Cardiovascular autonomic response to exercise in women 10-25 years after a hypertensive pregnancy: a HELPFUL study analysis

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Background: Hypertensive pregnancies are associated with increased cardiovascular risk in later life. During the pregnancy women have altered features of autonomic function, which may be relevant to later risk. To what extent impaired autonomic function at rest, or in response to stress, remains evident after pregnancy has been unclear.

Purpose: This study evaluated differences in cardiovascular adaptations during exercise between women with a history of hypertensive pregnancy disorders (HTDG) and normotensive pregnancy controls (NMTG) 10 to 25 years after pregnancy.

Methods: A secondary analysis of data from the cross-sectional observational, Hypertension Explored in Long-term Post-partum Follow-Up in Later Life (HELPFUL) study. The analysis included 83 women (46 post-preeclampsia, 8 post-gestational hypertension and 29 post-normotensive pregnancy). Participants attended a 4-hour visit, which included a cardiopulmonary exercise test, performed as an incremental exercise protocol on a stationary bike reaching up to 80% of maximal HR, followed by a 5-minute recovery period. ECG data was collected during CPET to examine the autonomic nervous system response of women at rest and during exercise.

Results: Mean age at study visit was 52 years (SD 5 years). Women with a history of hypertensive pregnancy showed significantly higher resting systolic (HTDG = 125 mmHg; NMTG = 117 mmHg; p<.05) and diastolic blood pressure (HTDG = 77 mmHg; NMTG = 73 mmHg; p<.05), and lower resting oxygen consumption (HTDG = 4.32 ml/min/kg; NMTG = 4.96 ml/min/kg; p<.05). During exercise, at the first threshold, oxygen consumption remained lower in the hypertensive pregnancy group (HTDG = 11.55 ml/min/kg; NMTG = 12.85 ml/min/kg; p<.05). At peak exercise, both heart rate (HTDG = 130 bpm; NMTG = 137 bpm; p<.05) and oxygen consumption were lower in the hypertensive pregnancy group (HTDG = 19.22 ml/min/kg; NMTG = 22.66 ml/min/kg; p<.05). During recovery, women who had a hypertensive pregnancy exhibited a blunted heart rate and blood pressure recovery (decline to second minute: HTDG = 25bpm; NMTG = 34bpm; p<.05) and a lower heart rate reserve index (HTDG = 0.802; NMTG = 0.961; p<.05) utilizing a lower percentage of their heart rate reserve during exercise ((HTDG = 60%; NMTG = 68%; p<.05). HR Reserve and HR Frequency Recovery index were related to resting blood pressure and a lower heart rate reduction after exercise following a hypertensive pregnancy. These markers also correlated with a lower VO_2 during peak exercise (HR Reserve Index: r = 0.500, p<.001) (HR Frequency Recovery: r = 0.427, p<.001), indicating lower metabolic and cardiovascular efficiency.

Conclusion: Women who have had a hypertensive pregnancy exhibit subclinical cardiovascular alterations years after pregnancy that are particular evident after exercise testing. Exercise stress testing may be of value to identify women at greatest risk for future cardiovascular problems after hypertensive pregnancy.