

CARDIOVASCULAR DISEASE CERTIFICATION EXAMINATION ELECTROCARDIOGRAMS AND IMAGING STUDIES

SAMPLE CASES

This booklet contains examples of the electrocardiograms and imaging studies (echocardiograms, ventriculograms or aortograms, and angiograms) presented in the Electrocardiogram and Imaging Studies section of the Cardiovascular Disease Certification Examination. Scoring of the sample cases is discussed on page 10. **(Note: This Sample Cases booklet contains still-frame images; however, the Imaging Studies section of the exam contains moving images.)**

Electrocardiograms: Pages 2 and 3 of this booklet show an example of the electrocardiograms, patient descriptions, and answer option lists found in the Electrocardiogram section. All electrocardiograms are conventional 12-lead tracings recorded with three simultaneous leads. When two rhythm strips are shown, they are recorded simultaneously.

Echocardiograms: Pages 4 and 5 of this booklet show an example of the echocardiograms, patient descriptions, and answer option lists found in the Imaging Studies section. All modalities of echocardiography may be presented. All views will be appropriately labeled. Vertical markings on M-mode frames represent 1-cm increments.

Ventriculograms or Aortograms: Pages 6 and 7 of this booklet show an example of the ventriculograms, patient descriptions, and answer option lists found in the Imaging Studies section. (Some cases in this portion of the Imaging Studies section are based on aortograms, and the option list is applicable to both types of cases.) All contrast studies will be appropriately labeled. Contrast injection should be assumed adequate in all cases.

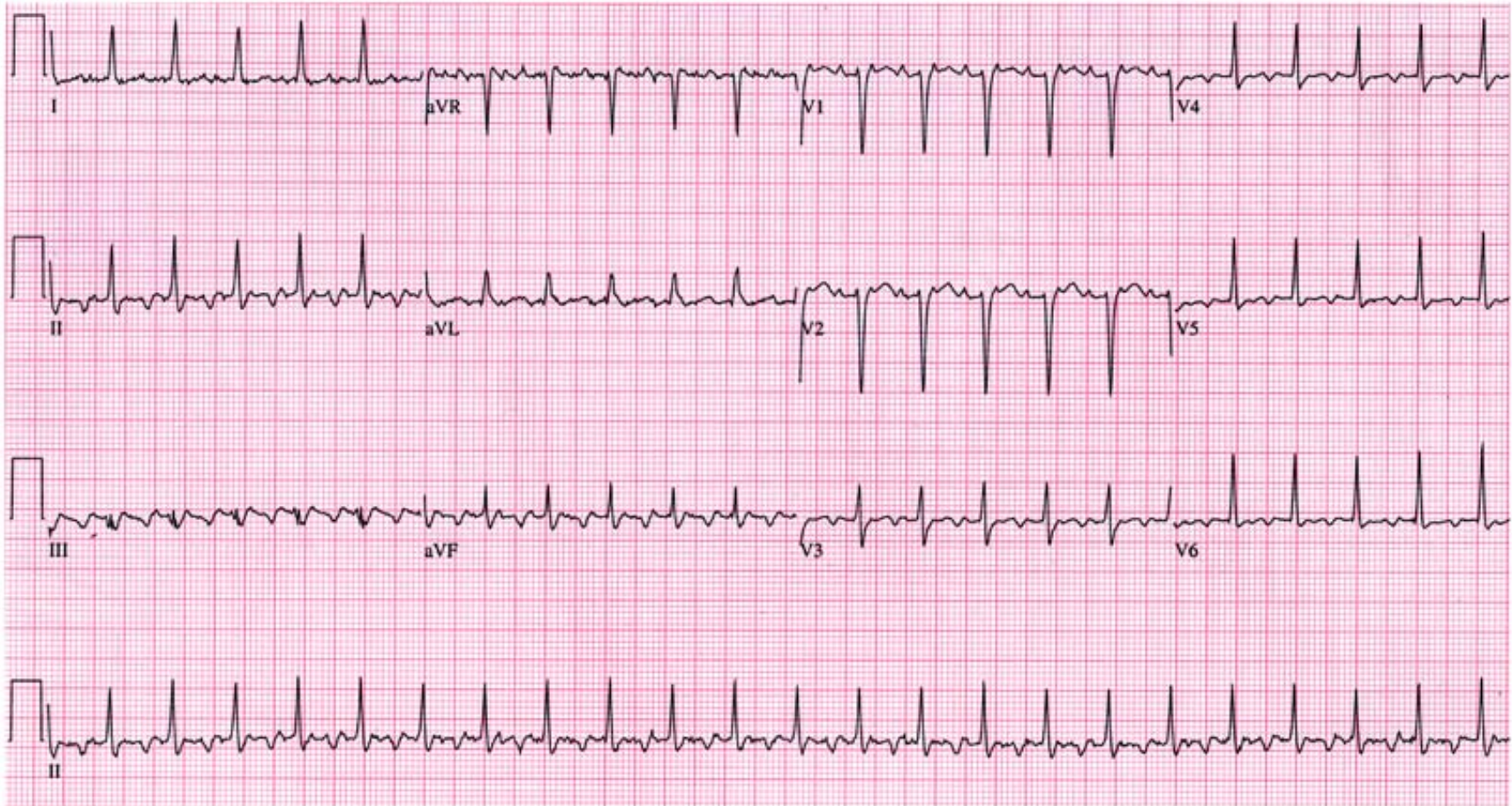
Angiograms: Pages 8 and 9 of this booklet show an example of the angiograms, patient descriptions, and answer option lists found in the Imaging Studies section. All contrast studies will be appropriately labeled. Contrast injection should be assumed adequate in all cases.

