Imaging Assessment of Intracardiac Foreign Bodies

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IFB are rare, but pose potentially life-threatening complications. If detected early, they can be treated successfully using endovascular or open surgical techniques. Specific localization is necessary to avoid unnecessary and inappropriate therapeutic approach. Diagnosis of IFB may be easily suspected immediately after injury when there are clinical manifestations related to the heart, including cardiac tamponade or bleeding. This can be very challenging in the absence of trauma. The presenting symptoms are nonspecific and include pericarditis and pericardial effusion, pericardial tamponade, arrhythmia, thrombi, elevated troponin, fever/infection, shock and death. Therefore, extreme caution is required in certain sub-groups of the adult population, in which IFB may be found with increased frequency, including patients with history of vascular or thoracic interventions, patients with implanted cardiac or vascular devices, drug users. This diagnosis may also be made incidentally in asymptomatic patients, who potentially may become symptomatic in the future. Plain radiography provides the mainstay of imaging investigation. CT is helpful demonstrating the presence of radiolucent foreign bodies and determining the exact localization, especially prior to any planned intervention.

Diagnosis of IFB can be challenging in the absence of suspected heart injury due to nonspecific symptomatology. Cardiac imagers should be aware of typical imaging appearance and carefully search for foreign objects in the heart, especially in high risk adult populations, due to possible risk of life-threatening complications.

References
Cardiomyopathy: Decreased left ventricular systolic function, segmental hypokinesia in areas affected, edema present during acute inflammation. Myocardial delayed enhancement in majority of patients (up to 90%) subendocardial, mid myocardial or subepicardial. Pericardium: Pericardial effusion may be present

Case Presentation
29 year old female with a history of asthma diagnosed at age of 21 years, presented with chest pain, dyspnea, nonproductive cough, rash in lower extremities, 9kg weight loss.

Labs: elevated troponin of 6.6 (N:0.0-0.3), leukocytosis with absolute eosinophil count of 5970 (N:500).

ECG: Q waves in III and AVF as well as abnormal R waves seen in the V4 suggestive of anteroseptal infarction.

TEE: findings as below, Cath was normal.

CMR showed findings most consistent with Churg-Strauss syndrome.

Loeffler Endocarditis
(Loeffler Endocarditis is also known as simple pulmonary eosinophilia) typically presents with transient radiographic infiltrates and elevated eosinophil count in peripheral blood.

Usually the cause is not identified but a number of allergens have been linked to the syndrome, including parasites (ascaris, strongyloides, ankylostoma) and drugs (aspirin, penicillin).

Typical Imaging Findings
CMR: HRICT: transient non segmental air space opacification unilateral or bilateral, usually predominantly peripheral distribution.
The most common cardiac manifestation is endocarditis. Acute eosinophilic infiltration of endocardium and myocardium results in thrombosis, inflammation, and fibrosis of intramural coronary arteries, mural thrombosis and endocardial fibrosis. Subsequently a restrictive right heart cardiomyopathy can develop.

Case Presentation
46 year old female with a history of asthma and multiple allergies, presented with palpitations, dyspnea, and orthopnea.

Labs: leukocytosis with absolute eosinophil count of 560 (N:0-500).

ECG: sinus rhythm, non-specific intraventricular conduction delay, probable anterior infarct.

CXR: Cardiomegaly

TEE: biventricular thrombus. Cath was normal. CMR showed findings most consistent with eosinophilic endocarditis.

Imaging Manifestations of Eosinophilic Heart Disease
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Although the etiology of EHD is not always apparent, important causes include hypersensitivity to a drug or substance, parasitic infections, or vasculitis (such as Churg-Strauss syndrome). EHD occurs also in more than 50% of patients with idiopathic hypereosinophilic syndrome, which represents a spectrum of diseases, including Davies’ endomyocardial fibrosis and Loffler’s myocarditis. The spectrum of clinical presentation is wide including acute cardiitis (endocarditis, myocarditis, pericarditis), new onset heart failure with ventricular dilation or restrictive changes, electric disturbances (sinus tachycardia, conduction delays and ST-T wave abnormalities), acute coronary syndrome, and cardiogenic shock. Peripheral blood eosinophilia is not necessarily seen in all cases of EHD, but this, the diagnosis is often not suspected clinically.

The natural history of EHD is usually rapidly progressive untreatable congestive heart failure and death, which may be sudden. Clinical improvement is possible with early corticosteroid treatment; therefore early diagnosis is extremely important. Endomyocardial biopsy is a valuable tool to confirm the diagnosis if positive, but it is not a very sensitive technique because the infiltrates in EHD are often focal (estimated sensitivity 50%). CMR is a valuable diagnostic tool in suspected EHD as it can visualize pattern of inflammatory changes in the myocardium. Imaging may also be helpful in treatment monitoring.

Typical imaging findings
CMR showed findings most consistent with Churg-Strauss syndrome.

Eosinophilic heart disease is a rare, potentially fatal disease, which is rarely recognized clinically and often first discovered at postmortem examination.

The gold diagnostic standard is endomyocardial biopsy, however it is invasive, time consuming and low sensitivity method.

Cardiac MR emerges as a valuable diagnostic tool establishing the diagnosis. It may be also useful in evaluation of prognosis and treatment response.

Eosinophilic Syndrome
Defined as persistent (> 6 months) peripheral blood eosinophilia (> 1500 eosinophils/mm³) and lack of evidence for a known cause of eosinophilia (such as parasitic infection, allergy, or hematologic malignancy) with multigorgan infiltration with eosinophilic heart, lungs, liver, GI tract, kidneys, nervous system and possible damage.

Hypereosinophilic Syndrome
58 year old male with a history of asthma and hypertension, presents with substernal chest pain and dyspnea.

Labs: leucocytosis of 5.9 with absolute eosinophil count of 7980 (N:500).

ECG: sinus tachycardia, LA and LV enlargement.

CXR: Cardiomegaly, bilateral pleural effusions, bilateral patchy airspace opacities, more on the left.

CT: Cardiomegaly, a small pericardial effusion, low attenuation clot in the left ventricle.

Cardiac Disease
- Combined right and left ventricular involvement
- Fibrous obliteration of ventricular apices
- Atrioventricular valve regurgitation
- Pericardial effusion may be present

Pulmonary: Affected in 40%
Plural effusions
Transient hazy opacities or consolidation
Nodules ≤ 1cm with surrounding ground-glass attenuation