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Magnetic Resonance Imaging and Computed Tomography of Cardiac Masses and Pseudomasses in the Atrioventricular Groove

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Abstract

The atrioventricular (AV) groove constitutes the anatomic space separating the atria and ventricles. The AV groove is often difficult to visualize at echocardiography, and suspected lesions can be further assessed with cardiac computed tomography or magnetic resonance imaging. AV groove lesions may originate from within the AV groove or extend into this space from adjacent structures. The differential diagnosis for AV groove lesions is often wide, but a precise diagnosis can sometimes be made. This pictorial essay illustrates the magnetic resonance imaging and computed tomography appearance of common and uncommon AV groove lesions, and attempts to provide a logical framework for differential diagnosis when confronted with a known or suspected lesion at cross-sectional imaging.

Resumé

Le sillon atrio-ventriculaire est l'espace anatomique situé entre les atriums et les ventricules. L'échocardiographie permet rarement de le voir correctement. Pour vérifier la présence de lésions, la tomodensitométrie cardiaque ou l'imagerie par résonance magnétique est plus efficace. Les lésions peuvent provenir de l'intérieur même du sillon atrio-ventriculaire ou pénétrer le sillon à partir des structures adjacentes. Bien que le diagnostic différentiel des lésions au sillon atrio-ventriculaire soit souvent vague, on peut parfois poser un diagnostic précis. Cet essai illustre l'apparence des lésions courantes et peu courantes au sillon atrio-ventriculaire sur les images obtenues par résonance magnétique ou par tomodensitométrie, et tente de fournir un cadre logique pour poser un diagnostic différentiel lorsqu'un examen d'imagerie transversale confirme ou laisse supposer la présence de lésions.

Key Words: Cardiac mass; Cardiac CT; Cardiac MRI

The atrioventricular (AV) groove (also known as the coronary sulcus) constitutes the anatomic space encircling the right and left AV valves, and contains the right and circumflex coronary arteries, the coronary sinus, fat, and small nerves and lymphatic vessels. The AV groove can be a difficult region to visualize with echocardiography, and referrals for cross-sectional imaging for further characterization of a lesion or potential pseudolesion are not uncommon in our practice.

AV groove lesions may originate from within the AV groove or extend into this space from adjacent structures such as the atria, ventricles, valves, and pericardium. The differential diagnosis for AV groove lesions is often wide, but a precise diagnosis (or nondiagnosis in the case of pseudolesions) can occasionally be made. This pictorial essay illustrates the appearance of common and uncommon AV groove lesions with magnetic resonance imaging (MRI) and computed tomography (CT), and attempts to provide a logical framework for differential diagnosis when confronted with a known or suspected lesion at cross-sectional imaging.

General Considerations

CT Technique

Electrocardiographic (ECG)–gated cardiac CT or coronary CT angiography (CTA) is generally preferable to nongated CT; however, images may be diagnostic even on nongated studies, particularly when high pitch, rapid scan protocols are employed using modern multidetector

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Table 1
Classification of AV groove lesions.

	Characteristics	Differential diagnosis
Mass		
Angiosarcoma	Heterogeneous, infiltrative, favors RA and RV	Metastasis, lymphoma, Erdheim-Chester disease
Lymphoma	Uniform, infiltrative but occasionally focal, hypoenhancing, marked hyperactivity on PET/CT	Angiosarcoma, Erdheim-Chester disease, metastasis
Metastasis	Circumscribed > infiltrative, usually known metastatic disease in other sites	Angiosarcoma, lymphoma
Thymoma	Extension from mediastinal mass	Metastasis, lymphoma
Paraganglioma	Highly vascular, parasitizes blood supply from coronary arteries, elevated serum metanephrines	Hypervascular metastasis (melanoma, breast), angiosarcoma
Schwannoma	Circumscribed, target appearance on T2-weighted images, slow enhancement	Metastasis
Lymphangioma	Marked T2 hyperintensity, infiltrative or cystic	Hemangioma, angiosarcoma
Inflammatory/proliferative		
Erdheim-Chester disease	Favors right heart, infiltrative, AV groove enhancement, associated periaortitis, perirenal fibrosis	Lymphoma, IgG4-related disease
IgG4-related disease	Coronary periaortitis, AV groove and right atrial infiltration, associated pancreatic, biliary, renal involvement	Erdheim-Chester, lymphoma
Sarcoid	Basal septal thickening and/or delayed myocardial enhancement, associated mediastinal/hilar adenopathy	Lymphoma
Vascular/cardiac chamber lesions		
Coronary aneurysm	Usually atherosclerotic, may be mistaken for mass on echocardiography, particularly with extensive peripheral thrombus	
Coronary fistula	Dilated coronary artery and draining vein or cardiac chamber	Coronary artery aneurysm
CABG aneurysm	Aneurysm along course of bypass graft	Coronary artery aneurysm, pericardial cyst
Cardiac chamber aneurysm or pseudoaneurysm	Blood-containing structure communicating with cardiac cavity, often associated with infection, prior surgery or infarction	Coronary artery aneurysm
Pseudolesions/miscellaneous		
AV groove fatty proliferation	CT or MRI is diagnostic	
RCA within RA	CTA demonstrates course of RCA within right atrium	
Caseous mitral annular calcification	Noncontrast CT demonstrates calcification of the lesion within or adjacent to the mitral annulus	

AV = atrioventricular; CABG = coronary artery bypass grafting; CT = computed tomography; CTA = computed tomography angiography; MRI = magnetic resonance imaging; PET = positron emission tomography; RA = right atrium; RCA = right coronary artery; RV = right ventricle.

systems. ECG-gated cardiac CT examinations can be acquired using prospective or retrospective gating. Prospective gating has the advantage of significantly lower radiation doses, whereas retrospective gating offers the opportunity to reconstruct cine images demonstrating the effect of AV groove lesions on cardiac function. Retrospective gating also allows more flexible reconstruction of images at different phases of the cardiac cycle, which may minimize motion artifact. Cardiac medications frequently employed in coronary CTA (beta-blockers such as propranolol to reduce the heart rate and vasodilators [typically nitroglycerin] to distend coronary arteries) are also useful in imaging AV groove lesions. Slow heart rates (below 60 beats/min) are particularly helpful for minimizing artifact when using prospective gating. Vasodilators may provide optimal visualization of vascular lesions. Contrast-enhanced images

Table 2
Differential diagnosis of AV groove masses

Imaging feature	Differential diagnosis
Infiltrative	angiosarcoma, lymphoma, lymphangioma, Erdheim-Chester disease, IgG4-related disease, sarcoid
Well defined	metastasis, paraganglioma, schwannoma, thymoma
High T2 signal intensity (MRI)	lymphangioma, paraganglioma, slow-flow vascular lesions
Hypervascular	metastasis (melanoma, breast), paraganglioma
Hypovascular	lymphoma, metastasis
Late enhancement (MRI)	Erdheim-Chester disease, sarcoid, IgG4-related disease

MRI = magnetic resonance imaging.