Copyright and Examination Non-Disclosure Policy

All ABIM materials are protected by the federal Copyright Act, 17 U.S.C. § 101, et seq. Access to all such materials, as further detailed below, is strictly conditioned upon agreement to abide by ABIM's rights under the Copyright Act and to maintain examination confidentiality.

ABIM examinations are confidential, in addition to being protected by federal copyright and trade secret laws. Candidates and diplomates who undertake examinations agree that they will not copy, reproduce, adapt, disclose, or transmit examinations, in whole or in part, before or after taking an examination, by any means now known or hereafter invented. They further agree that they will not reconstruct examination content from memory, by dictation, or by any other means or otherwise discuss examination content with others. Candidates and diplomates further acknowledge that disclosure or any other use of ABIM examination content constitutes professional misconduct and may expose them to criminal as well as civil liability, and may also result in ABIM's imposition of penalties against them, including but not limited to, invalidation of examination results, exclusion from future examinations, suspension, revocation of certification and other sanctions.

With respect to ABIM's Maintenance of Certification (MOC) products, including its Medical Knowledge Modules and ABIM PIMs Practice Improvement Modules[®], candidates agree that they will not copy, reproduce or make any adaptations of such materials in any manner; and will not assist someone else in the infringement or misuse of these or any other ABIM-copyrighted works.



ECG Sample Case: A 51-year-old woman with fatigue

GENERAL FEATURES

- 1. Normal ECG
- 2. Normal variant
- 3. Incorrect electrode placement
- 4. Artifact

P WAVE ABNORMALITIES

- 5. Right atrial abnormality/enlargement
- 6. Left atrial abnormality/enlargement

ATRIAL RHYTHMS

- 7. Sinus rhythm
- 8. Sinus arrhythmia
- 9. Sinus bradycardia (<60)
- 10. Sinus tachycardia (>100)
- 11. Sinus pause or arrest
- 12. Sinoatrial exit block
- 13. Atrial premature complexes
- 14. Atrial tachycardia
- 15. Atrial tachycardia, multifocal
- 16. Supraventricular tachycardia
- 17. Atrial flutter
- 18. Atrial fibrillation

AV JUNCTIONAL RHYTHMS

- 19. AV junctional premature complexes
- 20. AV junctional escape complexes
- 21. AV junctional rhythm/tachycardia

VENTRICULAR RHYTHMS

- 22. Ventricular premature complex(es)
- 23. Ventricular parasystole
- 24. Ventricular tachycardia (3 or more consecutive complexes)
- 25. Accelerated idioventricular rhythm
- 26. Ventricular escape complexes or rhythm
- 27. Ventricular fibrillation

AV CONDUCTION

- 28. AV block, 1°
- 29. AV block, 2°–Mobitz type I (Wenckebach)
- 30. AV block, 2°–Mobitz type II
- 31. AV block, 2:1
- 32. AV block, 3°
- 33. Wolff-Parkinson-White pattern
- 34. AV dissociation

