VCAST

With the third eye of VCAST,
the doctor will not miss anything

Kardiolytics

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What is **the advantage** of using **CFD systems to study FFR** over traditional catheterization methods?

The CFD simulation will work over the entire vessel length, revealing stenoses that the physician may miss by focusing on obvious areas.

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Fraction Flow Reserve (FFR) is a critical measurement used to assess coronary artery disease. It provides objective data about the hemodynamic significance of coronary lesions, helping to differentiate between functionally significant and non-significant blockages. By accurately identifying lesions that truly need intervention, FFR can help reduce the number of unnecessary stent placements and other invasive procedures, leading to better patient outcomes and lower healthcare costs.



*https://world-heart-federation.org/wp-content/uploads/World-Heart-Report-2023.pdf)

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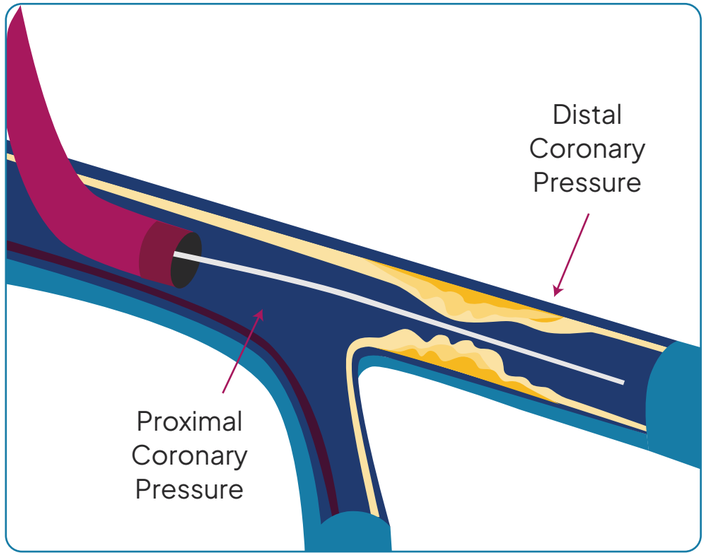
Invasive methods are being pushed aside by **modern technology**

Currently, the FFR parameter is measured mainly using invasive methods, eg. Pressure Wire Technique. A specialized pressure wire is introduced into the coronary artery through a catheter. This wire measures the pressure distal (downstream) to a coronary lesion and compares it to the pressure proximal (upstream) to the lesion during a state of maximal hyperemia (typically induced by pharmacological agents like adenosine). The FFR is calculated using the formula: FFR = {Pd}/{Pa} where (Pd) is the distal pressure and (Pa) is the proximal pressure. An FFR value of 0.80 or less is commonly considered indicative of significant ischemia and may warrant intervention.

However, the non-invasive method is becoming increasingly popular: CT Coronary Angiography. A non-invasive assessment of coronary arteries that can include FFR calculations based on CT data. This method, known as FFR-CT, uses computational fluid dynamics (CFD) to estimate FFR from anatomical information gathered through CT imaging.

Non-invasive, fast, and precise

VCAST system allows for full automation of measuring the FFR parameter based on CT images. As recent studies have shown, it is not only a **non-invasive tool** that shortens the analysis time but also a tool with **increased precision and accuracy**.

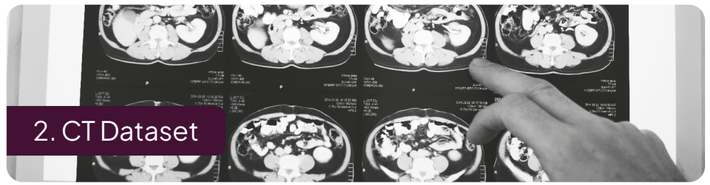


$$FFR = \frac{\text{Distal Coronary Pressure}}{\text{Proximal Coronary Pressure}}$$

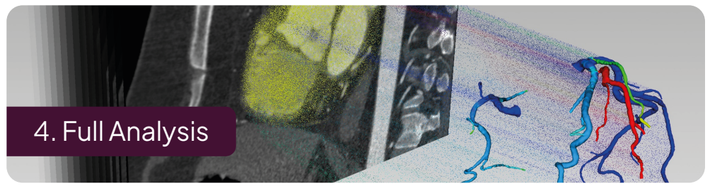


VCAST FFR Analysis Lifecycle











Comparative studies involving one of the institutions in Poland that also uses the VCAST system showed that in several cases, VCAST demonstrated greater accuracy of analysis than that carried out using standard, invasive methods.

No significant stenosis was shown during the patient's examination with the standard method. The lowest FFR value obtained oscillated at the level of 0.87 (mLAD, segment 7), suggesting no premises for further treatment of the patient, which is in accordance with generally accepted standards.

However, analysis performed on the same patient data through the VCAST system revealed more. The FFR parameter value in segment 7 matched the examination performed with invasive methods, but further analysis of the vessel revealed significant stenosis that had not been captured earlier. In the distal part of the vessel (First Diagonal Branch, D1), the FFR parameter decreases to 0.79, significantly changing the final diagnosis. The difference in FFR parameters is not significant enough to speak of a misdiagnosis, but this study shows the advantage of using CFD systems in combination with segmented CT images.

A powerful modern tool in the hands of radiologists will strengthen their work.

The key to this method's success is its physicality, which involves simulating flow through all segmented vessels. Unlike invasive methods, it does not act pointwise but over the entire length of the available segmented CT scan. This, in turn, allows for obtaining a full picture of potential stenoses without additional measurements, changes in the position of the measuring tool, or additional time.

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Non-invasive methods of conducting patient examinations greatly impact the costs incurred by medical facilities. Recent decades have shown a considerable increase in the incidence of coronary artery disease. According to a report by the World Health Federation, over half a billion people in the world suffer from coronary artery disease, and in 2021 alone, 20.5 million died. In relation to the rising costs of health care, developing techniques and tests that improve processes and relieve doctors is crucial to maintaining the level of health care available to every patient.

An essential aspect of modern medicine is the patient's comfort. This statement covers many activities, but the most important are a sense of security, the least possible interference in the body, and a quick diagnosis. The last point is the key to success because health and even life may depend on the speed of action and reaction. VCAST fits in perfectly with this trend, setting a new quality in the field of coronary artery disease.

VCAST system does not intend to exclude the radiologist from the current analysis path. The human factor is necessary in determining the final recommendation, which may result from the analysis itself and the results obtained but also from the patient's history, habits, undocumented health, or mental problems. **VCAST allows physicians to make more accurate and faster diagnoses, benefiting directly the costs of medical facilities and the quality of services provided**, without mentioning the considerable comfort for the patients if conducting the test does not require interference in their bodies.



Zbigniew Małota
Head of Biocybernetics Laboratory
Zbigniew Religa Foundation for the Development of Cardiac Surgey

VCAST offers a precise, non-invasive diagnostic tool that can detect significant changes in blood flow at an early stage, before serious symptoms of coronary artery disease appear.



Konrad Pieszko
Physician, Research Scientist
Multi-specialist hospital in Nowa Sól, Poland

VCAST provides precise hemodynamic assessment of the coronary artery tree with simultaneous accessible, interactive 3D visualization, can be easily and safely shared with the patient and other doctors in the form of a QR code.

For more information, visit our website:
www.kardiolytics.com
or email us at **info@kardiolytics.com**

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