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Regional Aortic Vascular Dysfunction in A Rodent Model of Metabolic Syndrome

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Abstract

Obesity and diabetes constitute a hallmark of metabolic syndrome that is directly linked to vascular dysfunction. Accordingly, we aimed to investigate regional changes in thoracic and abdominal aortic responses in a rat model of high fat diet (HFD) and streptozotocin (STZ)-induced diabetes mellitus. Five weeks old male Wistar albino rats (n=24) were fed with either HFD (45 kcal% fat) or control diet (10 kcal% fat) for 10 weeks. On week 7, 40mg/kg STZ and saline were injected intraperitoneally into the HFD and control groups, respectively. At the end of the treatment, the oral glucose tolerance test (oGTT) was performed and rats were subsequently euthanized to assess vasoconstrictor and vasodilator responses of dissected aortic segments. oGTT generated greater AUCs in HFD relative to control rats (64,361±383 vs. 14,169±398, p<0.001). Abdominal aortic vasoconstriction (N/g) to norepinephrine (NE, 1×10^{-9}–3×10^{-5}M) and the depolarizing signals of high K^+ (KCl, 5–120 mM) were higher (p<0.05) in the HFD group relative to controls. Thoracic aortic vasoconstrictor responses (N/g) to NE, but not high K^+, were greater (p<0.05) in the HFD group compared with controls. Thoracic and abdominal endothelium-dependent vasorelaxation to acetylcholine (1×10^{-10}–1×10^{-5}M) was blunted (p<0.05) in the HFD group relative to controls. In contrast, thoracic and abdominal aortic responses to sodium nitroprusside (SNP)-induced endothelium-independent relaxation remained comparable between groups. In conclusion, vascular functional responses along the descending aorta are altered in metabolic syndrome, exhibiting exaggerated vasocontractility and impaired endothelium-dependent relaxation. These vascular pathologies could potentially underlie the development of cardiovascular disease associated with the metabolic syndrome.

Biography:

Assistant Professor Omar Z Ameer is a physio-pharmacologist who graduated with a PhD in Advanced Medicine from Macquarie University at the Australian School of Advanced Medicine in 2015. Thereafter, Dr Ameer pursued his post-doctoral training within the area of neuroscience and surgery at the Department of Pediatrics, School of Medicine, Case Western Reserve University, Cleveland, Ohio. Dr Ameer published a book and over 50 peer-reviewed publications, scored 682 citations (Google Scholar) and accumulated 96.96 global impact points (Research Gate). He currently holds the position of Head of the Pharmaceutical Sciences Department at the College of Pharmacy, Alfaisal University, KSA.

Speaker Publications:

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