ABNORMALITIES OF QRS VOLTAGE OR AXIS

- 35. Low voltage, limb leads
- 36. Low voltage, precordial leads
- 37. Left axis deviation (> -30°)
- 38. Right axis deviation (> +100°)
- 39. Electrical alternans

VENTRICULAR HYPERTROPHY

- 40. Left ventricular hypertrophy
- 41. Right ventricular hypertrophy
- 42. Combined ventricular hypertrophy

INTRAVENTRICULAR CONDUCTION

- 43. RBBB, complete
- 44. RBBB, incomplete
- 45. Left anterior fascicular block
- 46. Left posterior fascicular block
- 47. LBBB, complete
- 48. LBBB, incomplete
- 49. Aberrant conduction (including rate-related)
- 50. Intraventricular conduction disturbance, nonspecific type

Q WAVE MYOCARDIAL INFARCTION

| | Age recent, or acute | Age indeterminate or probably old |
|--------------------------|------------------------------|-----------------------------------|
| Anterolateral | <input type="checkbox"/> 51. | <input type="checkbox"/> 52. |
| Anterior or anteroseptal | <input type="checkbox"/> 53. | <input type="checkbox"/> 54. |
| Lateral | <input type="checkbox"/> 55. | <input type="checkbox"/> 56. |
| Inferior | <input type="checkbox"/> 57. | <input type="checkbox"/> 58. |
| Posterior | <input type="checkbox"/> 59. | <input type="checkbox"/> 60. |

