The effect of parity on first trimester uterine artery Doppler waveforms in low-risk singleton pregnancies

Wpływ rodności na kształt fali przepływu Dopplera w pierwszym trzymestrze pojedynczej ciąży niskiego ryzyka

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Abstract

Objectives: The aim of the study was to evaluate the effect of parity on uteroplacental blood flow during the first trimester in low-risk singleton pregnancies.

Materials and methods: Uterine artery Doppler examinations were performed in 190 singleton pregnancies between 11-14 gestational weeks. Twenty-five pregnancies were excluded from the study due to history of preeclampsia, diabetes mellitus or inherited thrombophilia. A total of 165 low-risk singleton pregnancies were included in the study. Mean uterine artery pulsatility index (PI) was recorded and compared between nulliparous and multiparous women. The relation between maternal age, gestational week, maternal weight, parity, biochemical markers and abnormal uterine artery Doppler flows was evaluated. T-test and logistic regression analyses were used for the statistical analysis.

Results: A total of 165 singleton pregnancies without any risk factors for uteroplacental insufficiency were included in the study. Of them, 58 (36.7%) were nulliparous and 107 (63.3%) were parous. Correlation analysis revealed that the uterine artery pulsatility indices during the first trimester were not affected by maternal age and parity.

Conclusions: Mean uterine artery pulsatility indices are not different in nulliparous and multiparous low risk pregnancies at 11-14 weeks of gestation.

Key words: Doppler ultrasonography / uterine artery / parity / low-risk pregnancy /
Streszczenie

**Cel:** Celem badania była ocena wpływu rodności na przepływ maciczno-łożyskowy w pierwszym trzecim trzymerze poję- 
dynczej ciąży niskiego ryzyka.

**Materiał i metoda:** Przepływ w tętnicy macicznej zbędny w 190 pojedynczych ciągach w 11-14 tygodniu. 
Z analizy wyłączonego 25 ciąg żądziegiowego wywiadu w zielonej trzecim trzymerze poję- 
dynczej ciąży niskiego ryzyka. Zmierzono średni indeks pulsacji w tętnicy macicznej (PI), który porównano pomię 

**Wyniki:** Do badania włączone 165 pojedynczych ciąży bez czynników ryzyka niewydolności maciczno-łożyskowej. 
Z tej grupy, 58 (36.7%) kobiet było nieskończeni a 107 (63.3%) wielorodkowymi. Analiza statystyczna wykazała brak 

**Wnioski:** Średni indeks pulsacji w tętnicy macicznej nie różni się pomiędzy nieskończeniami a wielorodkowymi w ciąży 

Słowa kluczowe: doppler / ultrasonografia / tętnica maciczna / rodność / ciąży niskiego ryzyka /

Introduction

The first trimester screen has an increasing importance, as it 

A total of 165 singleton pregnancies without any risk factor 

Materials and methods

Singleton uncomplicated pregnancies admitted to our 

Results

A total of 165 singleton pregnancies without any risk factor 

Słowa kluczowe: doppler / ultrasonografia / tętnica maciczna / rodność / ciąży niskiego ryzyka /
The correlation analysis of mean uterine artery PI with maternal age, PAPP-A MoM, fBHCG MoM, parity, gestational week at scan and CRL measurements is shown in Table II. Mean PI was not significantly affected by parity (r=0.021, p=0.793). Mean UA PI values versus the parity status are shown in Figure 1. We found a negative correlation between gestational age and uterine artery PI (r=-0.044, p=0.589).

CRL measurement was highly negatively correlated with UA PI (r=-0.96, p=0.234). PAPP-A MoM levels were negatively correlated with UA PI (r=-0.064, p=0.442). However, these differences were statistically insignificant.

**Discussion**

The results of our study show that parity has no effect on uterine artery Doppler indices between 11-14 gestational weeks. This is an important finding, especially for screening for preeclampsia during early gestation in low-risk pregnancies. Recent studies have indicated that uterine artery Doppler velocimetry during the second trimester was significantly affected by parity as parous women had higher resistance indices in comparison to nulliparous women [8, 9]. Goynumer et al., demonstrated that uterine artery PI was affected by parity during the second trimester, especially before 21 weeks of gestation [10].

The results of our study need good understanding of the maternal vascular physiology during pregnancy. In early gestation, placenta occurs by the trophoblastic invasion of the maternal spiral arterioles, which results in progressive decrease in uterine vascular impedance during normal pregnancy [11]. The invaded muscular spiral arterioles becomes thin-walled vessels which are minimally sensitive to sympathetic and parasympathetic pathways [12]. The persistence of the dilatation enables proper utero-placental blood flow during the pregnancy course [13]. Lower incidence of preeclampsia in parous women may be explained by the possibility of some permanent changes in the uterine vasculature in subsequent pregnancies [8].

