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Hybrid imaging methods in the diagnosis of coronary artery disease

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Abstract

Coronary artery disease remains one of the leading causes of morbidity and mortality worldwide. Timely and accurate diagnosis is crucial for selecting optimal therapeutic interventions and improving patient outcomes. Various imaging modalities are employed for this purpose, while hybrid imaging techniques combine the advantages of individual modalities, providing a more detailed assessment of the myocardium's morphological and functional characteristics. This paper provides an overview of the available imaging methods for diagnosing coronary artery disease, with a particular emphasis on the role and application of hybrid techniques as a modern approach that contributes to more effective therapy planning and reduces the need for multiple diagnostic procedures. Special attention is given to the role of radiologic technologists in the entire diagnostic process, their daily professional responsibilities, and the importance of continuous professional development in the use of hybrid systems.

Keywords: hybrid imaging, coronary heart disease, PET/CT, PET/MR, radiopharmaceuticals, SPECT/CT, radiologic technologist, myocardial perfusion

Abbreviations and acronyms: ASNC (American Society of Nuclear Cardiology), AV (Atrioventricular), CAD (Coronary Artery Disease), CFR (Coronary Flow Reserve), CNMT (Certified Nuclear Medicine Technologist), CT (Computed Tomography), EANM (European Association of Nuclear Medicine), ECG (Electrocardiography), LGE (Late Gadolinium Enhancement), MBF (Myocardial Blood Flow), MRI (Magnetic Resonance Imaging), MRAC (Magnetic Resonance-based Attenuation Correction), OSEM (Ordered Subsets Expectation Maximization), PCI (Percutaneous Coronary Intervention), PET (Positron Emission Tomography), PSF (Point Spread Function), QA/QC (Quality Assurance / Quality Control), RT(N) (Radiologic Technologist – Nuclear), RT(R)(CT) (Radiologic Technologist – Radiology/Computed Tomography), SiPMs (Silicon Photomultipliers), SDS (Summed Difference Score), SNMMI (Society of Nuclear Medicine and Molecular Imaging), SPECT (Single-Photon Emission Computed Tomography), SSS (Summed Stress Score), SRS (Summed Rest Score), SUV (Standardized Uptake Value), TOF (Time of Flight), UTE (Ultrashort Echo Time), WHO (World Health Organization)

Introduction

Coronary artery disease (CAD) is one of the most common cardiovascular disorders and the leading cause of mortality worldwide. The disease often progresses without specific symptoms, making early diagnosis crucial for the prevention of cardiovascular events. The heart, the central organ of the circulatory system, is located in the anterior mediastinum and consists of two atria and two ventricles (1). The coronary arteries—the left (with its anterior descending and circumflex branches) and the right—originate from the ascending aorta and provide myocardial perfusion. Their narrowing or occlusion results in ischemia and clinical manifestations such as angina pectoris, acute coronary syndrome, and myocardial infarction (2).

CAD develops due to atherosclerotic changes in the coronary arteries, leading to luminal narrowing or occlusion and subsequent ischemia. Pathophysiologically, the process begins with endothelial dysfunction, lipid accumulation, and fibrous plaque formation. Plaque rupture may result in thrombosis and complete arterial occlusion, making it clinically important to differentiate stable stenoses from vulnerable plaques prone to rupture (3, 4). Clinical manifestations include stable and unstable angina, acute coronary syndrome (STEMI and NSTEMI), and, in severe cases, sudden cardiac death (5). According to the World Health Organization (WHO), CAD is the leading global cause of death, accounting for 17.9 million deaths annually, of which 38% are premature. Beyond its high mortality, CAD also causes significant disability and poses a substantial burden on healthcare systems. Risk factors include hypertension, dyslipidemia, smoking, diabetes, physical inactivity, unhealthy diet, and obesity (6).

The diagnostic process involves clinical assessment (history-taking and risk factor analysis), electrocardiography, biochemical markers (particularly troponin), stress testing (ergometry and pharmacological testing), and imaging modalities such as transthoracic and stress echocardiography, coronary CT angiography, and invasive coronary angiography as the gold standard (7, 8, 9, 10). Increasingly, multimodal techniques are used, combining CT or MRI with nuclear medicine methods such as SPECT (single-photon emission computed tomography) and PET (positron emission tomography) (11). Coronary artery disease (CAD) is one of the most common cardiovascular disorders and the leading cause of mortality worldwide. The disease often progresses without specific symptoms, making early diagnosis crucial for the prevention of cardiovascular events. The heart, the central organ of the circulatory system, is located in the anterior mediastinum and consists of two atria and two ventricles (1). The coronary arteries—the left (with its anterior descending and circumflex branches) and the right—originate from the ascending aorta and provide myocardial perfusion. Their narrowing or occlusion results in ischemia and clinical manifestations such as angina pectoris, acute coronary syndrome, and myocardial infarction (2).