ST, T, U WAVE ABNORMALITIES

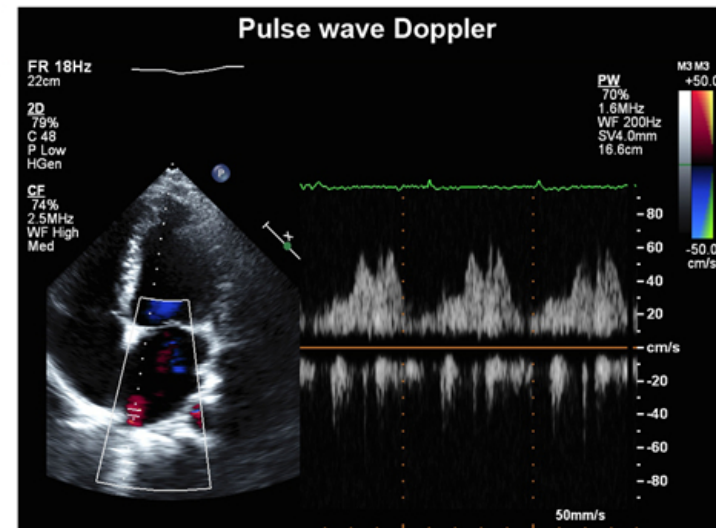
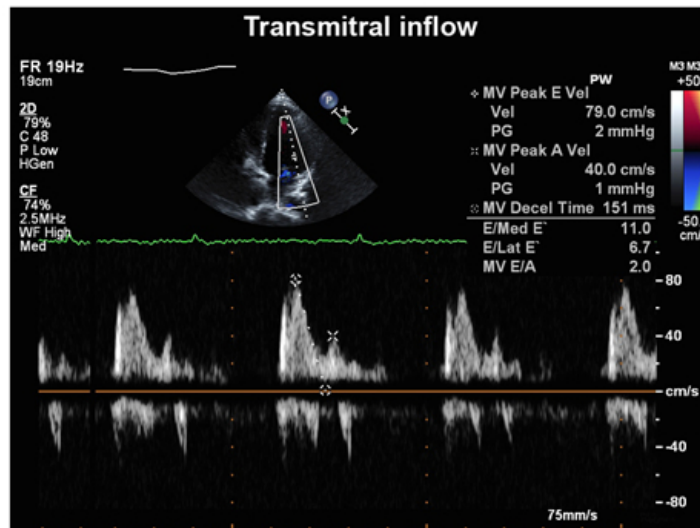
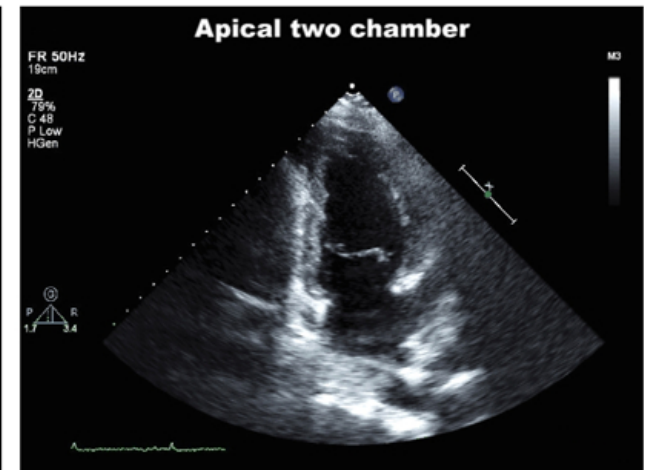
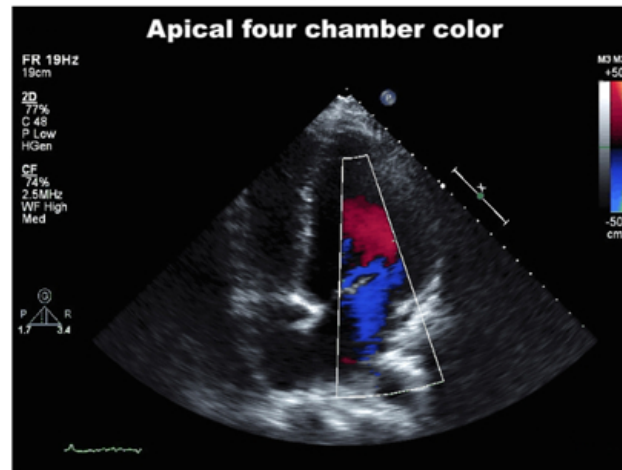
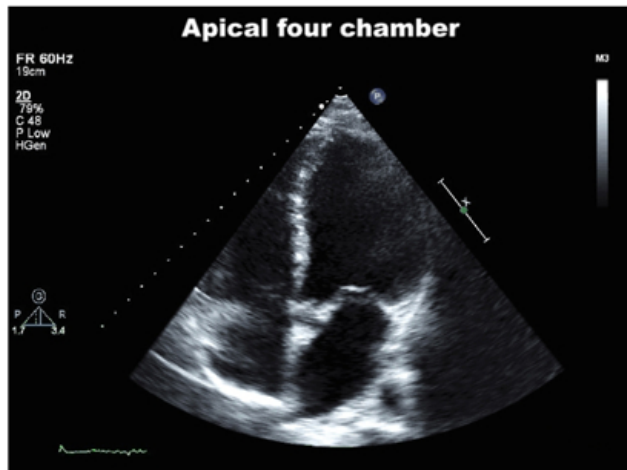
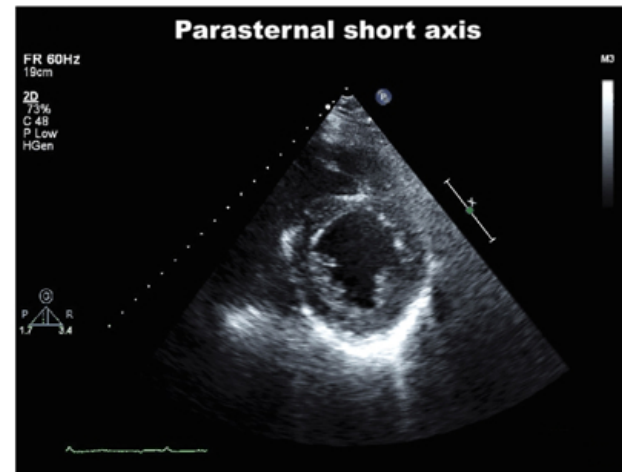
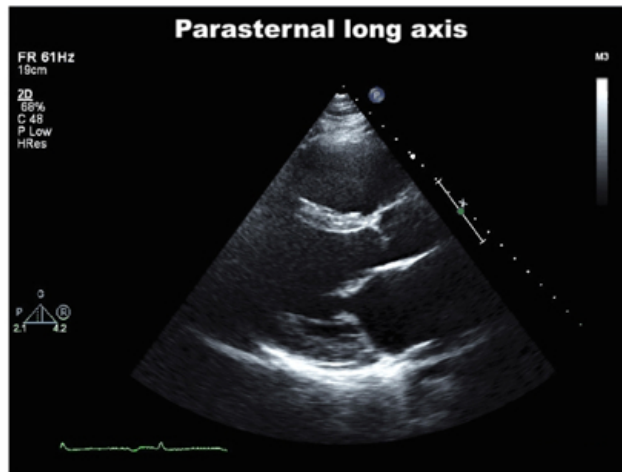
- 61. Normal variant, early repolarization
- 62. Normal variant, juvenile T waves
- 63. Nonspecific ST and/or T wave abnormalities
- 64. ST and/or T wave abnormalities suggesting myocardial ischemia
- 65. ST and/or T wave abnormalities suggesting myocardial injury
- 66. ST and/or T wave abnormalities suggesting electrolyte disturbances
- 67. ST and/or T wave abnormalities secondary to hypertrophy
- 68. Prolonged Q-T interval
- 69. Prominent U waves

