Effects of PTSD-Dependent Neurogenic Hypertension and Inflammation on Thoracic Aortic Wall Homeostasis

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Introduction: PTSD is associated with hypertension and elevated proinflammatory cytokines, which are risk factors for cardiovascular disease including thoracic aortic aneurysms. The connection between stress and aortopathy has been suggested, yet the mechanism linking the two is unknown. We hypothesize that PTSD-induced mechanical and inflammatory signals alter thoracic aortic wall homeostasis, which can predispose aortopathy.

Methods: C57BL/6 mice (n=7) underwent PTSD induction consisting of inescapable foot shock and single prolonged stress events. At 4-week intervals over 16-weeks mice were subjected to blood pressure measurements and behavioral testing for the DSM-V PTSD criteria. The absolute z-scores for individual behavioral tests were averaged to create a composite T-score. Mice with a composite T-score above 1.96 were classified as PTSD. At termination, thoracic aortic diameter was measured, plasma was collected, and aortic tissue was harvested for biochemistry and histology. Control mice (n=8) underwent the same procedures except for PTSD induction.

Results: Our protocol yielded a PTSD phenotype in 71% of mice. PTSD mice had higher systolic blood pressures following a conditioned stimulus (PTSD (n=5), 153 ± 8mmHg; control (n=8), 129 ± 7mmHg, $p<0.05$), increased plasma proinflammatory cytokines (IL1-α, IL-3, IL-5, IL-7, IL-9, all $p<0.05$), enhanced extracellular matrix remodeling, and larger aortic diameters (PTSD (n=5), 712.9 ± 97.6μm; control (n=8), 584.2 ± 102.7μm, $p <0.05$).

Conclusion: Our PTSD model recapitulated the human phenotype showing elevated systolic blood pressure and increased proinflammatory cytokines. Enlarged thoracic aortic diameter and enhanced extracellular matrix remodeling suggest that PTSD can alter thoracic aortic wall homeostasis predisposing it to pathology.