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Table I. Demographic features of the study population

<table>
<thead>
<tr>
<th></th>
<th>Nulliparous (n=58)</th>
<th>Parous (n=107)</th>
<th>p</th>
</tr>
</thead>
<tbody>
<tr>
<td>Maternal age</td>
<td>26.3±4.2</td>
<td>31.6±5.2</td>
<td>&lt;0.001*</td>
</tr>
<tr>
<td>Maternal weight</td>
<td>64.3±11.4</td>
<td>67.6±11.8</td>
<td>0.097</td>
</tr>
<tr>
<td>Gestational week at scan</td>
<td>12.2±0.7</td>
<td>12.3±0.8</td>
<td>0.797</td>
</tr>
<tr>
<td>CRL</td>
<td>63.2±10.2</td>
<td>63.9±10.1</td>
<td>0.693</td>
</tr>
<tr>
<td>NT</td>
<td>1.1±0.3</td>
<td>1.3±0.5</td>
<td>&lt;0.001*</td>
</tr>
<tr>
<td>Uterine artery mean PI</td>
<td>1.7±0.8</td>
<td>1.7±1.1</td>
<td>0.874</td>
</tr>
<tr>
<td>Ductus venosus mean PI</td>
<td>1.2±0.6</td>
<td>1.1±0.5</td>
<td>0.302</td>
</tr>
<tr>
<td>PAPP-A MoM</td>
<td>1.2±0.7</td>
<td>1.1±0.9</td>
<td>0.199</td>
</tr>
<tr>
<td>fBHCG MoM</td>
<td>1.3±0.8</td>
<td>1.3±1.1</td>
<td>0.938</td>
</tr>
</tbody>
</table>

Table II. Correlation analysis of mean uterine artery pulsatility index (PI) with maternal age, PAPP-A MoM, fBHCG MoM, parity, gestational week at scan and CRL measurements.

<table>
<thead>
<tr>
<th>Mean uterine artery PI</th>
<th>Maternal age</th>
<th>PAPP-A MoM</th>
<th>fBHCG MoM</th>
<th>parity</th>
<th>gestational week at scan</th>
<th>CRL</th>
</tr>
</thead>
<tbody>
<tr>
<td>r</td>
<td>0.145</td>
<td>-0.064</td>
<td>0.013</td>
<td>0.021</td>
<td>-0.044</td>
<td>-0.96</td>
</tr>
<tr>
<td>p</td>
<td>0.078</td>
<td>0.442</td>
<td>0.871</td>
<td>0.793</td>
<td>0.589</td>
<td>0.234</td>
</tr>
</tbody>
</table>

Figure 1. Distribution of mean uterine artery pulsatility index (PI) measurements according to the parity status in uncomplicated singleton first trimester pregnancies.
Doppler velocity waveforms regarding early gestation were evaluated in some studies. Stabile et al., studied uterine artery Doppler between 6-16 gestational weeks in 73 cases and found decrease of PI and RI as the pregnancy progressed [14]. Kurjak et al., conducted a study with 198 cases during 5-12 gestational weeks evaluating both, uterine and spiral arteries and indicated linear decrease of RI in both vessels [15]. Merce et al., analyzed 108 cases between 4-15 gestational weeks and showed again a progressive decrease in both, uterine and spiral arteries and an increase in velocity [16]. Similarly, we found a negative correlation between gestational age and uterine artery PI (r=–0.044, p=0.589). CRL measurement was highly negatively correlated with UA PI (r=–0.96, p=0.234). As the gestation progresses, the PI decreases in order to support adequate blood flow for the developing fetus.

Our study revealed that PAPP-A MoM levels were negatively correlated with UA PI (r=–0.064, p=0.442). PAPP-A is a protease which cleaves insulin-like growth factor binding protein-4 (IGFBP-4) [17]. Low PAPP-A levels may point to chromosomal anomalies, as well as preeclampsia [18]. UA PI may help in the management of pregnancies with low PAPP-A levels: increased resistance resulting in increased PI may alarm the clinician about the risk of preeclampsia [18, 19].

The main limitation of our study was the sample size. As the parity effect was not studied for the first trimester uterine artery Doppler indices before, we could not calculate the effect size and power of the study. We found that parity had no effect on the first trimester uterine artery Doppler indices. However, this preliminary finding should be confirmed by further studies with larger sample size.

As a result, evaluating UA PI during the visit for the first trimester screening test is reasonable. Our preliminary data show that uterine artery Doppler velocity forms in low-risk uncomplicated singleton pregnancies are not affected by maternal age, parity, and maternal weight. This is a great advantage for screening for preeclampsia in low-risk population, so that an increased UA PI may predict the subsequent development of the disease.

Authors’ Contribution:
1. Burcu Artunc Ulkumen – concept, assumption, study design, acquisition of data, analysis and interpretation of data, article draft, corresponding author.
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3. Yildiz Uyar – analysis and interpretation of data.
4. Yesim Bulbul Baytur – analysis and interpretation of data, revised the article critically.
5. Falk Muntaz Koyuncu – revised the article critically.

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- there is no ‘conflict of interests’ which occurs when the author remains in a financial or personal relationship which unjustly affects his/her actions associated with the publication of the manuscript;
- any possible relationship(s) of the author(s) with the party/parties interested in the publication of the manuscript are revealed in the text of the article;
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