CLINICAL DISORDERS

- 70. Brugada syndrome
- 71. Digitalis toxicity
- 72. Torsades de pointes
- 73. Hyperkalemia
- 74. Hypokalemia
- 75. Hypercalcemia
- 76. Hypocalcemia
- 77. Dextrocardia, mirror image
- 78. Acute cor pulmonale including pulmonary embolus
- 79. Pericardial effusion
- 80. Acute pericarditis
- 81. Hypertrophic cardiomyopathy
- 82. Central nervous system disorder
- 83. Hypothermia

PACEMAKER FUNCTION

- 84. Atrial or coronary sinus pacing
- 85. Ventricular demand pacemaker (VVI), normally functioning
- 86. Dual-chamber pacemaker (DDD), normally functioning
- 87. Pacemaker malfunction, not constantly capturing (atrium or ventricle)
- 88. Pacemaker malfunction, not constantly sensing (atrium or ventricle)
- 89. Paced morphology consistent with biventricular pacing or cardiac resynchronization therapy



Echocardiogram Sample Case: A 43-year-old man with fatigue and dyspnea

LEFT VENTRICULAR SIZE, FUNCTION, AND STRUCTURE

LV Size

- 1. Normal
- 2. Enlarged
- 3. Small

LV Diastolic Function

- 4. Normal
- 5. Grade 1 (abnormal relaxation)
- 6. Grade 2 (pseudonormal)
- 7. Grade 3 (restrictive)

Regional Wall Motion Abnormalities

- 8. Normal WM
- 9. Global hypokinesis

LV Infarct Complications

- 10. Ventricular septal rupture
- 11. Free wall rupture

LV Ejection Fraction

- 12. Normal to hyperdynamic ($\geq 50\%$)
- 13. Mild to moderately reduced (35-49%)
- 14. Severely reduced ($< 35\%$)

LV Wall Thickness

- 15. Normal
- 16. Concentric
- 17. Asymmetric septal hypertrophy

18. LVOT Obstruction/SAM

19. LV Mass or Thrombus

Cardiac Masses

- 20. Atrial myxoma
- 21. Atrial thrombus
- 22. Metastatic tumor
- 23. Atrial septal lipomatous hypertrophy
- 24. Hiatal hernia
- 25. Fibroelastoma

| | Anterior | Septal | Lateral | Inferior/Posterior | Apical |
|---------------------------------|------------------------------|------------------------------|------------------------------|------------------------------|------------------------------|
| Hypokinesis | <input type="checkbox"/> 26. | <input type="checkbox"/> 27. | <input type="checkbox"/> 28. | <input type="checkbox"/> 29. | <input type="checkbox"/> 30. |
| Akinesis | <input type="checkbox"/> 31. | <input type="checkbox"/> 32. | <input type="checkbox"/> 33. | <input type="checkbox"/> 34. | <input type="checkbox"/> 35. |
| Thinning and/or scar | <input type="checkbox"/> 36. | <input type="checkbox"/> 37. | <input type="checkbox"/> 38. | <input type="checkbox"/> 39. | <input type="checkbox"/> 40. |
| Aneurysm | <input type="checkbox"/> 41. | <input type="checkbox"/> 42. | <input type="checkbox"/> 43. | <input type="checkbox"/> 44. | <input type="checkbox"/> 45. |
| Pseudoaneurysm | <input type="checkbox"/> 46. | <input type="checkbox"/> 47. | <input type="checkbox"/> 48. | <input type="checkbox"/> 49. | <input type="checkbox"/> 50. |
| Ischemia (with stress testing) | <input type="checkbox"/> 51. | <input type="checkbox"/> 52. | <input type="checkbox"/> 53. | <input type="checkbox"/> 54. | <input type="checkbox"/> 55. |
| Viability (with stress testing) | <input type="checkbox"/> 56. | <input type="checkbox"/> 57. | <input type="checkbox"/> 58. | <input type="checkbox"/> 59. | <input type="checkbox"/> 60. |