Hybrid imaging in nuclear medicine combines functional and anatomical information for more precise diagnosis. The most commonly used systems are SPECT/CT and PET/CT, while PET/MR is a newer and still relatively uncommon technology (12). The quality of SPECT/CT images largely depends on collimator design, detector sensitivity, and scatter effects. The collimator aperture size determines image characteristics: larger apertures increase sensitivity but also allow more unwanted photons to pass through, reducing contrast and reconstruction accuracy (12). To mitigate this effect, the triple energy window method and iterative reconstruction are often applied. Iterative reconstruction achieves substantially higher accuracy compared to conventional methods by repeatedly comparing measured and calculated projections and incorporating parameters such as collimator response, attenuation, and scatter (16).

PET/CT represents one of the most significant technological advances in hybrid imaging. The standard acquisition protocol includes a topogram, low-dose CT, and PET imaging across 8–10 bed positions (14). The main advantage of PET is its ability to quantify radiopharmaceutical distribution commonly expressed as the standardized uptake value (SUV), which normalizes radiotracer concentration to body weight and injected activity. Modern devices also employ time-of-flight (TOF) technology, which measures the temporal difference in the arrival of annihilation photons, allowing for more precise localization of positron decay. In PET, collimation is electronic, as only coincident events along the same line of response are registered. This results in higher sensitivity and efficiency compared to SPECT/CT (15).

The integration of PET and MRI poses considerable technological challenges due to the strong magnetic field interfering with conventional PET detectors that use photomultiplier tubes. This issue was addressed by introducing silicon photomultipliers (SiPMs), which are insensitive to magnetic fields, provide high signal gain and precise timing resolution (TOF), and allow for compact system design (16). Wider clinical implementation of PET/MR remains limited by high costs and difficulties in achieving reliable and rapid attenuation correction. As an alternative, additional 3D skeletal models based on CT data are often used (17).

Aim of the paper

The aim of this paper is to present the significance and application of hybrid imaging methods in the diagnosis of coronary artery disease and to define the contribution of the radiological technologist within the overall diagnostic process.

Discussion

Myocardial perfusion scintigraphy

Myocardial perfusion scintigraphy is a noninvasive procedure used to visualize the accumulation of radiopharmaceuticals in the myocardium according to blood flow. It is employed in the diagnosis of CAD, assessment of myocardial viability, and risk stratification in patients with CAD. The most commonly used radiopharmaceuticals include Tl-201, Tc-99m complexes (such as sestamibi and tetrofosmin), as well as PET tracers like Rb-82 and N-13 ammonia (18). Following intravenous administration, the radiopharmaceutical is distributed via the bloodstream, with myocardial uptake proportional to coronary blood flow and myocyte integrity. During exercise stress testing, both blood flow and radiotracer uptake increase. Healthy coronary arteries ensure uniform distribution, whereas stenotic or occluded arteries result in irregular distribution and accumulation, particularly under stress conditions (19).

SPECT/CT myocardial imaging: procedure, analysis, and clinical significance

Myocardial SPECT/CT is performed when exercise testing cannot reliably confirm or exclude coronary artery disease. This method is indicated in asymptomatic patients at risk of CAD, in patients with a positive stress test, in

Table 1. Comparison of One-Day and Two-Day Imaging Protocols (22)

CHARACTERISTICS	ONE-DAY PROTOCOL	TWO-DAY PROTOCOL
DURATION	4-6 hours	2 days; one phase per day
RADIOPHARMACEUTICAL DOSE	lower total dose	higher total dose
IMAGE QUALITY	moderate (possible overlap)	high (fewer artifacts)
PRACTICALITY	higher staff workload, unnecessary additional dose if findings are normal	if the STRESS study is normal, no need for the REST phase
APPLICATION	more common in clinical practice	more common in obese patients

