# Importance of diagnostic coronary arteries testing in asymptomatic myocardial ischemia

## Importancia de exámenes diagnósticos de la arteria coronaria en isquemia miocárdica asintomática

*Yadanar Win Lei[1], Juan Pablo Jaldin[2]*

**Abstract**

In Myanmar, with recent advances on cardiac intervention, and diagnostic capability, we discuss different techniques on proper diagnosis of different types of coronary disease. We reviewed a case with one known vessel disease diagnosed by CT coronary arteries and then, were found to be two vessels disease when diagnostic cardiac catheterization was done. We discussed the uses and the limitations of various cardiac tests, including Coronary CT angiography (CCTA), Cardiac Magnetic Resonance Imaging (cMRI), Diagnostic Cardiac Catheterization (CC), Multi-detector computed tomography (MDCT) via a literature review.

***Keywords***: coronary artery disease, coronay stenosis, coronary angiography/methods

**Resumen**

En Myanmar, con los avances recientes en la intervención cardíaca y la capacidad de diagnóstico, discutimos diferentes técnicas sobre el diagnóstico adecuado de los diferentes tipos de enfermedad coronaria. Revisamos un caso con una enfermedad vascular conocida diagnosticada por arterias coronarias por TC y luego, se descubrió que era una enfermedad de dos vasos cuando se realizó el cateterismo cardíaco de diagnóstico. Discutimos los usos y las limitaciones de varias pruebas cardíacas, incluidas la angiografía coronaria por tomografía computarizada (CCTA), las imágenes de resonancia magnética cardíaca (cMRI), el cateterismo cardíaco diagnóstico (CC), la tomografía computarizada con multidetectores (MDCT) a través de una revisión de la literatura.

***Palabras claves***: enfermedad de la arteria coronaria, estenosis coronaria, angiografia coronaria/metodos

With the popularity of the cardiac intervention, primary care physicians, cardiologists need to be aware of the various diagnostic testing based on the choice of the patient profile, benefit, risk, and the guideline to use the proper intervention. This case report, by no means serve as a complete guide but to improve the awareness of the various tests on the coronary care and proper planning on the intervention for symptomatic and asymptomatic cardiac case.

## Case Presentation

A 73 year old, ex-smoker of half pack per day of cigarettes, with known Diabetes Mellitus type 2 and hypertension presented with intermittent and vague pressure like shoulder pain, 4/10 intensity for one month. He is an avid golfer and is usually in good health except for controlled Diabetes. He drinks 4 glasses of whiskey per week. He has a family history of coronary artery disease.

Initial ECG shows Q waves on V1-V3. Echocardiogram shows left ventricular wall hypokinesis with ejection fraction of 61%. Routine baseline blood test was unremarkable. His medications were metoprolol 10 mg 1 tablet once a day, aspirin 80 mg 1 tablet once a day and atorvastatin 10 mg one tablet once a day. CT angiogram shows coronary artery atherosclerosis with calcified plaque in left anterior descending artery (LAD) 50-60% diameter stenosis, with Calcium score 56,32. Subsequently, cardiac catheterization with coronary angiogram was done and shows significant double vessel disease (left circumflex and LAD). Patient received percutaneous intervention in two vessels successfully and was started on double antiplatelet therapy (aspirin-clopidogrel).

## Discussion

**1. Cardiac Catheterization**

The risk of a major complication (death, myocardial infarction, or major embolization) during or after diagnostic cardiac catheterization is well below one percent.

Mortality is under 0,1%. Risk factors for death include advancing age, higher New York Heart Association heart failure class, left main coronary artery disease, severe left ventricular dysfunction, as well as the presence of valvular heart disease, chronic kidney disease, and diabetes mellitus requiring insulin therapy.

The risk of myocardial infarction is under 0,1%. Risk factors include the extent of disease, the presence of insulin dependent diabetes mellitus, and recent non-ST elevation myocardial infarction.

The risk of stroke has been reported to be as high as 0,2 and 0,4%. Risk factors for stroke include the severity of coronary artery disease, the length of fluoroscopy time, diabetes, hypertension, prior stroke, or renal failure.

[1]Physician, University of Medicine 1 Yangon
[2]Physician, San Andres University, Medical School
*Correspondencia a: Juan Pablo Jaldin
Correo electrónico: dr.jpjaldin@gmail.com
**Recibido el 03 de septiembre de 2019. Aceptado el 05 de octubre de 2019.**

Local complications at the site of catheter insertion are among the most common problems seen after cardiac catheterization. These problems may include acute hematoma, retroperitoneal hemorrhage, femoral artery pseudoaneurysm, or arteriovenous fistula.

Other potentially serious complications include: ventricular tachyarrhythmias, severe bradycardia, allergic reactions, atheroembolism, and acute kidney injury.

**2. Coronary CT angiography**

Coronary CT angiography and cardiac CT—Coronary CT angiography (CCTA) is available, and less invasive, and when combined with perfusion imaging, can provide both an assessment of the coronary arteries and the cardiac myocardium.

A visual estimate of >50% diameter stenosis is considered a "significant" stenosis. Stenosis of less than 70% are typically not flow-limiting, are rarely the cause of ischemia or angina, and usually do not require revascularization. Catheter-based or surgical revascularization decision should be based on both stress testing (functional evaluation) and anatomic imaging with CCTA[3]

In this patient, although CT coronary angiogram shows stenosis of 50-60% of the diameter of LAD which usually does not require revascularization, cardiologist's suspicion and prevention of further atherosclerosis based on patient's history led to perform cardiac catheterization where we found double vessel disease (the previous one found on CT coronary angiogram plus 90% diameter occlusion in left circumflex artery) . Advance of non invasive procedures (CT coronary angiogram) should not always exclude the need of invasive and more precise procedure (coronary catheterization) in patients with high coronary risk assessment score and clinical suspicions[4].

