

Umbilical Artery Doppler Findings in Patients with Preterm Premature Rupture of Membranes

Oya ALDEMİR¹, Ertuğrul KARAHANOĞLU¹, Deniz ESİNLER¹, Neslihan YEREBASMAZ¹, Erdem FADILLIOĞLU¹

Ankara, Turkey

OBJECTIVE: Comparison of umbilical artery hemodynamic parameters in Preterm Premature Membrane Rupture of Membrane (PPROM) cases with healthy control group

STUDY DESIGN: This study was performed as a retrospective cohort study at Ankara Etlik Zubeyde Hanım Maternity Hospital among 100 patients (42 with PPRM and 58 control group).

RESULTS: Umbilical artery resistance index and systolic/diastolic (S/D) ratio were not different in PPRM cases and the control group (0.59 vs 0.58, 2.55 vs 2.43, respectively). Increased duration of membrane rupture had no effect on Doppler velocimetry. In patients with PPRM longer than 5 days, resistance index was 0.60, and systole/diastole ratio was 2.58; in patients with PPRM shorter than 5 days, resistance index was 0.58 and systole/diastole ratio was 2.52. There was no difference between two groups regarding Doppler findings.

CONCLUSION: The presence of PPRM and the duration of PPRM have no effect on umbilical artery hemodynamic parameters.

Keywords: PPRM, Umbilical artery doppler, Resistance index, Systole/diastole ratio

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Introduction

Membrane rupture before the onset of labor is described as premature rupture of membranes (PROM). When it occurs before 37 weeks of gestation it is called as preterm premature rupture of membranes (PPROM) and it complicates 1.7% of all pregnancies.¹ There are many etiologic factors such as uterine overdistention, smoking, low socioeconomic status, low body mass index, nutritional deficiencies, previous cervical conization.² There is specific evidence linking PPRM to infections involving the urogenital tract. Subclinical chorioamnionitis is determined in up to 25% of patients with preterm rupture of membranes.³

Presence of subclinical infection and the metabolic response of the fetus to this infection are very important in

PPROM patients. This response is defined as fetal inflammatory response syndrome (FIRS).⁴ Bacterial endotoxins are thought to be responsible of FIRS.⁴ As a result of FIRS, cytokines are released and many systems of the fetus are affected and damaged.⁴ One of these systems is the cardiovascular system.⁵ After PPRM, cardiovascular functions of the fetus are disturbed.⁵ It would be reasonable to expect umbilical artery velocity changes as maintenance of fetal cardiovascular system. Increase in umbilical and splenic artery Doppler resistance index was determined in patients with chorioamnionitis; defined by postpartum pathological investigation; in PROM patients when compared to the PROM patients without chorioamnionitis.^{6,7} After amnioinfusion in PPRM patients, umbilical artery Doppler parameters were improved.⁸ Mechanical effect of oligohydramnios is probably responsible of disturbed fetal Doppler parameters in these patients. As a result, impairment of umbilical artery Doppler is determined related to the inflammatory response to subclinical chorioamnionitis and the mechanical effects of oligohydramnios in PPRM patients. In our study we investigated the effects of fetal systemic response and changed intraamniotic hydrostatic environment on fetal vascular system in PPRM patients. In this study we planned to compare umbilical artery Doppler findings of patients with membrane rupture longer than 48 hours before 34 weeks of gestation with control group (without membrane rupture) with the same gestational age.

¹ Etlik Zübeyde Hanım Maternity Hospital Division of Maternal Fetal and Medicine, Ankara

Address of Correspondence: Oya Aldemir
Etlik Zubeyde Hanım Maternity
Hospital Department of Obstetrics and
Gynecology Division of Maternal and
Fetal Medicine Ankara, Turkey
oyabircan@yahoo.com

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Material and Method

Our study was planned as a retrospective case control study. Forty two patients hospitalized for Preterm Premature Membrane Rupture of Membrane (PPROM) and 58 pregnant women without any obstetrical pathology as a control group were included into the study who attended to Ankara Etlik Zubeyde Hanım Hospital between January 2013 and June 2013. All PPRM patients were before 34 weeks of gestation and rupture of membranes were longer than 48 hours. PPRM patients with intrauterine growth restriction, clinical chorioamnionitis, determined congenital anomalies, and known oligohydramnios before PPRM, suspected karyotype anomalies, preeclampsia, and placental pathology were excluded. The umbilical artery Doppler resistance index, systole/diastole ratio and amniotic fluid volume were obtained from the last ultrasonographic measurement data of the patients before labor. Systole/diastole ratio was stated as S/D.

Statistical analyses were performed using SPSS Statistics (version 21.0). Difference between the Doppler parameters of PPRM and control patients were calculated using Wilcoxon signed test.

Results

The demographic characteristics of the patients included in this study are given in table 1. The mean umbilical artery re-

sistance index in the PPRM group was 0.59 ± 0.06 and S/D ratio was 2.55 ± 0.55 . In the control group resistance index was 0.58 ± 0.07 and S/D ratio was 2.43 ± 0.41 . The umbilical artery Doppler findings of the two groups were similar (Table 2).

