



Imaging of Heart Using Ultrasound, Magnetic Resonance Imaging and Computed Tomography

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INTRODUCTION

Non-invasive imaging of the heart utilising ultrasound, magnetic resonance imaging (MRI), computed tomography (CT), or nuclear medicine (NM) imaging using PET or SPECT is referred to as cardiac imaging. These cardiac modalities, which include myocardial perfusion imaging, are known as echocardiography, cardiac MRI, cardiac CT, cardiac PET, and cardiac SPECT.

Cardiac imaging may be recommended by a physician to help confirm a diagnosis of a heart issue. Because the treatment contains hazards and is unlikely to result in a change in a patient's care, medical specialty professional organisations oppose the use of routine cardiac imaging during pre-operative evaluation for patients set to have low or mid-risk non-cardiac surgery. In the examination of individuals without cardiac symptoms or in normal follow-ups, stress cardiac imaging is discouraged.

Echocardiography

Ultrasonic waves are used in transthoracic echocardiography to see the heart chambers and blood flow in real time. It is the most often used imaging method for identifying heart issues because it uses a technology called Doppler to provide non-invasive vision of the heart and blood flow *via* the heart.

A customised probe with an ultrasound transducer at its tip is introduced into the patient's oesophagus during transoesophageal echocardiography. It's utilised to diagnose a variety of thoracic problems or injury, such as heart and lung imaging. It has certain benefits and drawbacks when compared to thoracic or intravascular ultrasound.

Magnetic resonance imaging (MRI)

Visualises the heart by identifying hydrogen atoms, particularly those bound to water and fat molecules, using superconducting magnets. Nuclear spin is a feature that these hydrogen atoms have. Although the spin's orientation is normally random, it may be aligned with the help of a strong magnetic field. When the alignment of these hydrogen atoms is suddenly interrupted, they release faint electromagnetic signals that may be detected and utilised to build a picture of the heart.

In a single session, an MRI can assess the size, shape, function,

and tissue features of the heart. It is more repeatable than echocardiogram, with less inter-observer variability, allowing for more exact reference ranges to differentiate between health and sickness. Another advantage of cardiac MRI is the capacity to detect scarring within the heart utilising late gadolinium enhancement, as well as detecting other abnormalities of the heart muscle itself, such as infiltration.

CT (computed tomography)

CT is a type of imaging that uses a Contrast-enhanced dual-source. Coronary CT-angiography (CCTA) is an imaging technique that uses a ring-shaped machine with an X-Ray source revolving around the circular path to bathe the inner circle with a consistent and known X-Ray density. With the remarkable advancements in CT technology, the use of CT in cardiology is rising. Nowadays, cardiac studies may be performed using multi detector CT, notably the 64 detector-CT will be completed in a matter of seconds by use of Algorithms and software.

Imaging using nuclear medicine

PET stands for positron emission tomography, which is a nuclear medicine imaging technique for positron emitting radioisotopes. PET is one of the most versatile imaging modalities because it allows for visual image analysis of a variety of metabolic chemical processes. Due to technological and related economic challenges, cardiology usage is expanding slowly. The majority of applications are for research rather than therapeutic usage. To make the location of the chemical compounds of interest apparent in a PET scan, appropriate radioisotopes of elements inside chemical compounds of the metabolic pathway being studied are utilised.

Computed tomography using a single photon emission (SPECT)

SPECT stands for single photon emission computed tomography, which is a nuclear medicine imaging technique that uses gamma rays released by a radioactive tracer injected into the bloodstream and then distributed to the heart. SPECT is most typically used to identify ischemic heart disease by visualising myocardial perfusion. rebuild these pictures. In the medium term, there will be significant progress and expansion, allowing radiologists to identify cardiac

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artery disease without anaesthesia and in a non-invasive manner.

CT calcium scan of the coronary arteries

A coronary CT calcium scan is a cardiac computed tomography scan used to determine the degree of coronary artery disease. Specifically, it looks for calcium deposits in the coronary arteries that can narrow arteries and increase the risk of heart attack.

CONCLUSION

Non-invasive cardiac imaging methods have been critical in the assessment of patients with confirmed or suspected CAD, as

well as the optimum and cost-effective use of different treatment alternatives. The most essential and extensively used approach is nuclear MPI.

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CONFLICT OF INTEREST

There is no conflict disclosed in this article.