

Fifty Percent Coronary Artery Stenosis Causes

Segmental Left Ventricular Wall Dysfunction

– Experimental Study –

Purpose: We reported that left ventricular (LV) segmental diastolic dysfunction starts at 50% coronary artery stenosis (CAS). Since myocardial ischemia (MI) was the most probable cause, we conducted animal experiments to confirm whether 50% CAS causes MI and segmental systolic wall dysfunction.

Methods: Twenty-four coronary arteries of twelve anesthetized pigs were divided into a normal group (grN) and a 50% CAS group (grS). Blood flow probes to measure coronary blood flow (CBF) and vascular occluders were placed on the LAD #6 or 7, and on the LCX #11 or 13. CCI sensors were inserted in the anterior and lateral LV walls to measure myocardial oxygen pressure (PtiO₂). Occlusion of the LAD and LCX to produce 50% CAS was confirmed by measuring the diameters of each vessel by coronary angiography before and after occlusion. Segmental systolic function was evaluated by the strain rate (SR) function: $Z = 4.91 + 1.02 \times (100\text{-msec SR value}) + 1.23 \times (200\text{-msec SR value}) - 0.46 \times (\text{minimum SR value}) + 4.83 \times (\text{mean SR value})$. With this function, systolic segmental function decreases as the value of Z increases. The two groups (grN and grS) were compared by a paired t-test.

Results: CBF decreased by $25.1 \pm 6.7\%$ ($p < 0.001$) and PtiO₂ decreased by $38.2 \pm 9.8\%$ ($p < 0.001$) in grS compared with grN. Furthermore, Z was significantly larger in grS than in grN (1.96 ± 1.05 and -0.59 ± 2.61 , respectively, $p < 0.0001$).

Conclusion: Segmental LV wall dysfunction starts at 50% CAS due to myocardial ischemia.