

myocardial ischemia at rest in asymptomatic 75% coronary artery stenosis
- hibernation proven by strain and strain rate -

Purpose: In resting myocardial muscle downstream from a 75% coronary artery stenosis (CAS), the strain value decreases almost in parallel with the strain rate (SR) value. As a function corresponding to the longitudinal post-systolic index (PSI) of the strain, we created the following discriminant function (Z) of SR using values from 4 factors of the longitudinal SR curve:

$$Z=4.91+1.02\times(100\text{msec SR})+1.23\times(200\text{msec SR})-0.46\times(\text{minimum SR between }100\sim 200\text{msec})+4.83\times(\text{mean SR during }100\sim 200\text{msec}).$$

For $Z>0$, CAS was $\geq 75\%$ with a discriminant probability of 86.4%.

We examined whether the strain and SR decrease of 75% CAS was caused by ischemia, using PSI and Z of asymptomatic patients who had 75% CAS by coronary artery angiography (CAG). This degree of stenosis, as judged by traditional coronary artery hemodynamics, has been thought not to cause myocardial ischemia at rest.

Method: Forty-seven lesions in 43 asymptomatic patients with $Z>0$ who had 75% CAS, normal left ventricular (LV) wall motion in B-mode imaging, and negative results of traditional stress tests were enrolled in this study. Among the 47 lesions, 26 underwent percutaneous coronary intervention (PCI gr.). The PSI and Z values at rest were measured at the time of CAG and at two-week intervals post-PCI until $Z<0$. Then CAG was

repeated. Twenty-one lesions underwent medical intervention (Non-PCI gr.). Their PSI and Z were measured at rest during initial CAG and at CAG six months later.

Results: PCI gr: The PSI was $-18.35 \pm 17.88\%$ at CAG and $-0.01 \pm 0.03\%$ post-PCI ($p < 0.001$). The Z was 2.58 ± 2.87 at CAG and -2.87 ± 2.19 post-PCI ($p < 0.001$). Both were significantly improved by increased perfusion, though recovery time was long (PSI: 49.5 ± 18.1 days, Z: 79.7 ± 28.8 days). Repeated CAG showed no restenosis.

Non-PCI gr: The PSI was $-18.94 \pm 18.53\%$ at CAG and $-20.73\% \pm 19.29\%$ six months later; Z was 1.89 ± 1.41 at CAG and 1.56 ± 1.76 six months later. Neither value improved in this group. Neither regression nor progression of coronary stenosis was seen by repeated CAG.

Conclusion: The changes in PSI and Z at rest, in patients with asymptomatic 75% CAS and with negative results by traditional stress tests, were due to ischemia. In addition, since the improvements of PSI and Z after PCI required long term adjustment, it is appreciated that the myocardium perfused by the 75% stenotic coronary arteries in these patients was in a state of hibernation.