



The Impact of β -Blocker on Coronary Flow Reserve in a Case with Coronary Artery Ectasia

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Case Report

A 77-year-old female presented with persistent chest pain and was referred to ER of our hospital. She had a history of arterial hypertension but not hyperlipidemia. Troponin T level was 0.198 ng/ml. Therefore, emergent Coronary Angiogram (CAG) was performed. CAG showed extensive coronary artery ectasia in both right and left coronary artery (Figure 1). The impact of drugs on the coronary blood flow was evaluated. Thrombolysis in myocardial infarction frame count [74] after the injection of nitroglycerin obviously became slower than that [46] after propranolol. Combo-wire under hyperemia by adenosine triphosphate showed that Coronary Flow Reserve (CFR) value decreased from 1.3 to 0.7 after the injection of nitroglycerin regardless of no change in fractional flow reserve value (Figure 2). Furthermore, she presented with the symptom similar to chest pain at admission. The symptom disappeared immediately after the injection of propranolol. Then, CFR value obviously increased from 0.7 to 1.7 (Figure 2).

Wave Intensity (WI) was calculated to analyse this mechanism using brief formula as follow; $WI = \Delta P \Delta V$. After the injection of propranolol, WI and velocity in diastole were enhanced (Figure 3). While, after the injection of nitroglycerin, the reaction like after the injection of propranolol was not observed.

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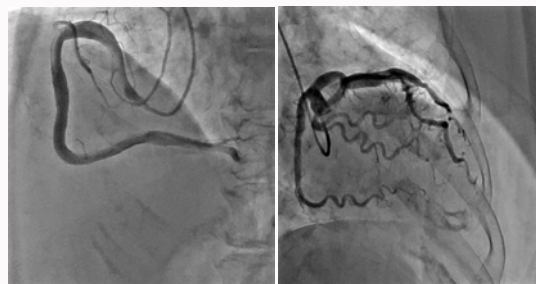


Figure 1: Coronary angiogram showed coronary artery ectasia in right and left coronary artery.

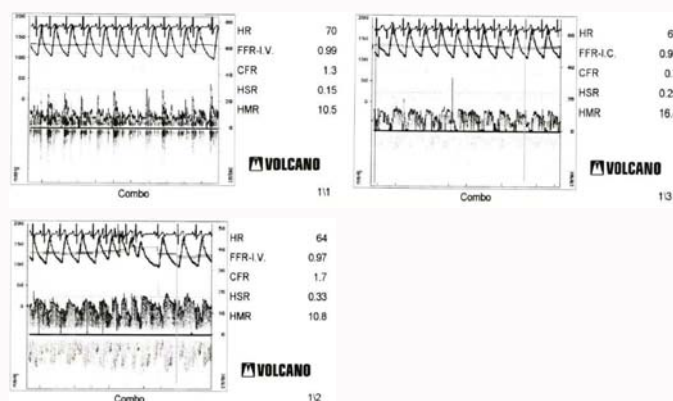


Figure 2: The data of combo-wire at baseline, after the injection of nitroglycerin, and after the injection of propranolol are shown. Combo-wire under hyperemia by adenosine triphosphate showed that Coronary Flow Reserve (CFR) value decreased from 1.3 to 0.7 after the injection of nitroglycerin regardless of no change in fractional flow reserve value (b). While, after the injection of propranolol, CFR value obviously increased from 0.7 to 1.7 (c). There were not obvious differences in blood pressure and heart rate among baseline, after the injection of nitroglycerin, and after the injection of propranolol.

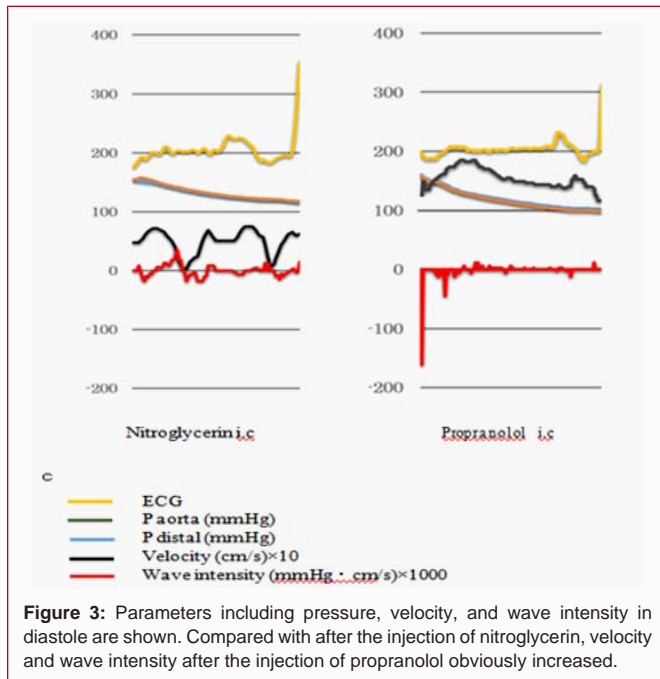


Figure 3: Parameters including pressure, velocity, and wave intensity in diastole are shown. Compared with after the injection of nitroglycerin, velocity and wave intensity after the injection of propranolol obviously increased.

Coronary flow has been reported to peak in diastole because of the dominance of a suction wave generated by myocardial microcirculatory decompression [1]. Thus, β -blocker enhanced the wave intensity and consequently increased coronary flow. As the mechanism, the improvement of the ventricular relaxation through the prolongation of R-R interval by β -blocker may have increased CFR. Though speculative, the improvement of the ventricular relaxation by β -blocker itself and the impact on wave intensity in systole by the negative inotropic effect of β -blocker might have also influenced the present finding. After discharge, she is free of chest pain by the prescription of bisoprolol and vitamin K antagonist oral anticoagulation.

Reference

1. Davies JE, Whinnett ZI, Francis DP, Manisty CH, Aguado-Sierra J, Willson K, et al. Evidence of a dominant backward-propagating "suction" wave responsible for diastolic coronary filling in humans, attenuated in left ventricular hypertrophy. *Circulation*. 2006;113(14):1768-78.