OVERVIEW OF CARDIAC IMAGING

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Echocardiogram

Trans-esophageal Echo (TEE)

Nuclear Cardiology (SPECT/PET) (Stress/viability)

Cardiac CT (CT coronary/structural CT)

Cardiac MRI

Cardiac Catheterization
• What is the question we want to answer
• What is the structure we want to see/evaluate
• Anatomy vs function
• Possible associated abnormalities
ECHOCARDIOGRAM: THE FIRST CHECK POINT

- Evaluate the systolic (EF) and diastolic function
- Evaluate the wall motion

- Evaluate the valves
  - Structure of the valves
  - Function of the valves
ECHOCARDIOGRAM: THE FIRST CHECK POINT

• The left atrium – Atrial Fib

• The right ventricle: PE, ASD, pulmonary HTN,
ECHOCARDIOGRAM: THE FIRST CHECK POINT

- Pericardial effusion and tamponade
- The IVC and fluid status
Used to evaluate the systolic and diastolic function

- Wall motion evaluation
- Atrial evaluation
- Valve function
- Evaluate the right ventricle

- Limitations
  - less sensitive for vegetations
  - The right ventricle
  - Cardiac shunts
TRANS-ESOPHAGEAL ECHO (TEE)

- Much more sensitive to detect vegetations
TRANS-ESOPHAGEAL ECHO (TEE)

- More precise to evaluate the aortic valve anatomy (but less sensitive in the hemodynamic evaluation – degree of stenosis)

- Much better in evaluating the Mitral valve – anatomy and hemodynamics
TEE

Thrombus in the appendage

PFO

Secundum ASD
TEE

- Better in evaluating vegetations
- Better in the structural evaluation of the valves
- Better in evaluating cardiac shunts
- Detect thrombi in the LA appendage
NEW ECHO TECHNOLOGIES -

- 3D
  - Very helpful with the mitral valve
  - Very helpful with structural procedures (TAVR/Mitraclip/PFO and ASD closure..etc)
  - Prospects for more precise EF estimation

- Strain imaging to for early detection chemotoxicity
EVALUATE FOR ISCHEMIA

• Exercise echo
• Pharmacological (Dobutamine) echo
• Exercise nuclear (SPECT)
• Pharmacological (vasodilator/lexiscan) nuclear (SPECT/PET)
• CT myocardial perfusion
• Pharmacological MRI
• If the patient has legs, try to order an exercise stress test rather than pharmacological

• If you order an exercise stress test, consider stopping BB and CCB

• Severe uncontrolled asthma → avoid pharmacological nuclear

• Advanced heart block → Avoid pharmacological nuclear

• Arrhythmias → avoid dobutamine

• LBBB → Order pharmacological nuclear
- Myocardial infarction on nuclear stress test does not necessarily mean dead myocardium
- Nuclear study provides EF
- Ischemic fraction: <12% could be treated medically; >12% do better with revascularization
VIABILITY STUDY: IS THE MYOCARDIUM DEAD OR JUST SLEEPING?

- Dobutamine echo

- Nuclear:
  - 2 day Thallium
  - FDG PET

- Cardiac MRI

  - The idea of a viability study is to determine the chances revascularization might help improve the systolic function/wall motion
    - Normal systolic function
    - Age of the patient
    - Complexity of lesions
MRI FOR VIABILITY OVER NUCLEAR

- A 1 day test
- No radiation
- Provide information in regards to the valves
- Provide precise information in regards to the right ventricle
Cardiac CT

- CTA coronary
- CT perfusion and FFR
- Gated structural Cardiac
- Ca score
• Can better risk stratify patient with family history of CAD and assess the need for statins

• Not covered by insurance
• Low radiation dose
CORONARY CTA

- Evaluate the coronary anatomy – best for coronary anomalies and evaluation of unknown grafts
- Newer uses: FFR to evaluate for significance of stenosis and myocardial perfusion
- With newer scanners, less radiation
- Some difficulties with insurance
Thrombus in the left atrial appendage

Pseudoaneurysm

Evaluation of mitral prosthetic valve

Bicuspid aortic valve
CARDIAC MRI -

- More accurate **EF evaluation**
- Much better evaluation of the **right ventricle**
- Better quantification of mitral/aortic/pulmonic **regurgitation**
- Evaluation of **intra-cardiac shunts** including QP/QS (degree of shunting)
- Evaluation of **congenital abnormalities**
- Evaluation of **myocardial scarring**
- Evaluation of **non-ischemic cardiomyopathy** (hemochromatosis, noncompaction, amyloidosis, sarcoidosis, myocarditis)
- **Myocarditis**
- **Viability**
• More accurate EF evaluation

• Much better evaluation of the right ventricle
• Non-ischemic cardiomyopathy:

Hypertrophic cardiomyopathy

Non-compaction

Cardiac amyloidosis
CARDIAC MASSES -

Left atrial myxoma

Left atrial thrombus

Focal Calcification of the mitral valve
Myocarditis

Congenital anomalies – Ebstein anomaly

Myocardial scarring and risk of arrhythmias
WHEN YOU WANT TO IMAGE THE HEART, THINK ABOUT

- The question you want to answer
- The structure you want to see/evaluate
- Anatomy vs function
- Ischemia vs viability
- The possible associated anomalies