



3D RECONSTRUCTION AND NUMERICAL CALCULATION OF FRACTIONAL FLOW RESERVE IN ATHEROSCLEROTIC CORONARY ARTERIES

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Abstract:

Atherosclerosis is a pathological process in which the accumulation of fatty substances, cholesterol, parts of dead cells and calcium into the internal wall of the artery occurs. The arterial plaque may grow sufficiently to significantly reduce blood flow through the arteries. The main complications arise when the artery wall is so rigid that it can break.

Fractional flow reserve (FFR) is an invasive diagnostic procedure in which, with the help of sophisticated radiological equipment, an examination of the interior (lumen) of the coronary arteries is performed. It allows the doctor to accurately see where coronary arteries are narrowed or closed.

An effective alternative to traditional coronary angiography, FFR calculation using numerical simulation delivers precise localization of ischemia-causing arterial stenosis, based on computational fluid dynamics modeling and three-dimensional (3D) coronary artery reconstruction. Main benefits from this type of procedure are to require a significantly smaller amount of performing time and costs of the patient's treatment.

Patient #01 (measured FFR 0.87, simulated FFR 0.89)

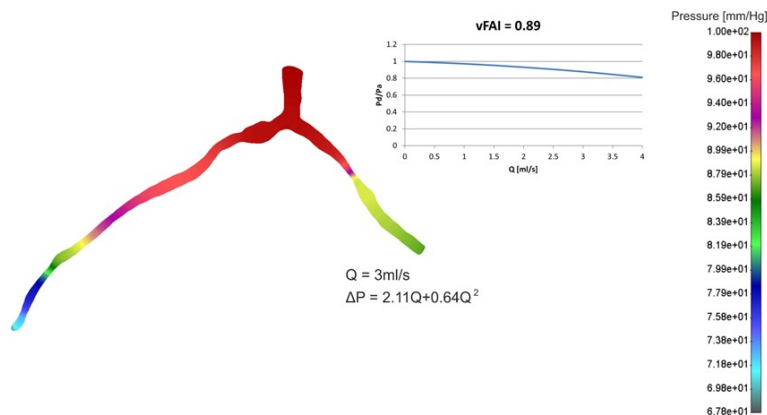


Fig. 1. Numerical simulation of calculated FFR in coronary artery

By performing 3D coronary reconstruction and finite element method, the required pressure change values are calculated and, due to those values, FFR results are determined.

Key words: finite element method, fractional flow reserve, coronary arteries

References

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