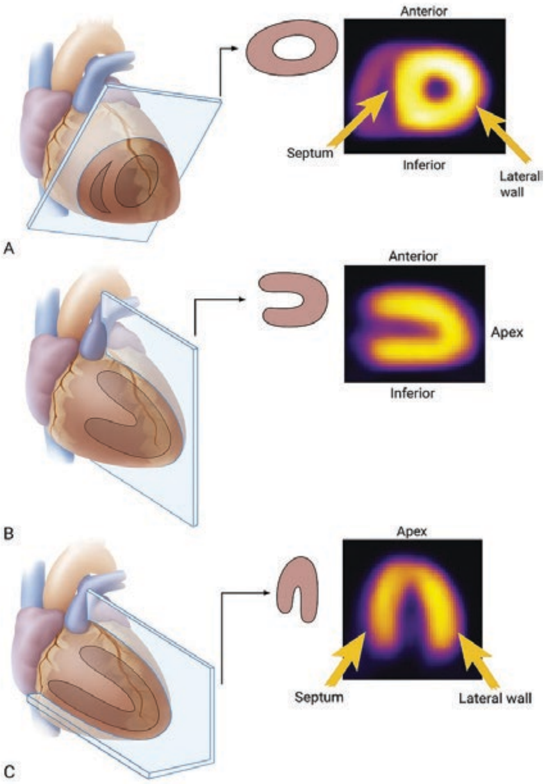

Figure 1. Myocardial perfusion SPECT. Schematic representation of heart sections in three planes. Panel A shows the short-axis section (SA), panel B the vertical long-axis section (VLA), and panel C the horizontal long-axis section (HLA).
Source: Hulić D, Dodig D, Kustić Z, et al. Clinical Nuclear Medicine. 3rd revised and expanded ed. Zagreb: Medicinska naklada; 2023. p. 169.

those presenting with atypical chest pain, as well as in symptomatic patients with a negative ergometry result. It is particularly valuable in the presence of conduction disturbances, ventricular hypertrophy, and left bundle branch block. Compared to coronary angiography, it demonstrates an average sensitivity of 90% and specificity of 80%. False-negative findings may occur due to insufficient stress, mild stenoses, single-vessel disease, well-developed collateral circulation, ongoing therapy, or technical errors (20, 21).

The advantages of this method include three-dimensional perfusion imaging with CT-based attenuation correction, thereby reducing the frequency of artifacts. Additional value is provided by gated SPECT, which enables simultaneous assessment of perfusion and left ventricular systolic function. Tc-99m–labeled radiopharmaceuticals are predominantly used, whereas Tl-201, although historically important for its redistribution properties, is now rarely applied due to its longer half-life and higher radiation dose to the patient. Imaging protocols may follow either a one-day or two-day format, depending on technical availability and clinical requirements (Table 1). Acquisition typically begins 30–60 minutes after radiopharmaceutical injection and lasts about 20–30 minutes. Patients are imaged using a dual-head gamma camera with detectors positioned at a 90° angle, rotating in 3° increments (22).

In SPECT/CT images, the myocardium is visualized in sections across three planes—two parallel and one perpendicular to the long axis of the left ventricle. On horizontal and vertical sections, it appears in the shape of a “U,” while short-axis sections have a ring-like configuration (Figure 1). In a healthy myocardium, the radiopharmaceutical is evenly distributed, and compared to planar scintigraphy, SPECT is more sensitive in detecting and more precise in localizing smaller perfusion defects, which is particularly important for identifying multivessel disease (12).

The goal is to identify perfusion defects that occur during stress, at rest, or in both states. Reversible defects indicate ischemia (Figure 2), irreversible defects correspond to non-viable myocardium (Figure 3), while mixed defects suggest partial viability. Through software-based analysis, images are segmented according to the standardized 17-segment model, and perfusion is quantified using scoring systems (SSS, SRS, SDS) (23).

SPECT/CT also has prognostic value. A normal scan indicates less than a 1% likelihood of developing coronary

