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IMPLEMENTATION OF CORONARY ARTERY PHANTOM WITH HYPEREMIA

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Fractional flow reserve (FFR) and coronary flow reserve (CFR) are the indices to diagnose ischemia in coronary artery diseases. To obtain these indices, hyperemia, the increased blood flow through vasodilation, is used as a reference and this occurs when adenosine is injected *in vivo*. However, for phantom models in previous studies, most researchers didn't consider hyperemia condition. This study aims to implement hyperemia in coronary artery phantom. We have constructed a circulation phantom to mimic coronary flow system. A coronary artery pressure consists of forward and backward waves. Hyperemia was simulated by the total occlusion of backward flow when the pressure was decreased, and flow velocity was increased. Doppler test fluid was used as the flow medium. A reservoir was made to implement the venous system. To realize the coronary artery stenosis, area ratios of 40%, 70%, and 88% stenosis model were made. The pressure and the flow velocity inside the tube were measured with a catheter (ComboWire XT, Philips Volcano, USA). When the mean pressure of the vein was 10 mmHg, FFR values were 0.93, 0.74, and 0.53 with back flow, and 0.80, 0.63, and 0.42 in hyperemia state, CFR values were 2.2, 1.5 and 1.2 at the stenosis rates of 40%, 70%, and 88%, respectively. When the mean pressure of the vein was increased to 30 mmHg, FFR values were 0.99, 0.95, and 0.69 with back flow, and 0.89, 0.85, and 0.59 in hyperemia state, CFR values were 2.5, 1.6 and 1.2 at the stenosis rates of 40%, 70%, and 88%, respectively. We successfully implemented an *in vitro* coronary artery system that can measure FFR and CFR values according to pressure of the vein and the degree of stenosis. It is expected that phantom model helps to understand the physiology of a coronary artery diseases.

BIOGRAPHY

Soohong Min is pursuing his doctorate from Jeju National University in Korea. He is interested in the diagnosis and treatment of cardiovascular disease. More specifically, he is interested in morphological and hemodynamic information in blood vessels. He is also interested in medical ultrasonic field.

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