P-wave dispersion in pre-eclampsia

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Objective

Pre-eclampsia complicates approximately 4-7% of all pregnancies and is associated with significant risks to the mother and the fetus. Although pre-eclampsia resolves after delivery, epidemiological studies demonstrate a strong association between pre-eclampsia and subsequent cardiovascular diseases including arrhythmia. P-wave dispersion (Pdis) is an appealing marker for predicting the risk of developing atrial arrhythmias. The purpose of this study was to investigate P-wave durations and Pdis in patients with pre-eclampsia and to compare with normal pregnancies.

Methods

Age, gestational age, body mass index (BMI), resting heart rate and blood pressure of the participants were recorded. Women with known chronic systemic disease (endocrinological, cardiovascular, gastrointestinal, immunological or oncological) were excluded. The diagnosis of pre-eclampsia was based on well known criteria. The 12-lead ECG was recorded at a paper speed of 50 mm/s and 1-mV/cm standardization. Onset of the P-wave was defined as the first atrial deflection from the isoelectric line and the offset was the return of the atrial signal to baseline. Maximum P-wave duration (P-max) was defined as the longest measurable P-wave duration in any lead. Minimum P-wave duration (P-min) was defined as the shortest measurable P-wave duration in any lead P-wave dispersion (Pdis) was calculated as the maximum-minimum P-wave duration(Pdis=P maximum – P minimum). Measurements of P-wave duration was performed manually by two cardiologists. To improve accuracy, measurements were performed with calipers and a magnifying lens for defining the electrocardiographic deflection. Intraobserver and interobserver coefficients of variation (standard deviation [SD] of differences between two observations divided by the mean value and expressed as percent) were 3. 2% and 3. 5% for maximum P-wave duration, and 3. 4% and 3. 8% for PWD, respectively. Statistical analysis: Data were analyzed using the statistical Package for the Social Sciences (SPSS Inc., Chicago, IL, USA) version 12. 0. Descriptive statistics were expressed as the mean and standard deviation for numerical variables. Comparison of multiple independent groups was performed by Kruskal Wallis test for numerical variables that are not normally distributed. Subgroup comparisons were performed using Mann Whitney U test with Bonferroni correction. The level of statistical significance was considered as p<0. 05.

Results

The study comprised 28 women in the mild pre-eclampsia group, 30 women in the severe pre-eclampsia group, and 30 pregnant in the control group. The characteristics of the groups are summarized in Table 1. Groups were similar in age, gravidity, BMI and maternal resting heart rate. Pdis values were significantly higher in the pre-eclampsia groups than that in the control group. Pdis values of the severe pre-eclampsia group were also higher compared to that of the mild pre-eclampsia group. There was no difference in Pmax among the groups.

Conclusion

Women affected by pre-eclampsia exhibit higher rates of the metabolic syndrome and sympathetic dominance several months after delivery, all of which are risk factors for atrial and ventricular dysrhythmias. İt was shown that women with a prior pre-eclampsia were at a significantly higher risk of hospitalisation for heart failure or an atrial or ventricular dysrhythmia. Pdis is an ECG marker in the prediction of atrial fibrillation in various clinical disorders. It is believed that an increased Pdis reflects non homogeneous distribution of the sinus impulses. In this study, minimum P-wave duration was found to be shorter in pre-eclampsia. Pdis was increased in pre-eclampsia due to the shortening of the minimum P wave length. Pdis values of the severe pre-eclampsia group were also significantly higher compared to that of the mild pre-eclampsia group. Furthermore, long-term prospective studies are needed to clarify the clinical utility and prognostic importance of Pdis in pre-eclampsia.

Table 1. Characteristics of the study population

Characteristic	Controls, n=30	Mild PE, n=28	Severe PE, n=30	*p* value
	Mean, SD	Mean, SD	Mean, SD	
Age in yrs	27.2, ±4.8	28.2, ±5.5	28.5, ±5.6	0.593
Gestation in weeks	38.7, ±0.9 [c]	38.0, ±1.4 [c]	35.3, ±2.7 [ab]	<0.001
BMI	29.2, ±2.4	30.3, ±4.1	28.4, ±3.8	0.132
Gravidity	1.7, ±0.9	2.2, ±1.1	18.1, ±1	0.724
Heart rate (bpm)	79.6, ±5.5	80.8, ±7.3	82, ±5.7	0.318
Systolic tension (mm Hg)	110.6, ±8.2 [b,c]	142.5, ±8.6 [ac]	160.6, ±14.0 [ab]	<0.001
Diastolic tension (mm Hg)	72.5, ±7.4 [b,c]	88.4, ±8.2 [a,c]	103.1, ±8.6 [a,c]	<0.001

a Different from the control group; b Different from the mild preeclampsia group; c Different from the severe preeclampsia group

Table 2. P-Wave Measurements of the study population.

Characteristic	Controls, n=30	Mild PE, n=28	Severe PE, n=30	*p* value
	Mean, SD	Mean, SD	Mean, SD	
Maximum P-wave duration, (msec)	96.7, ±21.5	99.9, ±8.2	97.7, ±13.3	0.719
Minimum P-wave duration, (msec)	53.8, ±14.4 [bc]	38.9, ±10.7 [a]	36.5, ±12.3 [a]	<0.001
P-wave dispersion, (msec)	42.1, ±17 [bc]	58.0, ±10.8 [ac]	60.3, ±17.7 [ab]	<0.001

PWD, P Wave Dispersion; a Different from the control group; b Different from the mild preeclampsia group; c Different from the severe preeclampsia group

DIAGRAM OF TYPICAL LEAD II ECG TRACING