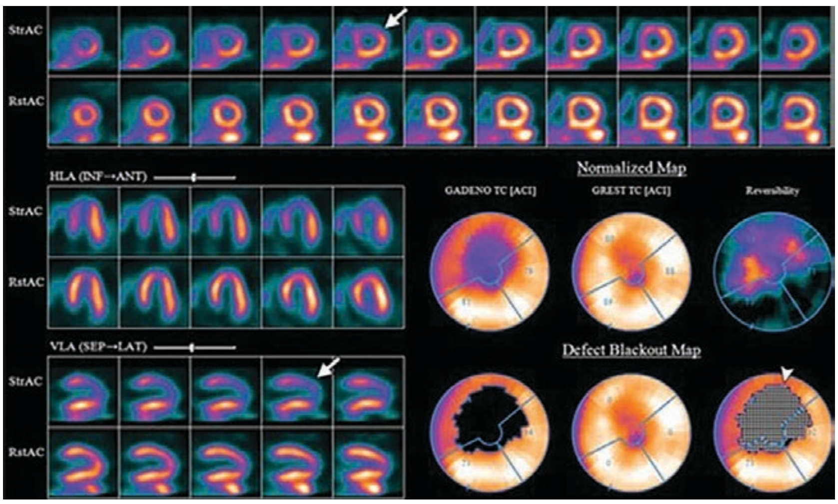

Figure 2. Findings: Large reversible perfusion defect in the distribution of the left anterior descending artery (LAD). The affected regions include the anterior wall, septum, and apex. A reversible defect indicates stress-induced ischemia without permanent myocardial damage—perfusion is reduced during stress but normalizes at rest.
Source: Interpretation of SPECT/CT Myocardial Perfusion Images: Common Artifacts and Quality Control Techniques | RadioGraphics

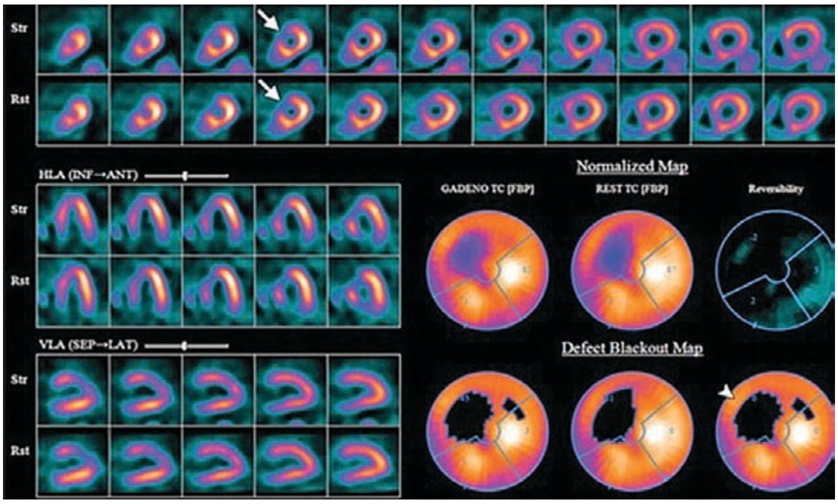

Figure 3. Findings: A large fixed perfusion defect is shown in the anteroseptal region, typical of myocardial infarction in the distribution of the left anterior descending artery (LAD). The affected area demonstrates persistently reduced activity, with no improvement in perfusion at rest, indicating an irreversible defect (infarcted tissue).
Source: Interpretation of SPECT/CT Myocardial Perfusion Images: Common Artifacts and Quality Control Techniques | RadioGraphics

artery disease, whereas moderate abnormalities predict a one-year risk of myocardial infarction of 2.7%. The severity of irreversible defects is associated with cardiac death, while reversible defects correlate with the risk of infarction. Multiple perfusion defects, increased radiotracer uptake in the lungs, left ventricular dysfunction on gated SPECT, and transient ischemic dilation indicate the need for revascularization (24). Compared to other methods, SPECT/CT offers several advantages: higher sensitivity than exercise testing (particularly in single-vessel disease), the ability to quantify and gain insight into disease pathophysiology, applicability in patients unable to perform an exercise test, and lower costs compared to coronary angiography. In addition to diagnosing the presence and extent of disease, it allows precise localization of the lesion responsible for ischemic symptoms, which is crucial for planning percutaneous coronary intervention (PCI). Furthermore, it is a useful tool for assessing PCI success, with the most reliable results obtained 4 to 6 weeks after the procedure (25).

Myocardial PET/CT: protocol, interpretation, and prognostic value

Myocardial PET/CT is an advanced non-invasive modality that allows simultaneous functional and anatomical imaging of the heart. For the assessment of coronary artery disease (CAD), perfusion radiotracers such as N-13-ammonia, Rb-82, or F-18-flurpiridaz (still under clinical investigation) are used. In contrast, F-18-FDG is primarily employed in oncology due to the Warburg effect, where tumour cells exhibit increased glucose uptake, enabling selective FDG accumulation in malignant tissues. F-18-FDG is not suitable for routine CAD diagnostics because it reflects glucose metabolism, which depends on the patient's metabolic state and requires specific preparation (26).