RIGHT VENTRICULAR SIZE, FUNCTION, AND STRUCTURE

- 61. Normal size and function
- 62. Enlarged
- 63. Global dysfunction/infarction
- 64. Septal motion suggests volume overload
- 65. Septal motion suggests pressure overload
- 66. Catheter or pacer present
- 67. Thrombus present

ATRIA

- 68. Enlarged left atrium
- 69. Enlarged right atrium

VALVULAR HEART DISEASE

Structure

Aortic Valve

- 70. Calcified
- 71. Rheumatic
- 72. Bicuspid
- 73. Vegetation
- 74. Prolapse
- 75. Flail

Mitral Valve

- 76. Calcified
- 77. Rheumatic
- 78. Cleft
- 79. Vegetation
- 80. Prolapse
- 81. Flail
- 82. Ruptured papillary muscle

Tricuspid Valve

- 83. Fails to coapt
- 84. Carcinoid
- 85. Vegetation
- 86. Prolapse
- 87. Flail

Pulmonic Valve

- 88. Congenitally abnormal
- 89. Carcinoid

Prosthetic Valve Present

- 90. Normal function (includes normal gradients and closing jets)
- 91. Pathologic regurgitation
- 92. Paravalvular regurgitation
- 93. Elevated gradients
- 94. Obstruction due to thrombus or pannus
- 95. Dehiscence
- 96. Prosthetic valve endocarditis

Endocarditis

- 97. Abscess

Function

Aortic Valve

Stenosis

- 98. Mild/moderate
- 99. Severe

Mitral Valve

Stenosis

- 100. Mild/moderate
- 101. Severe

Tricuspid Valve

Stenosis

- 102. Mild/moderate
- 103. Severe

Pulmonic Valve

Stenosis

- 104. Mild/moderate
- 105. Severe

Aortic Valve

Regurgitation

- 106. Mild/moderate
- 107. Severe

Mitral valve

Regurgitation

- 108. Mild/moderate
- 109. Severe

Tricuspid Valve

Regurgitation

- 110. Mild/moderate
- 111. Severe

Pulmonic Valve

Regurgitation

- 112. Mild/moderate
- 113. Severe

CARDIOMYOPATHY AND SYSTEMIC DISEASES

Types of cardiomyopathy

- 114. Hypertrophic
- 115. Apical hypertrophic
- 116. Restrictive
- 117. ARVD
- 118. Dilated
- 119. Noncompaction
- 120. Takotsubo (stress induced)

Systemic disease

- 121. Amyloid
- 122. Hypereosinophilia

PULMONARY DISEASES

- 123. Findings consistent with acute pulmonary embolism
- 124. Findings consistent with pulmonary hypertension

SIMPLE CONGENITAL HEART DISEASES

- 125. Patent foramen ovale
- 126. Primum ASD
- 127. Secundum ASD
- 128. Sinus venosus ASD
- 129. Muscular VSD
- 130. Membranous VSD
- 131. Supracristal VSD
- 132. PDA
- 133. Subaortic stenosis
- 134. Anomalous coronary artery
- 135. Coronary fistula

PERICARDIAL AND PLEURAL DISEASES

- 136. Tamponade
- 137. Pericardial effusion
- 138. Pericardial mass or hemopericardium
- 139. Pericardial constriction
- 140. Pericardial cyst
- 141. Pleural effusion

