TACSM Abstract

Nitric Oxide Bioavailability at Peak Dynamic Handgrip Exercise in Young Metabolic Syndrome Women

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ABSTRACT

The bioavailability of nitric oxide (NO) has been shown to contribute to vascular function during peak exercise. Young women with Metabolic Syndrome (MetSyn) have presented with a deficit in vascular conductance during exercise hyperemia. **PURPOSE**: The aim of this study is to measure changes in bioavailable blood NO levels at rest and during peak handgrip exercise to determine the mechanistic role of NO on dynamic vascular conductance in women with MetSyn compared to healthy controls during small muscle exercise. **METHODS**: In this study, 16 participants (7 MetSyn and 9 Controls) performed graded dynamic handgrip while beat-to-beat blood pressure (CNAP finger plethysmography), brachial artery diameter and blood flow with Doppler ultrasound and B-mode imaging were measured continuously. Exercise workload was increased in a ramp fashion (0.5 kg/min) at 30 contraction/min until task. At rest and immediately upon task failure, a venipuncture was performed to take rest and peak venous NO levels to be later measured by EPR Spectroscopy (Bruker Biospin EleXsys-II E-540 EPR L-band) at the UNM Health Science Center and Colorimetric Nitrate/Nitrite commercial ELISA kit. Whole blood was drawn into a prepared vacutainer in a 1:1 venous blood with deferoxamine (DF) chelator, in diethyldithiocarbamate (DETC) Krebs buffer. Plasma was preserved with EDTA and all samples were immediately flash frozen in liquid nitrogen and stored at -80 degrees Celsius. **RESULTS**: There was a significant difference in resting NO values ($p=0.034$) and end NO concentration values ($p=0.053$) between MetSyn and control groups. However, the MetSyn showed higher resting and peak NO values than control group as measured by ELISA. The change in plasma NO did not show any significant changes from rest to peak exercise in both groups (MetSyn $p=0.757$, control $p=0.562$). However, EPR indicated a significance between rest and peak exercise ($p<0.05$). There was no significant change in NO between the groups ($p=0.633$). The MetSyn group has a significantly diminished arterial conductance in the brachial artery during handgrip as well as an attenuated response in the femoral artery during dynamic leg kick. **CONCLUSION**: The colorimetric nitrate/nitrite ELISA did not prove to be a sensitive enough technique to measure the degree of change of NO concentrations at peak exercise. The whole blood EPR technique in our laboratory is a more robust signal for identifying these changes in a wider range of concentrations between rest and peak. Future projects include an expansion of the standard curve for NO EPR to identify the potential differences at rest between the two research groups as well as to identify any health disparate differences between the regional populations of New Mexico and West Texas. Research reported in this publication was supported by an Institutional Development Award (IDeA) from the National Institute of General Medicine Sciences of the National Institutes of Health under grant number P20GM103451.