Patient preparation includes fasting, temporary discontinuation of medications that affect perfusion, avoidance of caffeine, blood glucose monitoring, and, if CT coronary angiography is planned, assessment of renal function (27). Imaging begins with intravenous administration of the radiotracer, with the dose determined based on biodistribution and half-life. Commonly used tracers include N-13-ammonia (370–740 MBq), which offers high spatial resolution with an acquisition time of approximately 10 minutes, and Rb-82 chloride (1100–1500 MBq), which, due to its very short half-life (~75 s), allows rapid acquisition of around 6 minutes using an automatic injector. Patients may undergo either physical or pharmacological stress. Imaging is performed with the patient in a supine position and arms raised above the head, synchronized with the ECG ("gated PET") to allow for additional assessment of left ventricular systolic function (28).

The CT component in PET/CT primarily serves for attenuation correction, but it can be extended to contrast-enhanced coronary angiography. PET acquisition begins immediately after radiotracer administration, with the duration depending on the type of tracer; a single bed position typically takes approximately 7 minutes. For optimal reconstruction, a 128 × 128 matrix is most commonly used, while CT parameters range from 80 kV/30 ref mAs to 100 kV/40 ref mAs. Data are reconstructed using iterative algorithms such as Ordered Subsets Expectation Maximization (OSEM), often combined with TOF and point spread function (PSF) technologies, enhancing contrast and spatial resolution (29). During image processing, corrections are applied for attenuation, scatter, random coincidences, and, when possible, motion.

Myocardial perfusion analysis is based on the reconstructed images (Figure 4), with semi-quantitative parameters including SSS, SRS, and SDS. Quantitative analysis further involves measuring myocardial blood flow (MBF, ml/g/min) and coronary flow reserve (CFR), which enables the detection of microvascular dysfunction even in the absence of significant epicardial stenoses (30).

In 2016, the American Society of Nuclear Cardiology (ASNC) and the Society of Nuclear Medicine and Molecular Imaging (SNMMI) emphasized that perfusion PET/CT remains underutilized despite its clear advantages. Compared to SPECT, myocardial PET perfusion provides higher resolution, lower radiation exposure, better detection of multivessel ischemia, and the ability to quantify myocardial blood flow and coronary flow reserve (31).

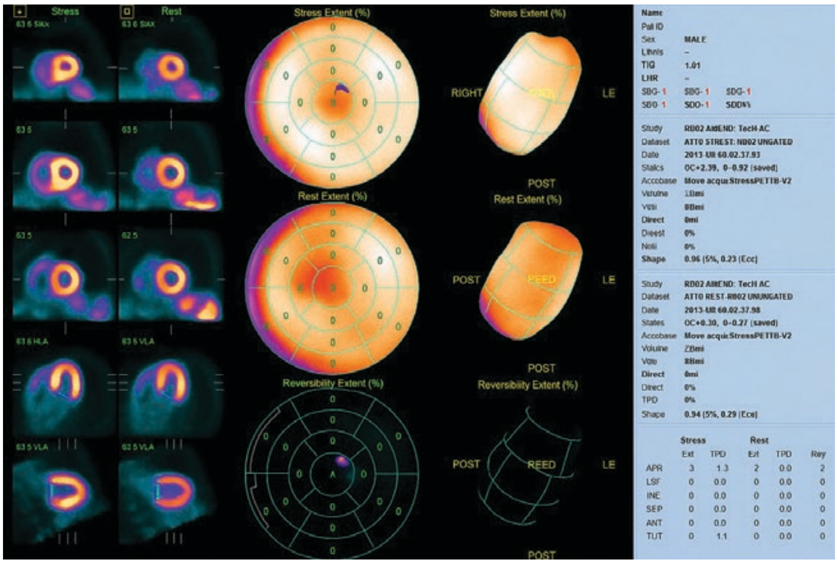

Figure 4. Myocardial PET/CT with Rb-82
Source: https://www.modernnuclear.com/service/cardiac-pet-ct-imaging/

Quantification is particularly important in women and patients with diabetes, as these populations often present with atypical disease manifestations and diffuse microvascular changes that anatomical methods cannot detect, leading to underestimation of true cardiovascular risk. PET/CT demonstrates superior diagnostic and prognostic value in these groups by enabling precise flow quantification and early disease detection. It is also highly useful in patients with inconclusive findings from other tests, allowing personalized diagnostics and more accurate risk assessment. This approach supports earlier implementation of targeted therapy, including more aggressive risk factor management, tailored pharmacotherapy, or referral for invasive diagnostics and revascularization (25,31).

