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MR Imaging of Cardiac Masses	137
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<p>Cardiac MR imaging is the preferred method for assessment of cardiac masses. A comprehensive cardiac MR imaging examination for a cardiac mass consists of static morphologic images using fast spin-echo sequences, including single-shot techniques, with T1 and T2 weighting and fat suppression pulses as well as dynamic imaging with cine steady-state free precession techniques. Further tissue characterization is provided with perfusion and delayed enhancement imaging. Specific cardiac tumoral characterization is possible in many cases. When specific tumor characterization is not possible, MR imaging often can demonstrate aggressive versus nonaggressive features that help in differentiating malignant from benign tumors.</p>	
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<p>Cardiomyopathies, diseases of the myocardium associated with cardiac dysfunction, include hypertrophic, restrictive, and dilated forms and rare entities, such as arrhythmogenic right ventricular dysplasia, ventricular noncompaction, and apical ballooning syndrome. Many have similar presentations, but the underlying condition determines prognoses and treatment. Cardiac MR imaging plays a role in characterizing the range of entities and is crucial for evaluation and management. In addition, delayed enhanced imaging can allow differentiation among the forms of cardiomyopathy and offer prognostic information. As the speed and technical ease of cardiac imaging improve, MR imaging will assume an increasing role in the care of patients who have cardiomyopathy.</p>	
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<p>Imaging of the pericardium requires understanding of anatomy and the normal and abnormal physiology of the pericardium. MR imaging is well-suited for answering clinical questions regarding suspected pericardial disease. Pericardial diseases that may be effectively imaged with MR imaging include pericarditis, pericardial effusion, cardiac-pericardial tamponade, constrictive pericarditis, pericardial cysts, absence of the pericardium, and pericardial masses. Although benign and malignant primary tumors of the pericardium may be occasionally encountered, the most common etiology of a pericardial mass is metastatic disease.</p>	

MR Imaging of Ischemic Heart Disease

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Gautham P. Reddy, Sandra Pujadas, Karen G. Ordovas, and Charles B. Higgins

When ischemic heart disease (IHD) is suspected or confirmed, the primary imaging modality is echocardiography. When appropriate, complementary examinations can be performed. These include stress perfusion scintigraphy, cardiac catheterization, coronary angiography, and CT. MR imaging techniques have developed rapidly over the past several years, and MR imaging has the ability to delineate myocardial perfusion, ventricular function, and myocardial viability in a single examination. Although coronary MR angiography is promising, in recent years it has been supplanted as a noninvasive imaging modality by coronary CT angiography. The other capabilities of MR imaging suggest that it will be performed more and more frequently for the assessment of IHD.

MR Imaging of the Thoracic Aorta

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Derek G. Lohan, Mayil Krishnam, Roya Saleh, Anderanik Tomasian, and J. Paul Finn

MR imaging has been incorporated into the diagnostic algorithm for suspected thoracic aortic pathology, challenging CT and invasive catheter angiography as investigations of choice. Techniques, including spin echo, 3-D steady-state free precession, cardiac cine imaging, phase-contrast flow quantification, and high-resolution contrast-enhanced magnetic resonance angiography, are poised to trump other single competitive modalities. The proliferation of 3-tesla systems has advanced the performance of magnetic resonance, aided by parallel imaging techniques, multiarray surface coils, and powerful gradient coils. This article considers the current status of MR imaging in evaluation of the thoracic aorta, with reference to common clinical indications in clinical practice.

Time-Resolved MR Angiography of the Thorax

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Derek G. Lohan, Mayil Krishnam, Anderanik Tomasian, Roya Saleh, and J. Paul Finn

Time-resolved magnetic resonance angiography (TR-MRA) has received considerable attention recently owing to its ability to provide a dynamic complement to otherwise “static” high-resolution 3-D contrast-enhanced MRA for a variety of clinical indications. Steady technologic advances, including ultrafast pulse sequences, phased multiarray surface coils, parallel data acquisition techniques, and the widespread availability of high-field magnetic resonance systems, have enhanced the clinical usefulness of TR-MRA. This article considers the current role of TR-MRA in thoracic imaging, illustrating many of its clinical applications, and potential future of this recent approach to noninvasive dynamic vascular evaluation.

MR Imaging of Thoracic Veins

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Navid Rahmani and Charles S. White

The thoracic venous system can be visualized and characterized well with MR imaging. In this article, MR sequences that are suited for this purpose (including the more advanced techniques) are reviewed. The normal thoracic venous anatomy and a brief summary of its embryogenesis is provided. The appearances of congenital and acquired abnormalities of the systemic and pulmonary thoracic veins are described. This article also discusses recent applications of MR imaging in the evaluation of the pulmonary veins and the left atrium in patients who have atrial fibrillation.