Limitation of CCTA use on patient with high Calcium Score, in the ACCURACY trial and other studies, the presence of coronary artery calcium reduces the specificity (eg, 86 versus 53% for detection of ≥50% stenosis with calcium scores ≤400 versus >400 Agatston units).

Other precautions on use of CCTA are that intravenous iodinated contrast is required and

oral or intravenous beta blockers, or both, are administered to slow the heart rate to less than 60 to 70 beats/minute[1].

**3. Multi detector or Multi slice Computed Tomography (MDCT)**

MDCT technology is evolving continuously and rapidly. A form of computed tomography (CT) technology for diagnostic imaging. In MDCT, a two-dimensional array of detector elements replaces the linear array of detector elements used in typical conventional and helical CT scanners. The two-dimensional detector array permits CT scanners to acquire multiple slices or sections simultaneously and greatly increase the speed of CT image acquisition. Image reconstruction in MDCT is more complicated than that in single section CT.

Limitations, the following patient-related factors can interfere with the diagnostic quality of CCTA image. Heart rate greater than 60 or 70 beats/min, Irregular heart rhythm, Inability to sustain a breath hold for at least five seconds. Severe coronary calcification or the presence of coronary artery stents, since image reconstruction artifacts related to radiodense material such as calcium or metal can obscure the coronary artery lumen. Segments with a diameter <1.5mm can usually not be assessed for stenosis. Such small vessel caliber is typical of distal coronary artery segments and some side branches.

Contrast and Radiation exposure, CCTA is contraindicated in patients with a history of allergy to iodinated contrast medium and relatively contraindicated in patients at high risk for contrast nephropathy (eg, patients with diabetes and a serum creatinine concentration above 2.0 mg/dL [177 micromol/L])[2].

**4. Cardiovascular magnetic resonance (CMRI)**

has technical requirements for imaging of the coronary arteries similar to those of CT.

Advantages of CMRI over CCTA include the absence of exposure to ionizing radiation and iodinated contrast media and the lack of necessity for heart rate control with beta blockers. These features facilitate sequential studies and permit imaging in younger patients and those with renal dysfunction. In addition, coronary artery calcification, which lowers specificity with CCTA, is not prominent on CMRI images because of its low proton content. As a result, detection of coronary lesions in heavily calcified coronary segments by CMRI can be more reliable than by CCTA.

Limitations, there are several relative disadvantages and limitations to the use of CMRI:

The procedure requires considerable operator skill. CMRI is relatively contraindicated in the presence of implanted foreign bodies or medical devices that consist mostly or entirely of metal or contain electrical circuitry (eg, pacemakers, implantable cardioverter-defibrillators), with an important exception is the presence of coronary artery stent. Irrespective of stent type and time since implantation, stents are not a contraindication for MRI. However, the stent will interfere with local image quality.

Irregular heart rhythms, inability to comply with breath-holding instructions, and an irregular breathing pattern will result in poor image quality.

Compared with CCTA, the spatial resolution of CMRI is lower, but the temporal resolution is more flexible: The length of the data acquisition window is based upon the

patient's heart rate, rather than being fixed and determined by gantry rotation speed.

## Conclusion

The purpose of this article is to make all of us aware of the various types of investigations and proper use of these investigations based on the patient's profile. Also it should serve the brief update of advances of the coronary artery assessment with different mode of investigations. To reduce investigation related complications, doctors need to carefully choose the diagnostic testing according to the patient profile. The thorough assessment of coronary disease and risk factors evaluation before the definitive treatment, whenever possible, will bring better patient outcome. It is important to perform the investigations of repeated unsuspected findings for example to check invasive coronary angiogram even if noninvasive CT angiogram shows less severe findings.

## Referencias bibliográficas

1. Noninvasive Coronary Imaging with cardiac computed tomography and cardiovascular magnetic resonance Authors: Thomas C Gerber, MD, PhD, FACC, FAHA, Warren J Manning, MD. JACC Cardiovasc Imaging, 2011 April; 4(4): 328-37, doi; 10,1016/j.jcmg.2011.01.012.

2. Detection of coronary artery stenosis by low-dose, prospectively ECG- triggered, high- pitch spiral coronary CT angiography. A c h e n b a c h . S, Goroll T, Seltmann M, Pflederer T, Anders K, Ropers D, Daniel WG, Uder.M, Lell. M, Marwan M. Am Heart J, 2013 Feb; 165(2): 154-63.e3 doi;10.1010/j.ahj.2012.10.026. Epub 2012 Nov 26.

3. Head-to-Head comparison of prospectively triggered Vs retrospectively gated coronary computed tomography angiography: Meta-analysis of diagnostic accuracy, image quality and radiation dose. Menke J, Unterberg-Buchwald C, Staab W, Sohns JM, Seif Amir Hosseini A, Schwartz A. Eur Heart J, 2008 Dec;29(23):2902-7 , doi:10.1093/eurheartj/ehn454, Epub 2008 Oct 14.

4. Computed tomographic angiography or conventional coronary angiography in therapeutic decision-making, Piers LH, Dikkers R, Willems. TP, de Smet BJ, Oudkerk M, Zijlstra F, Tio RA. Eur Heart J. 2008 Dec;29(23):2902-7. doi:10.1093/eurheartj/ehn454. Epub 2008 Oct 14.