Myocardial PET/MR: functional-anatomical assessment and clinical application

Myocardial PET/MR enables simultaneous evaluation of myocardial morphology, function, and perfusion, as well as detection of ischemia, fibrosis, scarring (LGE), and inflammatory processes. This is particularly valuable in subclinical CAD and in patients with inconclusive results from other tests. Short-lived perfusion radiotracers, such as N-13-ammonia or Rb-82, are used, and pharmacologic stress induces maximal vasodilation for optimal PET acquisition, alongside concurrent MR sequences (32).

Patient preparation includes fasting for 4–6 hours prior to the examination, temporary discontinuation of medications that affect perfusion, avoidance of caffeine, screening for MR contraindications (such as pacemakers, stents, and implants), and preparation for gadolinium contrast (33). MR is performed first to obtain anatomical and functional information, enabling MR-based attenuation correction of the PET signal using the MRAC algorithm (Figure 5). This approach allows quantitative radiotracer measurement and reduces artifacts in PET images (34).

Reconstruction of cardiac PET/MR images for the diagnosis of coronary artery disease (CAD) requires a series of technical steps to achieve high-quality and reliable diagnostic results. Attenuation correction is critical, and in PET/MR systems, it is based on MR data using Dixon or UTE sequences to generate μ-maps. Motion correction due to respiration and cardiac activity is also essential and is achieved through ECG and respiratory gating. Additionally, scatter and random coincidence corrections are applied to prevent image degradation (36).

Reconstruction is most commonly performed using the iterative OSEM algorithm, with the option of TOF technology to improve contrast and localization. Reconstructed images typically have voxel sizes of 2–4 mm, and reconstruction parameters (number of iterations and subsets) are tailored to the specific scanner. Gaussian filters are often applied post-reconstruction to reduce noise. In the PET component, perfusion defects appear as areas of reduced radiotracer uptake, indicating ischemia or scar. Quantitative analysis involves calculating myocardial blood flow (MBF) and coronary flow reserve (CFR), with a reduced CFR indicating hemodynamically significant disease. The MR component enables perfusion analysis at both stress and rest, as well as T2-weighted and T2 mapping for edema detection, LGE for scar assessment, and T1 mapping for diffuse myocardial changes (37).

Table 2. Comparison of PET/MR with PET/CT and SPECT/CT (38)

CHARACTERISTIC	PET/MR	PET/CT	SPECT/CT
SPATIAL RESOLUTION	high (MR)	moderate (CT)	low
FLOW QUANTIFICATION	yes (PET)	yes (PET)	limited
RADIATION EXPOSURE	low	higher	highest
VIABILITY ASSESSMENT	yes (MR and PET)	limited	limited
AVAILABILITY	limited	broader	broader
EXPENSE	high	moderate	low

The integration of PET and MR data enables the differentiation of viable ischemic tissue from non-viable myocardium, the assessment of perfusion, and the evaluation of functional changes. PET/MR has proven particu-

