I have results, what next?

Echo, SPECT & Coronary CTA Findings

For Internal Medicine Physicians

Learning Objectives - Goals of Today's Talk

ECHOCARDIOGRAPHY:
- Recognize key echo findings in common cardiovascular diseases
- Understand diagnostic criteria for valvular disease severity
- Apply echo parameters to clinical decision-making

SPECT & CTA IMAGING:
- Interpret SPECT stress test results and risk stratification
- Understand CAD-RADS 2.0 classification system
- Guide appropriate referrals based on imaging findings

OVERALL GOAL:
Enhance your ability to integrate cardiac imaging into clinical practice for optimal patient management

Hypertension - Echocardiographic Findings

CASE: 58-year-old male with 15-year history of HTN, presenting with dyspnea on exertion. BP 165/95 despite ACE inhibitor therapy.

LEFT VENTRICULAR CHANGES:
- Concentric LV hypertrophy (? wall thickness)
- Preserved or reduced ejection fraction
- Diastolic dysfunction (Grade I-III)

ATRIAL & VASCULAR:
- Left atrial enlargement
- Aortic root dilatation
- ? E/e' ratio (>15)

KEY POINT: Early diastolic dysfunction often precedes systolic dysfunction in hypertensive heart disease

Atrial Fibrillation - Echocardiographic Findings

CASE: 72-year-old female with new-onset AFib, palpitations, and fatigue. Considering cardioversion vs rate control strategy.

ATRIAL CHANGES:
- Left atrial enlargement (>34 mL/m²)
- Reduced LA appendage velocities
- Spontaneous echo contrast

FUNCTIONAL IMPACT:
- Loss of atrial kick
- Variable mitral inflow patterns
- Potential thrombus formation

KEY POINT: TEE recommended for thrombus exclusion before cardioversion or ablation

Pulmonary Hypertension - Echocardiographic Findings

CASE: 45-year-old female with progressive dyspnea and leg swelling. History of connective tissue disease. Loud P2 on exam.

RIGHT HEART CHANGES:
- RV enlargement and hypertrophy
- Flattened interventricular septum
- TR jet velocity >3.4 m/s

HEMODYNAMIC MARKERS:
- RVSP >50 mmHg
- Reduced TAPSE (<17 mm)

KEY POINT: Combination of findings more reliable than isolated TR velocity for PH diagnosis

Aortic Stenosis - Echocardiographic Findings

CASE: 78-year-old male with exertional chest pain and syncope. Harsh systolic murmur radiating to carotids. Considering TAVR vs surgical AVR.

VALVE MORPHOLOGY:
- Thickened, calcified aortic leaflets
- Restricted leaflet motion
- Bicuspid vs tricuspid valve

SEVERITY PARAMETERS:
- Peak velocity >4 m/s (severe)
- Mean gradient >40 mmHg
- Valve area <1.0 cm^2 (severe)

KEY POINT: Concordance between velocity, gradient, and valve area confirms severity assessment

Low Flow Low Gradient AS - Echocardiographic Findings

CASE: 82-year-old female with heart failure, EF 35%. Calcified aortic valve with low gradients. Determining true vs pseudo-severe AS.

DIAGNOSTIC CRITERIA:
- Valve area <1.0 cm^2
- Mean gradient <40 mmHg
- Stroke volume index <35 mL/m^2

DOBUTAMINE TESTING:
- Contractile reserve assessment
- True severe: AVA remains <1.0 cm^2
- Pseudo-severe: AVA increases >1.0 cm^2

KEY POINT: Calcium score and dobutamine stress echo help differentiate true vs pseudo-severe AS

Mitral Regurgitation - Echocardiographic Findings

CASE: 65-year-old male with progressive dyspnea and fatigue. Holosystolic murmur at apex. Evaluating for mitral valve repair vs replacement.

VALVE ASSESSMENT:
- Leaflet morphology and motion
- Prolapse, flail, or restriction
- Jet direction and area

SEVERITY MARKERS:
- EROA >0.4 cm^2 (severe)
- Regurgitant volume >60 mL
- LA enlargement and LV dilatation

KEY POINT: Primary vs secondary MR classification guides treatment strategy

Stress Testing Modalities - Bruce Protocol vs Pharmacological

BRUCE PROTOCOL:
- Exercise treadmill testing
- Staged increases in speed/grade
- Requires functional capacity
- Target: 85% max predicted HR
- Contraindicated: severe AS, unstable angina

PHARMACOLOGICAL STRESS:
- Vasodilators: Adenosine, Regadenoson
- Inotropes: Dobutamine
- Used when exercise not feasible
- Obesity, orthopedic limitations, Beta-blocker therapy

KEY POINT: Exercise preferred when possible; provides functional capacity and symptom assessment

SPECT Scoring System - Summed Stress Score (SSS) Calculation

17-SEGMENT MODEL:

- Each segment scored 0-4
- 0 = Normal perfusion
- 1 = Equivocal
- 2 = Moderate defect
- 3 = Severe defect
- 4 = Absent perfusion

SSS CALCULATION:

- Sum all 17 segment scores
- Maximum possible score = 68
- SSS <4 = Low risk
- SSS 4-8 = Intermediate risk
- SSS >8 = High risk

