Umbilical Artery Doppler Velocimetry in Pregnant Women with Iron Deficiency Anemia

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ABSTRACT

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UMBILICAL ARTERY DOPPLER VELOCIMETRY IN PREGNANT WOMEN WITH IRON DEFICIENCY ANEMIA

Objective: To detect possible fetoplacental vascular compromise by Doppler velocimetry in pregnant women with iron deficiency anemia and to compare the outcomes of pregnancies in women with and without iron deficiency anemia.

Methods: Seventy-eight women with mild iron deficiency anemia (Hb 9.97±0.7 gr/dl, ferritin 9.6±2.1 ugr/L) and 156 women with normal Hb and ferritin values were evaluated with Doppler ultrasonography in the second and third trimesters and the outcomes of pregnancies were prospectively evaluated at birth. All the cases had adequate nutrition, were nonsmokers and did not consume alcohol or narcotic drugs.

Results: Four women in the study group had pathological indices in Doppler velocimetry, one having intrauterine growth retardation, two preterm birth, while in the control group, 9 had pathological indices, resulting in two intrauterine growth retardation, two preterm birth, and two meconium aspiration. The Doppler results and adverse outcome rates were not significantly different from the control group (p for both >0.05).

Conclusion: Mild iron deficiency anemia during pregnancy as objectively demonstrated by Doppler study does not cause fetoplacental vascular insufficiency that may lead to intrauterine growth retardation or preterm birth.

Key Words: Doppler, Iron Deficiency Anemia; Pregnancy.

ÖZET

DEMİR ESKİKLİĞİ ANEMİLİ GEBELERDE UMBİLİKLİ ARTER DOPPLER VELOSİMETRİ

Amaç: Demir eksikliği anemisi olan gebelerde utero-plasental dolaşım bozukluğunun Doppler çalışması ile ortaya konulması ve gebelik sonucununun değerlendirilmesi.

Yöntem: Demir eksikliği olan (Hb 9.97±0.7 gr/dl, ferritin 9.6±2.1 ugr/L) 78 gebelik, normal Hb ve ferritin değerlerine sahip olguların ikinci ve üçüncü trimesterde Doppler yapılmasından sonra gebelik sonucununun değerlendirilmesi. Tüm olgular, normal beslenme alışkanlıkları olan, sigara içmemeyen, alkollü ve narkotik ilacı kullanan olgulardı.


Sonuç: Bu çalışmada, Doppler bulguları, hafif derecede demir eksikliği anemisinin intrauterin gelişme genliği veya erken doğuma neden olan bir fetoplazenter dolaşım yetersizliğine yol açmamaktadır.

Anahtar Kelimeler: Doppler, demir eksikliği anemisi, Gebelik

Although a consensus is not reached, some studies suggest that anemia during pregnancy may increase the likelihood of poor outcomes, such as increased risk of preterm delivery, low birth weight (SGA) and prenatal mortality (1,2). Furthermore, observational studies report that (3) iron deficient women who are not necessarily anemic showed an increased risk of associated complications during pregnancy such as preeclampsia.

It is known that low birthweight and preterm mortality is associated with uteroplacental insufficiency. We hypothesized that if Fe++ deficiency anemia indeed does cause small for gestational (SGA) birth and preterm delivery, then uteroplacental insufficiency should be revealed by Doppler velocimetry. Thus we proceeded in order to test this hypothesis on anemic pregnant women and controls.

MATERIAL AND METHODS

During a 10 month period, 78 women with iron deficiency anemia (Hb<11.0 gr/dl) in the first and third trimesters, <10.5 gr/dl in the second trimester, ferritin <12 pg/L (4) and MCV 82 fl or less were examined by color Doppler velocimetry. An Aloka