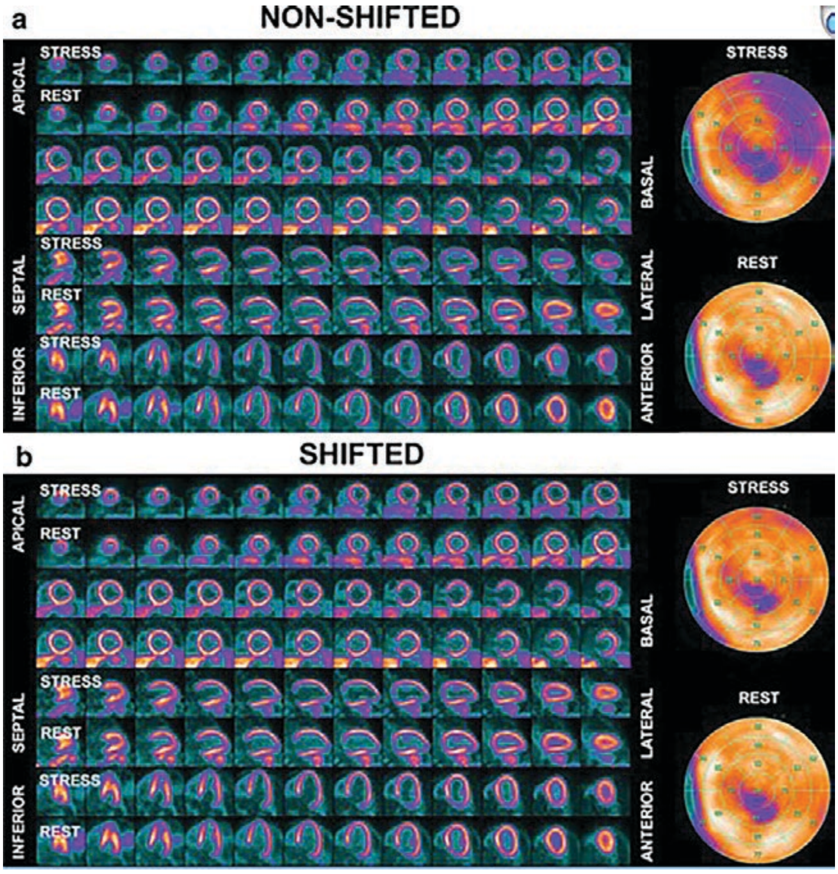

Figure 5. Example of misregistration artifact caused by myocardial motion. Images labeled "a" show a reduction in anterolateral counts on stress images, mimicking a reversible perfusion defect. Images labeled "b" demonstrate that manual adjustment of the MRAC map nearly fully normalizes the anterolateral wall, as shown in the repositioned images, revealing that the apparent perfusion defect was actually an artifact.
Source: Myocardial creep-induced misalignment artifacts in PET/MR myocardial perfusion imaging – PubMed

larly valuable in complex clinical scenarios and subclinical CAD. Although it offers superior diagnostic and prognostic value compared to SPECT/CT and PET/CT, high cost, demanding preparation, and technical complexity still limit its routine clinical use (Table 2) (38).

Radiologic technologist: an indispensable member in coronary disease diagnosis using hybrid imaging modalities

The radiologic technologist plays a pivotal role in conducting hybrid cardiac imaging using SPECT/CT and PET/CT technologies. The work of a radiologic technologist requires high-level expertise, interdisciplinary knowledge, and continuous professional development. Competencies should include specific nuclear medicine certifications, such as Radiologic Technologist – Nuclear (RT(N)) or Certified Nuclear Medicine Technologist (CNMT), which confirm the ability to safely handle radioactive sources and perform nuclear medicine procedures. Additionally, it is desirable for the technologist to hold further education or licensure for CT operation, such as Radiologic Technologist – Radiology/Computed Tomography (RT(R)(CT)) or an equivalent certification, in accordance with relevant legislation and institutional standards. The technologist must have a thorough understanding of cardiac anatomy and physiology, as well as electrophysiological processes and the fundamentals of coronary artery disease. Additionally, they must possess knowledge of various radiopharmaceuticals and their mechanisms to accurately and safely perform diagnostic procedures (39, 40).

Before imaging, the radiologic technologist is responsible for preparing the patient. This includes detailed patient education regarding the procedure, its duration, potential side effects, and the importance of following specific instructions, such as fasting for a prescribed period before the examination. Once the patient is adequately informed, the technologist prepares and administers pharmacologic stress agents. Depending on clinical indication and availability, medications such as adenosine, regadenoson, or dobutamine are used, which the technologist prepares and administers under physician supervision while monitoring the patient's condition. It is crucial that the technologist is aware of potential contraindications for contrast agents and stress medications, including asthma, conduction disorders such as AV block, iodine allergies, and other risk factors (41, 42).

One of the most critical responsibilities in hybrid imaging is the proper handling of radiopharmaceuticals. The technologist must be familiar with the specific preparation and administration of different radioactive compounds. For PET perfusion studies, radiopharmaceuticals such as Rb-82, N-13-ammonia, or O-15-H_2O are used, while F-18-FDG is employed for metabolic imaging, particularly in assessing inflammatory processes, myocardial viability, or sarcoidosis. Accurate dosing is determined based on the patient's body weight, the radiotracer's half-life, and institutional protocols. Any error in dosing can result in suboptimal diagnostic images or unnecessary radiation exposure, emphasizing the importance of precision and responsibility in practice (41).

