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Research Article

**THE IMPORTANCE OF MRI IN THE ANALYSIS OF CARDIAC  
PATHOLOGIES**<sup>1</sup>Dr Easha-Tur-Razia, <sup>2</sup>Dr Hina Ali, <sup>3</sup>Dr Azha Maqbool<sup>1</sup>AJK Medical College, Muzaffarabad AJK., <sup>2</sup>Quaid.e.Azam Medical College, Bahawalpur.,<sup>3</sup>Allama Iqbal Medical College, Lahore.**Article Received:** October 2020    **Accepted:** November 2020    **Published:** December 2020**Abstract:****Purpose:** MRI of the heart is a non-invasive diagnostic tool for cardiac pathology compared to echocardiography, angiography and cardiac computed tomography and this study was held to determine its efficacy.**Duration:** The study was conducted at the Radiology department of Bahawal Victoria Hospital, Bahawalpur for six-months duration from March 2020 to August 2020.**Methods:** 30 patients with a clinically diagnosed cardiac problem were scanned after informed consent in the Philips Achieva 1.5T MR system**Results:** Of the 30 patients, 25 showed (ejection fraction) cardiac function almost equal to EF on echocardiography, but anatomical anomalies or lesions are better detected by MRI (10: 4). On the other hand, compared to the 64-slice CT scan of the heart, living walls and functions were better diagnosed with MRI, however, CT of the heart has advantages over MRI in diagnosing coronary problems.**Keywords:** ejection fraction (EF), magnetic resonance imaging (MRI), computed tomography (CT), echocardiography, coronary artery disease (CAD)**Corresponding author:****Dr Easha-Tur-Razia**

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**INTRODUCTION:**

Magnetic resonance imaging (MRI) of the heart has a wide range of clinical applications. Many of these applications are commonly used in clinical practice - for example, in the assessment of congenital heart defects, heart tumors, pericardium, right ventricular dysplasia, and hibernating myocardium. Other applications, such as the assessment of myocardial perfusion and valve and ventricular function, are very carefully assessed by MRI, but in clinical practice competing methods such as single photon emission computed tomography (SPECT) imaging and echocardiography are used more frequently. Some applications, such as imaging of the coronary arteries, are now being more closely evaluated by other methods. MRI of the heart is a valuable and accurate method for assessing the structure and function of the heart. It is increasingly recognized as a useful non-invasive test in the treatment of cardiovascular disease as a result of significant advances in MR technologies. Assessment of congenital heart disease is an important application of cardiac MRI as the morphological details of the ventricles, septum, defects and abnormal connections are accurately presented. Additionally, information is provided on flow through valves, chambers, outflow paths and bypasses. Its usefulness is further enhanced, especially when observing patients after corrective surgery. The specific advantages of MRI in assessing women include excellent soft tissue characterization and contrast, three-dimensionality, absolute blood flow quantification, and overall better temporal and spatial resolution for imaging vascular and myocardial abnormalities.

**ADVANTAGES:**

1. No radiation
2. Independent of acoustic windows
3. Can image at any angle and on any plane
4. Repeatable method for quantifying the functions of the chambers
5. Quantification of the flow
6. Does not require sedation in older children.

**PROTOCOL:**

1. ECG Phase-gated images
2. Phased Array coil was used.
3. Planned photos are as follows
  - Coronal (one to three images), passing through the mid-third of the chest to provide landmarks for the skull and tail.
  - Axial (six images), planned in a coronary examination, by the heart.
  - Oblique (six images), planned in the axial scout, parallel to the ventricular septum.

**PATIENTS AND METHODS:**

Cardiac MRI is a non-invasive diagnostic tool for cardiac pathology, compared to echocardiography, angiography, and a CT scan of the heart. This study was conducted in the Radiology department of Bahawal Victoria Hospital, Bahawalpur for six-months duration from March 2020 to August 2020. Patients were selected from Medical Indoor and OPD. 30 patients with a clinically diagnosed cardiac problem were scanned after informed consent was obtained in the Philips Achieva 1.5T MR system. NPO 2 to 4 hours prior to the application of I / V contrast. Non-ionic gadolinium contrast was used as needed. 20 ml of non-ionic intravenous contrast was administered at a rate of 3-5 ml / s and images were obtained at 4-5 mm intervals through the chest. The images were transferred to the operating console for further measurements.

**RESULTS:**

Of the 30 patients, 25 showed cardiac function (ejection fraction) almost equal to EF on echocardiography, but anatomical anomalies or abnormalities are better detected by MRI (10: 4). On the other hand, compared to the 64-slice CT scan of the heart, living walls and functions were better diagnosed with MRI, however, CT of the heart has advantages over MRI in diagnosing coronary problems.