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Iron Deficiency Anemia

<table>
<thead>
<tr>
<th>Parameters</th>
<th>Control</th>
<th>Iron Deficiency Anemia</th>
</tr>
</thead>
<tbody>
<tr>
<td>Age (yrs)</td>
<td>20.9±0.42</td>
<td>20.8±0.40</td>
</tr>
<tr>
<td>BMI (kg/m2)</td>
<td>21.8±0.36</td>
<td>23.9±0.31</td>
</tr>
<tr>
<td>Monthly income ($)</td>
<td>1107±185</td>
<td>1203±208</td>
</tr>
<tr>
<td>Multiparas (%)</td>
<td>52 (69.8)</td>
<td>107 (65.7)</td>
</tr>
<tr>
<td>Hb (gr/dl) [range]</td>
<td>9.97±0.71</td>
<td>12.4±0.54</td>
</tr>
<tr>
<td>He (%)</td>
<td>29.1±0.7</td>
<td>36.4±0.6</td>
</tr>
<tr>
<td>MCV (fl)</td>
<td>77.2±1.5</td>
<td>89.8±1.8</td>
</tr>
<tr>
<td>Ferritin (µg/L)</td>
<td>9.6±2.1</td>
<td>24.1±3.1</td>
</tr>
</tbody>
</table>

The number of women with abnormal Doppler velocimetry and adverse prognosis were not significantly different (p>0.05) and the parameters (stated in Table 2) of the two groups were similar (p for all>0.05). Among the four cases with abnormal results of Doppler in the anemia group, one had no end diastolic flow and three had S/D index exceeding 3.0. One of these babies had an uneventful delivery, 2 were preterm, born at the gestational ages of 35 and 36 weeks, while the other was born with a birthweight of 2310 gr at 391/2 weeks of gestation. These mothers did not have any distinguishing clinical findings that might explain these births. In the control group, one mother had myoma uteri, and one had abruptio placenta, however the rest of the adverse prognosis births did not have any mentionable clinical findings. In both groups, we did not encounter placenta previa, postpartum hemorrhage or morbidity (such as prolonged hospital stays or infections) or mortality.

**DISCUSSION**

Although the prevalence of anemia during pregnancy has declined over the past few decades (6), it is still abundant in developing countries and anemia and spontaneous preterm birth are reportedly related (7). Increased placental weight and a high ratio of placental weight to birthweight which are associated with an increased risk of high blood pressure in infants' later life (8) have been linked to maternal anemia during pregnancy and specifically to maternal iron deficiency anemia (9). On the other hand, a high hematocrit level exceeding 43% was also found to be significantly relevant to SGA and preterm delivery (10).

Doppler velocimetry is known to have a significant predictive value in diagnosing SGA infants prenatally. These infants may have pathological indices of S/D index or diminished or reversed end diastolic flow illustrating the placental vascular insufficiency. Our report which failed to demonstrate an elevated incidence of placental insufficiency may have implications in reassessing the present concept of the adverse effects of iron deficiency anemia in pregnancy. Our findings may in part, be due to the fact that the study and control population consisted only
of patients from the second and third trimester since Doppler velocimetry may not be of much predictive value before this period of pregnancy. As Klebanoff et al (7) also pointed, in the second trimester anemia approximately doubled the risk of preterm delivery but the relationship between anemia and preterm birth could not be demonstrated in the third trimester. Moreover, Higgins et al (11) reported that the highest infant birthweights were associated with the lowest third-trimester maternal hemoglobin concentrations. One should also bear in mind that the present study population lacked mothers with severe iron deficiency anemia (Hb<6 gr/dl) which are exceptionally rare and should be treated on an individual basis.

Instead of an effect of anemia or a high hematocrit, the increased risk of preterm delivery and low birthweight may reflect uncontrolled confounding factors related to inadequate nutrition or low socioeconomic status. As these factors were essentially alike in the present study, this hypothesis may find some support in our results. In the Camden study of School et al (1) when vaginal bleeding preceded the anemia in 18% of women, the odds of preterm delivery were substantially increased which suggests that an underlying fetal or maternal pathology may have given rise to preterm delivery. Although the number of patients in the present study was small, untoward factors were meticulously excluded and the results suggest that iron deficiency anemia does not cause fetoplacental vascular compromise and probably constitutes a trivial role in the etiology of preterm deliveries and SGA births.

KAYNAKLAR