg/m² was significantly higher than those with normal pre-gravid BMI (OR: 2.49; 95% CI: 1.22–5.12). In multivariate analyses, the combination with abnormal UtA-PI and pre-gravid BMI over 25 kg/m² contributed to the occurrence of preterm delivery (OR: 33.5; 95% CI: 7.63–147.21), gestational diabetes (OR: 3.98; 95% CI: 1.17–13.56) and pregnancy induced hypertension (OR: 12.71; 95% CI: 3.45–46.87), compared to the control group with pre-gravid BMI of 25 kg/m² and less, and normal UtA-PI.

Conclusion: Women with pre-gravid BMI over 25 kg/m² show increased tendency of abnormal uterine artery pulsatility index during 28–34 weeks, which increases the risk of adverse pregnancy outcomes.

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Introduction

Uterine artery (UtA) Doppler ultrasound has become a useful method in assessing the placental implantation, placental circulation, and spiral artery remodeling at the maternal–placenta interface [1]. Of the several semi-quantitative indices of vascular impedance, an abnormal value of uterine artery pulsatility index (UtA-PI) during the early periods or mid-trimester is considered to be a predictor of risk of developing obstetric disease due to inefficient implantation; pre-eclampsia and/or severe fetal growth restriction (IUGR) and stillbirth [2–5].

However, the accuracy of Doppler investigation for adverse pregnancy outcomes in the early or mid-trimester has been reported to show a high false positive rate in the general population, as demonstrated by the fact that abnormal Doppler findings are often followed by uncomplicated outcomes [6,7]. Especially, isolated abnormal Doppler findings of the uterine artery in the early second trimester reportedly yielded poor sensitivity (43%) and specificity (67%) for predicting preeclampsia in low-risk women [7].

Normally, uterine artery vascular impedance gradually decreases until the late mid-trimester, owing to the establishment of a low-resistance placental circulation. However, the UtA pulsatility has been shown to be persistently increased until the late-trimester in approximately 30% of the low-risk population, although its association with obstetric complications is unclear [8,10].

Previous studies on Doppler examination in the late trimester focused on the prediction of uteroplacental insufficiencies, such as preeclampsia, and abnormal fetal biometry. In women with persistently increased UtA-PI until the early third trimester, the risk of preeclampsia has been found to be significantly increased [8]. As a screening

tool for abnormal fetal growth, UtA-PI at 30–32 weeks has been demonstrated to be valuable for predicting small-for-gestational-age neonates [9]. In addition, Maroni et al. [10] reported that abnormal UtA pulsatility at 34 weeks in normotensive patients was significantly correlated with the occurrence of slower fetal growth, but not late-onset preeclampsia. Few studies, however, have been conducted to identify the maternal characteristics that are associated with persistently abnormal vascular impedance of the uterine artery over the late-trimester.

Maternal obesity is a well-known risk factor of various morbidities *in-utero* [11–13]; and, it can therefore be inferred that mothers with abnormal body mass index (BMI) are at increased risk of developing obstetric complications such as pregnancy-induced hypertension, gestational diabetes, cesarean delivery, and stillbirth [13,14]. As a potential explanation of the etiology of complications due to maternal obesity, a role of endothelial dysfunction in the systemic and/or peripheral vasculatures has been hypothesized [11,13,14].

We have therefore speculated that the maternal obesity would be associated with the vascular impedance of uterine artery. Given the above background, we conducted this study to identify the correlation between the maternal obesity and the UtA-PI during early third trimester, and additionally, to evaluate the predictive value of the UtA-PI for the occurrence of adverse obstetric outcomes depending on the maternal obesity.

Methods

Study patients

We conducted this prospective observational study in patients who underwent uterine artery

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