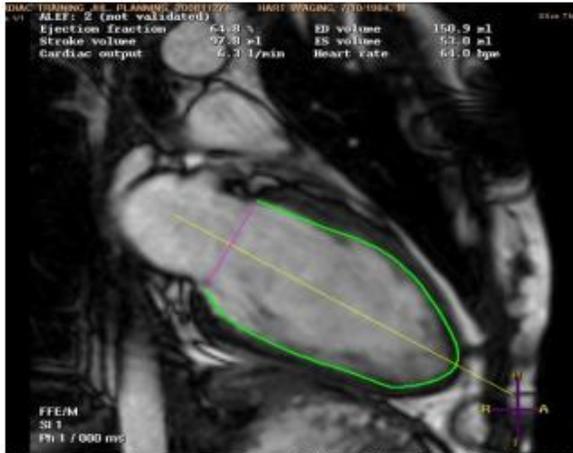


Figure 1: Measurement of the Ejection fraction in MRI. (Long axis sequences)

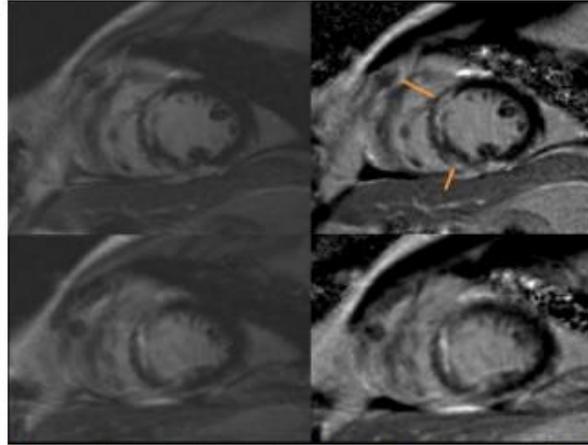


Figure 2: Acute myocardial Infarction showing delayed enhancement. (short axis sequences)

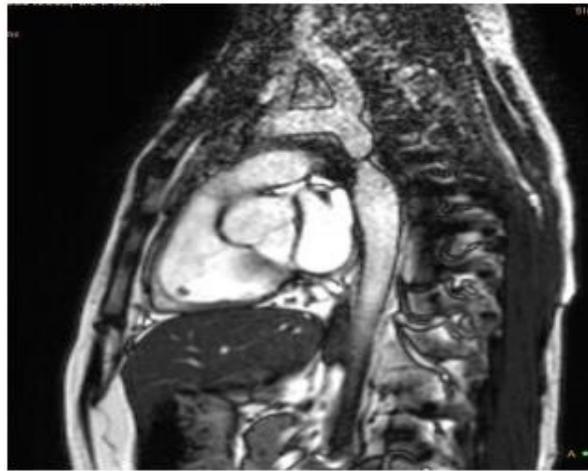


Figure 3: Aortic sequences showing co-arctation of the aorta in 26 years old man.

### DISCUSSION:

More than 400,000 women in the United States die each year from cardiovascular disease (CVD), making them the leading cause of death in the United States. In addition to its ability to provide anatomical and functional data, magnetic resonance imaging (MR) can also provide tissue characterization, a technique that will help distinguish between sensitive and stable plaques and which is considered the Holy Grail in cardiac diagnosis. One of the main advantages of cardiac MRI is the absence of ionizing radiation, which is important for SPECT and computed tomography (CT). The strength of cardiac magnetic resonance imaging in comparison to computed tomography is better time and contrast resolution. However, the spatial resolution of CT is better. While there are competing methods for every clinical application of cardiac magnetic resonance imaging, there is no single method that can provide as comprehensive an assessment as MRI. For this

reason, MRI of the heart is often referred to as the "on-site shop". The challenges faced by other non-invasive diagnostic methods indicate that cardiac MRI is an ideal non-invasive means of imaging women. Overall, non-invasive methods face the challenge of detecting the disease in women who have smaller epicardial coronary arteries, a lower left ventricular mass, and a smaller left ventricle size than men, and a larger chest<sup>3</sup>. This ability requires improvement in many areas: through the currently available resolution of MR images, which can be obtained with high-speed imaging methods such as parallel imaging; thanks to new data acquisition strategies that are fully controlled by the spectrometer. The main goal of MRI in this application is to develop techniques for recognizing acute infarction and differentiating viable myocardium from non-viable myocardium. The literature is full of MRI studies of acute myocardial infarction (MI). Many articles discuss the presence of

increased signal intensity in T2-weighted acute infarction regions; However, Filipchuk et al. Revealed that although the sensitivity was adequate (88%), the specificity was only 17% compared to the control. Myocardial thinning was the most specific symptom in MI (88%) and the sensitivity was only 67%. Variation in subendocardial signal intensity can also be difficult to distinguish from flow gain. In a study by Rogers et al. 17 patients with recurrent myocardial infarction underwent marker imaging and intravenous contrast enhancement at weeks 1 and 7. MRI is very sensitive in the diagnosis of constrictive pericarditis. For constrictive pericarditis, a diffuse pericardial thickening of 4 mm or greater has an accuracy of 93%. Importantly, the MR perfusion imaging study by Panting et al. Showed that subendocardial ischemia may be responsible for chest pain in women with non-obstructive angina. Myocardial perfusion reserve, which can be assessed by comparing stress and stress-free MR perfusion measurements, is inversely associated with cardiac risk factors and coronary calcium in asymptomatic individuals, including patients with nonobstructive CAD. Previously, steady-state slow precession imaging sequences were limited to 1.5T due to increased static field heterogeneity in 3T. Recent technological advances in local shims correct the static magnetic field and have allowed these techniques to be used in 3T, using their ability to double the total acquisition SNR.

### CONCLUSION:

MRI of the heart has emerged as one of the most effective non-invasive imaging techniques in almost all heart disease groups. The increased availability of dedicated cardiovascular MRI scanners with better image quality will continue to increase the number of tests performed with this method.

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