

Arterial stiffness and hypertension in diet-induced obese mice

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BACKGROUND: Arterial stiffness (AS) may contribute to increased blood pressure (BP) during aging and obesity and is an independent predictor of cardiovascular complications.

AIMS: To elucidate the molecular mechanisms of arterial stiffness and its relationship to the development of hypertension in a model of diet-induced obesity.

METHODS AND RESULTS: C57BL/6J mice fed high fat–high sucrose diet (HFHS), showed increased fat mass, body weight and insulin resistance compared to normal diet (ND). Pulse wave velocity (PWV), the speed of pressure waveform propagation along the aorta used as index of AS, increased by 2.5–fold after 2 mos HFHS and remained elevated thereafter while BP, measured by radiotelemetry, increased only after 8 mos HFHS. Microalbuminuria, an index of renal dysfunction, developed after 4 mos HFHS. Aortic wall thickness and renin increased after 2 mos HFHS suggesting that renin–angiotensin–aldosterone system (RAAS) may contribute to AS in advance of hypertension. Stiffness modulus of aortic extracellular basal membrane, determined in vitro, was increased at 8 mos HFHS.

CONCLUSIONS: In diet-induced obese mice, AS precedes the development of hypertension and kidney dysfunction. Our results suggest that RAAS may contribute to structural changes in aortic smooth muscle, as evidenced by aortic wall thickening and extracellular basal membrane stiffening, causing AS.