EXAMPLE: LAD territory (6 segments) with moderate defects (score 2) = SSS of 12 (high risk)

SPECT Low Risk - Interpretation & Clinical Significance

SPECT FINDINGS:
- Normal perfusion at rest and stress
- Summed stress score (SSS) <4
- No reversible defects
- Preserved left ventricular function

CLINICAL IMPLICATIONS:
- Annual cardiac event rate <1%
- Excellent short-term prognosis
- Medical management appropriate
- Repeat testing in 2-3 years if indicated

EXAMPLE: 55-year-old with atypical chest pain, normal stress SPECT, SSS = 2

SPECT Moderate & High Risk - Interpretation & Clinical Significance

Moderate - 62-year-old diabetic with chest pain, single vessel defect.
vs
High - 68-year-old with typical angina, multivessel disease pattern.

MODERATE RISK (SSS 4-8):
- Small reversible perfusion defect
- 5-10% myocardium involved
- Annual event rate 1-3%
- Consider catheterization if symptomatic

HIGH RISK (SSS >8):
- Large reversible defects
- Multivessel disease pattern
- Annual event rate >3%
- Urgent catheterization warranted

EXAMPLES: Moderate - Single vessel LAD defect, SSS = 6; High - Multivessel defects, SSS = 15

COURAGE & ISCHEMIA Trials - Evidence-Based CAD Management

ISCHEMIA TRIAL (2020):
- 5,179 patients with moderate-severe ischemia
- Excluded: Left main >50%, proximal LAD
- Excluded: EF <35%, very high-risk anatomy
- No reduction in CV death, MI, hospitalization
- Greater angina relief with invasive approach

COURAGE TRIAL (2007):
- 2,287 patients with =70% stenosis
- Excluded: Left main, proximal LAD equivalent
- No difference in death or MI at 4.6 years
- PCI improved angina-free status ~24 months

KEY INSIGHT: Both trials excluded patients with >10% myocardium at risk (left main/proximal LAD). Results apply only to moderate-risk stable CAD.

Coronary CTA Overview - CAD-RADS 2.0 Classification System

INDICATIONS:
- Low-intermediate pretest probability
- Chest pain evaluation
- Rule out coronary anomalies
- Pre-procedural planning

CAD-RADS CATEGORIES:
- CAD-RADS 0: No stenosis
- CAD-RADS 1: Minimal (1-24%)
- CAD-RADS 2: Mild (25-49%)
- CAD-RADS 3: Moderate (50-69%)
- CAD-RADS 4A: Severe (70-99%)
- CAD-RADS 5: Total occlusion
- P1-P4: Plaque modifiers (composition, vulnerability)

KEY POINT: CAD-RADS provides standardized reporting and guides downstream management

CTA: Mild to Moderate Stenosis - CAD-RADS 2 & 3 Risk Stratification

Mild - 50-year-old with atypical chest pain, non-obstructive plaque.

Moderate - 58-year-old diabetic with intermediate stenosis requiring functional testing.

CAD-RADS 2 (MILD: 25-49%):
- Non-obstructive coronary disease
- Atherosclerotic plaque present
- Recommend: Medical therapy
- Follow-up: Risk factor modification
- Prognosis: Low annual event rate

CAD-RADS 3 (MODERATE: 50-69%):
- Moderately obstructive disease
- May cause ischemia
- Recommend: Functional testing
- Consider: Stress imaging or FFR-CT
- Prognosis: Intermediate risk

KEY POINT: CAD-RADS 3 lesions require functional assessment to determine hemodynamic significance

CTA: Severe Stenosis & Occlusion - CAD-RADS 4A, 4B & 5 Management

CASE: 68-year-old diabetic male with exertional chest pain. CTA shows severe proximal LAD stenosis and RCA occlusion.

CAD-RADS 4A (SEVERE: 70-99%):
- Hemodynamically significant stenosis
- High likelihood of ischemia
- Recommend: Invasive angiography
- Consider: Direct revascularization
- Left main >50% = urgent referral

CAD-RADS 5 (TOTAL OCCLUSION):
- Complete vessel occlusion (100%)
- Chronic total occlusion (CTO)
- Assess collateral circulation
- Specialized CTO intervention
- Consider viability testing

CLINICAL ACTION: CAD-RADS 4A/5 require urgent cardiology consultation. Consider acute presentation vs staged approach.

CAD-RADS Clinical Scenarios - Management Decision Points

SCENARIO 1: CAD-RADS 4A
- 65-year-old with stable angina
- 95% proximal LAD stenosis
- Action: Urgent cath lab referral
- Timeline: Same day or next day
- Likely outcome: PCI with stent

SCENARIO 2: CAD-RADS 5
- 58-year-old post-MI patient
- 100% RCA occlusion, good collaterals
- Action: CTO specialist referral
- Consider: Viability assessment first
- Timeline: Weeks to plan intervention

KEY TEACHING: CAD-RADS 4A requires urgent intervention. CAD-RADS 5 allows time for optimal planning and specialist consultation.

Thank You

Questions & Discussion

Thank you for your attention!
Enhancing cardiovascular care through evidence-based imaging