During image acquisition, the technologist must thoroughly understand the CT component's functions due to its multifaceted role. CT is used for attenuation correction to reduce artifacts in PET or SPECT images, employing a low-dose, non-contrast protocol with breath-hold instructions to minimize motion. Coronary artery imaging is also performed to calculate the calcium score, which identifies and quantifies calcifications indicative of atherosclerotic changes. In certain protocols, contrast-enhanced CT angiography is performed to better visualize coronary anatomy, allowing precise correlation of perfusion defects with anatomical findings. Following the acquisition, the technologist performs image post-processing, including motion correction, respiratory phase alignment, and the accurate fusion of PET and CT images using specialized software. The technologist must recognize various artifacts, including those from improper attenuation correction, patient mispositioning, or technical issues during radiopharmaceutical administration. Regular quality assurance (QA/QC) is crucial for obtaining reliable results, minimizing variability, and promptly detecting equipment malfunctions. The technologist should be well-versed in routine and specific QA protocols, whether daily, weekly, monthly, or annual (40, 41, 42).

The radiologic technologist maintains detailed documentation for each patient, including radiopharmaceutical doses, type and timing of administration, pharmacologic stress protocols, and any observed clinical reactions. They are also responsible for adhering to safety procedures related to ionizing radiation and emergency protocols, such as managing adverse reactions to pharmacologic stress or allergic responses (39, 40).

PET/MR technology is increasingly important in cardiac diagnostics, requiring technologists to possess specific knowledge of MR safety protocols, including the recognition of contraindications such as ferromagnetic implants, and the ability to monitor patients during MR imaging. Additional responsibilities include patient preparation, aligning imaging protocols with clinical requirements, handling radiopharmaceuticals, and actively participating in post-processing and analysis of fused images (43).

According to EANM (European Association of Nuclear Medicine), SNMMI, and ASNC guidelines, technologists working on PET/MR systems should continuously expand their knowledge through specialized education and certification programs. Professional organizations emphasize a multidisciplinary approach, integrating nuclear medicine and MR technology, and encourage the use of modern educational programs and curricula adapted to emerging technologies, including online modules and workshops. For example, the ASNC PET Curriculum includes specialized PET/MR modules, while EANM and SNMMI provide recommendations and workshops focused on safety and quality in these imaging modalities (43).

In conclusion, the role of the radiologic technologist in hybrid cardiac imaging encompasses not only technical aspects but also educational and coordinative responsibilities. Their expertise enables integrated application of advanced technologies for high-quality and safe cardiac diagnostics, significantly contributing to improved clinical outcomes and personalized patient care (39).

Conclusion

Hybrid imaging modalities, such as SPECT/CT, PET/CT, and PET/MR, enable simultaneous assessment of anatomical and functional characteristics of coronary circulation, significantly improving diagnostic accuracy and evaluation of the hemodynamic significance of stenotic vessels. They are particularly valuable in women and diabetic patients, in whom the disease often presents with atypical symptoms. Radiologic technologists play a crucial role in implementing these methods, utilizing their expertise, continuous education, and adherence to guidelines from the SNMMI, ASNC, and EANM, which ensures high-quality imaging, proper radiopharmaceutical administration, and patient safety. Although hybrid methods present challenges such as high costs and complex protocols, their development and integration into clinical practice facilitate more precise diagnostics, earlier disease detection, and improved outcomes for individual patients.

All data in this paper are part of the results of the undergraduate thesis " Hybrid imaging of the heart" written at the Faculty of Health Sciences, University of Split (44). ■

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Hibridne slikovne metode u dijagnostici koronarne bolesti srca

Sažetak

Koronarna bolest srca i dalje je jedan od glavnih uzroka pobola i smrtnosti na globalnoj razini. Pravovremena i precizna dijagnoza od presudne je važnosti za odabir optimalnih terapijskih postupaka i poboljšanje ishoda liječenja. U tu svrhu primjenjuju se različite slikovne metode, dok hibridne tehnike oslikavanja objedinjuju prednosti pojedinih modaliteta te omogućuju detaljniji uvid u morfološke i funkcionalne karakteristike miokarda. Ovaj rad donosi pregled dostupnih slikovnih postupaka u dijagnostici koronarne bolesti srca, s posebnim naglaskom na značaj i primjenu hibridnih metoda kao suvremenog pristupa koji doprinosi učinkovitijem planiranju terapije i smanjenju potrebe za višestrukim dijagnostičkim pretragama. Posebna pažnja posvećena je ulozi radioloških tehnologa u cijelom dijagnostičkom procesu, njihovim svakodnevnim profesionalnim obvezama te važnosti kontinuiranog stručnog usavršavanja u području primjene hibridnih sustava.

Ključne riječi: hibridna oslikavanja, koronarna bolest srca, PET/CT, PET/MR, radiofarmaci, SPECT/CT, radiološki tehnolog, perfuzija miokarda