

Abstract



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EVIDENCE OF A DOMINANT BACKWARD-PROPAGATING “SUCTION” WAVE, RESPONSIBLE FOR DIASTOLIC CORONARY FILLING IN HUMANS, ATTENUATED IN LEFT VENTRICULAR HYPERTROPHY

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Background: Coronary blood flow peaks in diastole when aortic pressure has fallen. Current models fail to completely explain this phenomenon. We present a new approach — using wave intensity analysis—to explain this phenomenon in normal subjects, and to evaluate the effects of left ventricular hypertrophy (LVH) on the coronary microcirculation.

Method: Simultaneous pressure and Doppler velocity were measured using intracoronary wires in the left main stem, left anterior descending, and circumflex arteries of 20 subjects (mean age 54 ± 10 years, 13 female) following a normal coronary arteriogram. Coronary wave speed was calculated using a new method¹ we have recently developed and wave intensity analysis then applied. **Results:** A consistent pattern of six predominating waves was identified². 94% of wave energy, accelerating coronary blood forward, came from two waves: first a pushing-wave from left ventricular ejection and later a suction-wave from relief of microcirculatory compression. This suction-wave ($18.2 \pm 13.7 \cdot 10^3 \text{ W m}^{-2}\text{s}^{-1}$, 30%) was larger than the pushing-wave ($14.3 \pm 17.6 \cdot 10^3 \text{ W m}^{-2}\text{s}^{-1}$, 22.3%, $p=0.001$) and was associated with a substantially larger incremental increase in coronary flow velocity (0.51 versus 0.14 m/s, $p<0.001$). In LVH, the suction-wave was decreased (33.1 v 26.9%, $p=0.01$) and inversely correlated with septal wall thickness ($r=-0.52$, $p<0.02$). **Conclusion:** Six waves predominantly drive human coronary blood flow. Coronary flow peaks in diastole because of the dominance of a suction-wave generated by microcirculatory decompression. This is significantly reduced in LVH.

1 Davies JE, Mayet J *et al.* *Am J Physiol Heart Circ Physiol* 2006;290(2):H878-H885

2 Davies JE, Mayet J *et al.* *Circulation* 2006;113:1767-1778