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EDITORIAL COMMENT

Pregnancy and electrocardiogram: Can a basic tool help us to understand a complex and understudied population?

Gravidez e ECG: poderá uma ferramenta básica ajudar a compreender uma população complexa e subestudada?

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In most developed countries, no major decrease in maternal mortality has been reported in recent decades and there are countries such as the United States of America where maternal morbidity and mortality have even been rising in recent years.[1–3] In these cases, cardiovascular disease is the leading cause of pregnancy-related deaths and there are some well-known, identified contributing factors.[2,4,5] Women are now older and begin pregnancy with more cardiometabolic risk factors and chronic conditions such as obesity, hypertension, and diabetes. Additionally, the improved management of congenital and valvular heart disease has resulted in more children with congenital heart disease surviving into adulthood, leading to more women with these conditions being able to become pregnancy.[1,4]

All these factors, including the significant hemodynamic changes associated with pregnancy, such as cardiac output increase and adrenergic stimuli, can pose a challenge for heart function in general but can also bring about some electrophysiological changes.[1,6] Not surprisingly, maternal ventricular and atrial ectopic beats are more common in pregnancy and the likelihood of a woman having an arrhythmia is elevated during pregnancy and the postpartum period.[1,6] There appears to be electrical remodeling with gestation that can lead to some changes on an electrocardiogram (ECG). However, the literature on electrical activity in the pregnant heart is scarce and there are very few systematic studies tracking changes in ECG throughout pregnancy.[6,7] The large variability between patients and the dynamic nature of gestation are some of the reasons that explain why this electrical gestational remodeling is such an under-researched area. Several human studies place emphasis on a snapshot of the cardiac electrical activity at only single point during pregnancy, and use unrelated non-pregnant data as a control rather than a longitudinal study on women before and during pregnancy.[1,6,7]

In this issue of the Journal, Omidi et al.[8] analyzed the electrocardiographic cardiac conduction system changes in normal pregnant women throughout the gestation period. They reported data from a cohort of 103 healthy women in which a standard 12-lead electrocardiogram was performed in the first and third trimester of pregnancy. The patients were classified in two age categories, under and over 30 years of age. The main findings were an increase in heart rate and QTc interval and a decrease in intervals PR, TP and QT dispersion. All of these indices were within the normal range in both trimesters and there was no significant difference between the two age groups.

The anatomical displacement of the heart due to the expanding uterus and a mild reversible hypertrophy are

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expected modifications that could be correlated with some of the ECG changes seen with gestation.

However, this study highlights that there may be other types of electrical changes and mechanisms with pregnancy. The increase in heart rate and shortening of PR interval, for example, have traditionally been associated with changes in the autonomous nervous system, specifically vagal and sympathetic control (x). Nevertheless, according to previous studies on hearts excised from pregnant mice, increased heart rate persisted in the absence of neural connections, suggesting that there are changes in cardiac ion channel expression and behavior during pregnancy.[7] The complex and fluctuating mixture of hormones seen in this period can influence ion channel kinetics since cardiac myocytes have several hormonal receptors like estrogen and progesterone.[6,7] Activation of these sex hormone receptors can alter the electrical activity of the heart through ion channel modulation that ultimately can lead to growth and development of the heart.

The authors also noticed a prolongation of the QTc interval and a decrease in QT dispersion. These were differences already reported in women with a potential increased risk of polymorphic ventricular tachycardia and sudden death.[1,6,7] However, in a pregnancy context, these changes seem to be benign and probably related to sympathetic activity and anatomical changes in heart orientation with the growing uterus. Available observational data on pregnancy in women with long QT syndrome is also favorable.[9]

As the authors report, the study is limited by its small sample size and short-term follow-up, excluding the postpartum period, which is a very important phase since the postpartum heart does not immediately return to its pre-pregnant condition. This analysis also cannot provide information on the benefit of ECG in pregnant women with history of cardiovascular disease as there is no comparison with this population.

However, even with the above limitations, the authors are to be recognized for their research in this particular population with such a lack of real-world information. Collaboration and standardization of data collection should be encouraged to facilitate comparison of outcomes from different cardio-obstetric programs.

The changes in the electrical substrate of the heart during pregnancy and the postpartum period could have clear implications for the safety of pregnant women. Large studies with appropriate controls are needed for a better understanding of pregnancy on the electrical profile of the heart. This could contribute to more comprehensive pre-pregnancy counseling, early recognition, careful delivery planning, and close postpartum follow-up and, therefore, to an improvement in care for these patients.

Conflicts of interest

The author has no conflicts of interest to declare.

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