In PPRM cases, to investigate the correlation between the duration of PPRM and umbilical artery Doppler velocimetry values, the patients were divided into two groups according to the mean value that was found to be 5 days. The duration of PPRM was shorter than 5 days in the first group. The resistance index was 0.58 ± 0.063 and S/D ratio was 2.52 ± 0.39 in this group. The resistance index was 0.60 ± 0.064 and S/D ratio was 2.58 ± 0.38 in the second group that covered the patients with PPRM longer than 5 days. When the two groups' umbilical artery resistance index and S/D ratios are compared there was no change in Doppler parameters with the duration of PPRM (Table 3)

Discussion

In our study umbilical artery resistance index and systole/diastole (S/D) ratio in PPRM cases were found to be similar with the control group at the same gestational age. In a study performed by Yucel et al., PPRM cases with histologically determined chorioamnionitis, S/D ratio was found to be increased compared to the PPRM patients without chorioamnionitis.⁶ As we could not investigate the placentas

Table 1: Demographic characteristic of the groups

	PPROM (n=42)	Control (n=58)	p value
Age (y)	26.31±5.6	25.72±5.5	NS
Gestational age (weeks)	33.14±1.18	33.4±0.59	NS
Amniotic fluid index (mm)	43.8±2.56	104.9±19	<0.001
Duration of PPRM (days)	7.5±6.3		

PPROM: Preterm premature membrane rupture of membrane

Table 2: Comparison of resistance index and S/D ratio of PPRM and control groups

	PPROM (n=42)	Control (n=58)	-p value
Resistance index (RI)	0.59±0.06	0.58±0.07	NS
Systole/diastole (S/D)	2.55±0.38	2.43±0.41	NS

PPROM: Preterm premature membrane rupture of membrane

Table 3: The correlation between the Doppler parameters and the duration of PPRM

	The duration of PPRM (<5 days)	PPROM DURATION The duration of PPRM (>5 days)	p value
Resistance index	0.58±0.063	0.60±0.064	NS
Systole/diastole	2.52±0.39	2.58±0.38	NS

PPROM: Preterm premature membrane rupture of membrane

of the patients histologically, we could not differentiate the patients to subgroups as having chorioamnionitis or not. Effects of PPRM on fetal vascular system may not appear until the inflammatory response reaches to a certain degree, and this would be the reason of our result. Hsu et al. found decrease in umbilical artery Doppler resistance index and S/D ratio after amnioinfusion in PPRM patients before 26 weeks' gestation in their study. This result supports that there is also a mechanical effect on Doppler parameters.⁸ Depending on this study, we divided the patients into two groups according to amniotic fluid index (AFI) using mean value of amniotic fluid index which was 40 mm. Comparing the two groups; we found no difference in the resistance index and S/D ratio between the patients with AFI greater than 40 mm and lower than 40 mm. The anatomic and histologic nature of the cord probably prevents mechanical adverse effects on the fetal circulation to some extent.

To view the effect of PPRM duration on umbilical artery Doppler parameters, we divided PPRM patients into two groups using mean PPRM duration of 5 days. Also we found no difference between umbilical artery resistance index and S/D ratio between the two groups: PPRM duration shorter than 5 days and longer than 5 days. Duration of PPRM had no effect on umbilical Doppler parameters in PPRM patients.

As a conclusion, in our study we found that PPRM had no effect on umbilical artery Doppler parameters. Nevertheless, as we could not assess subclinical chorioamnionitis, we could not analyze the subgroups. Presence of subclinical chorioamnionitis can possibly change these findings therefore prospective studies including more patients in which the placenta is investigated at the same time are needed.

Preterm Prematür Membran Ruptürü Olan Hastalarda Umbilikal Arter Doppler Bulguları

AMAÇ: PPRM olgularında umbilikal arter hemodinamik parametrelerinin sağlıklı kontrol grubu ile karşılaştırılması.

GEREÇ VE YÖNTEM: Çalışma retrospektif vaka kontrol çalışması olarak Ankara Etlik Zübeyde Hanım Kadın Hastalıkları Ve Doğum Eğitim Araştırma Hastanesi'nde 42 pprom ve 58 kontrol grubu hastada yapıldı.

BULGULAR: Umbilikal arter rezistans endeks ve sistol diyastol oranı (A/B) PPRM olgularında ve kontrol grubunda değişiklik göstermemektedir (0,59 ve 0,58; p 0,402), (2,55 ve 2,43; p 0,119). PPRM süresinin uzaması Doppler bulgularında değişikliğe neden olmamıştır. PPRM süresi 5 günden uzun olanlarda rezistans endeks 0,60, sistol diyastol oranı (A/B)

2,58; 5 günden kısa olanlarda rezistans endeks 0,58; sistol diyastol oranı (A/B) 2,52 bulunmuş; p0,406 ve 0,640 olduğu için iki grup arasında fark tespit edilmemiştir.

SONUÇ: PPRM varlığı ve süresi umbilikal arter hemodinamik parametrelerinde değişikliğe neden olmamaktadır.

Anahtar Kelimeler: PPRM, Umbilikal arter Doppler, Rezistans endeks, Sistol diyastol oranı

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