A Physician’s Guide to
Cardiac MR Imaging

Advances in technology... diagnosis you can trust.

Cardiac MR imaging is an emerging frontier for the evaluation of cardiovascular disease.
Cardiac MR imaging at Yale-New Haven Hospital

Cardiac MRI (magnetic resonance imaging) examinations may be performed as adjunctive studies to echocardiography and/or cardiac catheterization or may be performed as independent examinations.

Cardiac Physiology

Information regarding cardiac perfusion and function can be obtained with MRI. Assessment of indices of global cardiac function (e.g., ejection fraction) can be obtained as evaluation of regional myocardial function. Assessment of pressure and volume overload can be indirectly assessed via the evaluation of ventricular volumes and myocardial mass.

Cardiovascular Anatomy

Due to its multi-planar capabilities, MRI is well suited to evaluate complex cardiovascular anatomy. This is particularly useful in infants with complex congenital heart disease or adults with repair of congenital heart disease in whom anatomic characterization is required for diagnosis. This assessment includes evaluation of the heart and great vessels.

Congenital Heart Disease

Cardiac MRI may be performed for the diagnosis and assessment patients with known or suspected congenital heart disease. MRI may also be used to assess cardiac function and shunt/baffle patency in patients with surgically treated congenital heart disease.

Valvular Disease

MRI has similar sensitivity and specificity to echocardiography in the identification and quantification of valvular disease and may be used when echo evaluation is technically limited. Phase contrast imaging allows the quantification of valvular regurgitation and stenosis. Valve morphology and movement can also be assessed.
**Myocardial Perfusion and Viability**

These two studies are often performed during the same session. Myocardial perfusion can be assessed at rest and during pharmacologic stress. When Gadolinium-based intravenous contrast is administered, areas of diminished perfusion can be identified. Myocardial viability is assessed by imaging the myocardium 8-15 minutes after intravenous contrast enhancement. Areas of scar will demonstrate enhancement on the delayed images in comparison to the normal myocardium.

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**Putting trust in our imaging...**

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**Myocardial Function**

Cardiac function may be assessed through a variety of MRI techniques. Images are acquired in the short axis and four chamber views through the entire cardiac cycle in order to assess regional and global myocardial function. Like echocardiography and gated SPECT images, cardiac MRI allows for the identification and quantification of areas of abnormal function.

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**Constrictive vs. Restrictive Cardiomyopathy**

Differentiation of constrictive from restrictive cardiomyopathy has clear clinical implications as constrictive disease may be amenable to surgical intervention while restrictive disease is medically managed. MRI allows for differentiation of these two entities based upon its exquisite evaluation of even focal pericardial thickening (constrictive disease) and of myocardial thickening and abnormal signal characteristics (restrictive disease).

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**Cardiac Masses**

Cardiac masses are often identified on CT imaging or echocardiography. MRI allows for full characterization of intra- and para-cardiac masses, including location, mobility, attachments and enhancement characteristics. MRI allows differentiation of intra-luminal clot from tumor. Gadolinium-based intravenous contrast may be required for this indication.

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**Cardiac Indices (EF, SV, LV Mass)**

Short axis bright blood images are utilized to calculate end systolic and diastolic right and left ventricular volumes, ejection fraction, stroke volume and myocardial mass. There is an excellent correlation of MRI data with echocardiography results. MRI is superior to echocardiography in the evaluation of right ventricular functional measurements due to the relative ease of MRI of the right ventricle.
ARRHYTHMOGENIC RV DYSPLASIA (ARVD)

ARVD is a known cause of sustained ventricular tachycardia that can lead to sudden cardiac death in young patients. There are a number of diagnostic criteria including ECG, clinical and imaging findings. MR imaging is the diagnostic imaging modality of choice. Findings include abnormal right ventricular contractility, RV aneurysms and fat within the right ventricular free wall.

There is a vast amount of information which may be obtained by MRI including evaluation of cardiovascular anatomy, perfusion, function, valvular assessment and evaluation of pericardial disease and myocardial viability. Each examination must be tailored to answer the clinical question posed.

For complete details, questions, or an individualized consultation of our services, you may contact:
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