MR Imaging/Magnetic Resonance Angiography of the Pulmonary Arteries and Pulmonary Thromboembolic Disease 263

Sebastian Ley and Hans-Ulrich Kauczor

Magnetic resonance angiography (MRA) of the pulmonary arteries still is a rapidly evolving technique with already proved high clinical usefulness. Contrast-enhanced and non-contrast-enhanced angiographic techniques are widely available for high spatial or real-time imaging of the pulmonary arteries. Multiple step protocols, such as perfusion MR imaging followed by high spatial resolution contrast-enhanced MRA, seem to be an optimal clinical approach for the assessment of different vascular diseases affecting the pulmonary arteries. This review article describes the MR imaging techniques available and their application in acute and chronic thromboembolic disease.

Functional MR Imaging of the Lung 275

Shin Matsuoka, Andetta R. Hunsaker, Ritu R. Gill, Francine L. Jacobson, Yoshiharu Ohno, Samuel Patz, and Hiroto Hatabu

Recent development of MR techniques has overcome many problems, such as susceptibility artifacts or motion artifact, allowing both static and dynamic MR lung imaging and providing quantitative information of pulmonary function, including perfusion, ventilation, and respiratory motion. Dynamic contrast-enhanced MR perfusion imaging is suitable for the evaluation of angiogenesis of pulmonary solitary nodules. ^{129}Xe MR imaging is potentially a robust technique for the evaluation of various pulmonary function and may replace ^3He . The information provided by these new MR imaging methods is proving useful in research and in clinical applications in various lung diseases.

MR for the Evaluation of Obstructive Pulmonary Disease 291

Julia Ley-Zaporozhan, Michael Puderbach, and Hans-Ulrich Kauczor

Obstructive lung diseases include emphysema, chronic bronchitis, chronic obstructive pulmonary disease, asthma, and cystic fibrosis. These diseases are a heterogeneous group of pulmonary disorders that share in common obstruction of air flow and deranged gas exchange. Traditionally these diseases are evaluated with clinical testing, such as pulmonary function tests, but such tests provide only global measures of respiratory function. MR techniques designed for obstructive lung disease have the capability of directly imaging the anatomic and pathophysiologic derangements and may prove useful for monitoring response to therapy.

MR Imaging in Diagnosis and Staging of Pulmonary Carcinoma 309

Alla Godelman and Linda B. Haramati

Lung cancer is the most common cause of cancer-related death for men and women in the United States. Accurate cancer staging is essential for determining appropriate management and predicting prognosis. CT, along with positron emission tomography with fluorodeoxyglucose, currently is the main imaging modality for staging lung cancer. The role of MR imaging is limited, although improvements in MR imaging technology and contrast media potentially will make MR imaging a viable ionizing-radiation-free alternative.

MR Imaging of Benign and Malignant Pleural Disease

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Ritu R. Gill, Victor H. Gerbaudo, Francine L. Jacobson, Beatrice Trotman-Dickenson, Shin Matsuoka, Andetta Hunsaker, David J. Sugarbaker, and Hiroto Hatabu

MR imaging serves as a problem-solving tool in the diagnosis of inflammatory and infectious pleural diseases and primary and secondary pleural malignancies. Knowledge of MR imaging appearance of pleural diseases, including pleural effusions and empyema, benign and malignant pleural tumors, and especially mesothelioma, helps guide treatment decisions and surgical planning.

MR Imaging of the Thoracic Inlet

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Ellen E. Parker and Christine M. Glastonbury

The thoracic inlet serves as the junction between the neck and the chest. As such, it is sometimes considered a sort of “no-man’s-land” between the well-defined and comfortable territories of the thoracic radiologist and that of the head and neck radiologist. Crucial digestive, respiratory, vascular, lymphatic, and neural structures traverse the thoracic inlet. Endocrine structures also are in close proximity to, and sometimes extend into, the thoracic inlet. Familiarity with the normal anatomy of the thoracic inlet on routine chest or neck imaging, and on dedicated high-resolution examinations of such areas as the brachial plexus, is critical for detection and characterization of pathologic conditions.

MR Imaging Evaluation of Disorders of the Chest Wall

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Theodore J. Lee and Jeremy Collins

Chest wall lesions constitute a diverse group of thoracic diseases, including those of soft tissue and osseous origin. MR imaging, with its superior tissue-resolving capability and multiplanar image acquisition, is an important tool for assessing chest wall lesions. In this article, the authors review common and uncommon diseases of the chest wall, with an emphasis on the MR imaging characteristics of these diseases. Among the diseases they discuss are diseases of the soft tissue including lipoma, hibernoma, liposarcoma, hemangioma, and lymphoma. They also examine diseases of the osseous thorax, including benign osseous tumors, fibrous dysplasia, and aneurysmal bone cyst. In addition, they discuss such malignant osseous tumors as osteosarcoma and Ewing’s sarcoma.

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