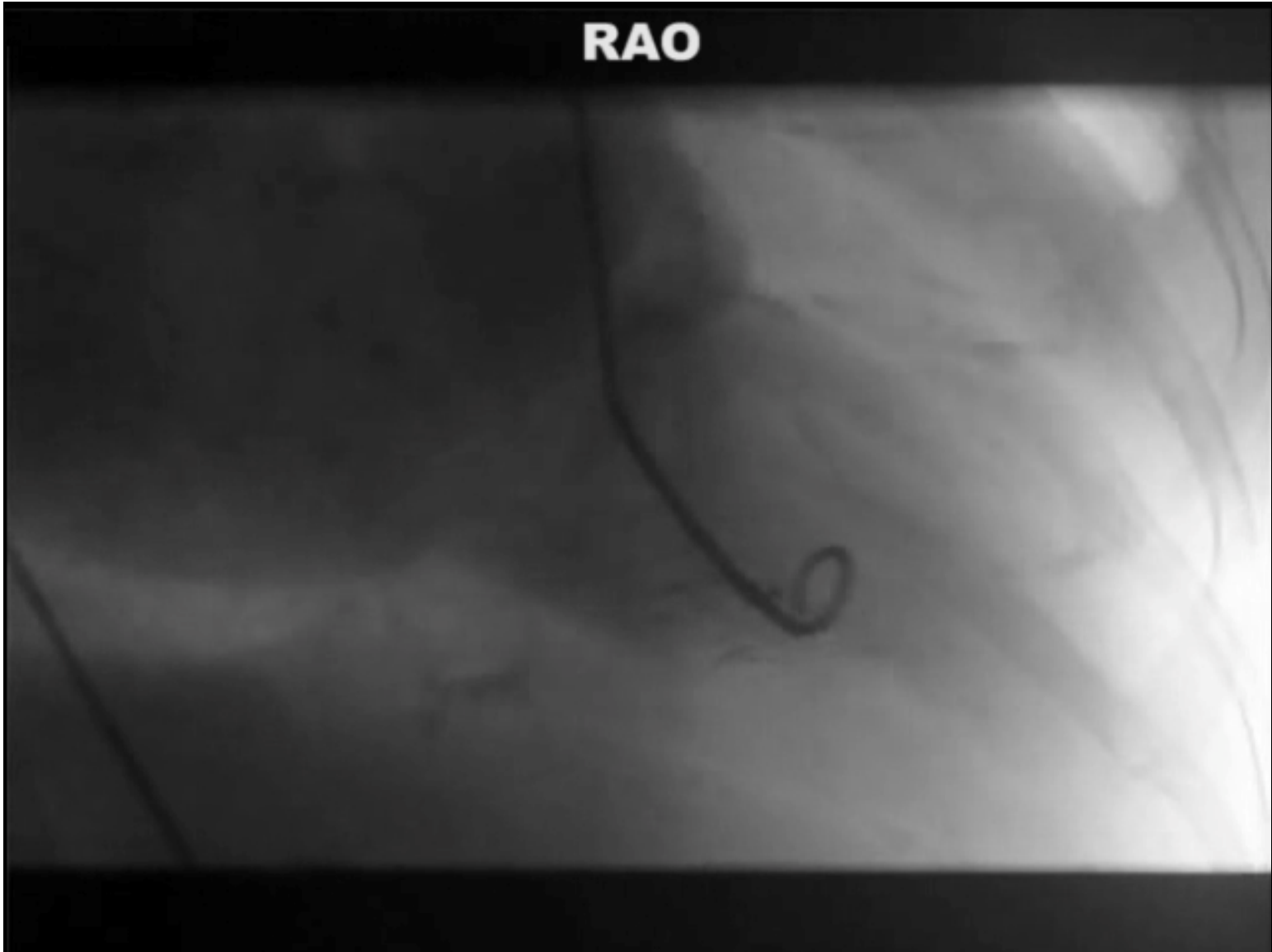
DISEASES OF THE AORTA

- 142. Marfan syndrome
- 143. Type A dissection
- 144. Type B dissection
- 145. Intramural hematoma
- 146. Aortic ulcer
- 147. Aortic enlargement or aneurysm
- 148. Aortic rupture
- 149. Sinus of Valsalva aneurysm
- 150. Sinus of Valsalva rupture
- 151. Coarctation

COMPLEX CHD

- 152. Tetralogy of Fallot
- 153. Ebstein's anomaly
- 154. Complete transposition (D-TGA)
- 155. Corrected transposition (L-TGA)

RAO



Ventriculogram-Aortogram Sample Case: A 74-year-old woman with chest pain

LEFT VENTRICLE

- 1. Normal
- 2. Global hypokinesia
- 3. Global hyperkinesia
- 4. Left to right shunt

| | Anterior or lateral | Inferior or posterior | Apical |
|-------------------------|------------------------------|------------------------------|------------------------------|
| Wall motion abnormality | <input type="checkbox"/> 5. | <input type="checkbox"/> 6. | <input type="checkbox"/> 7. |
| Aneurysm | <input type="checkbox"/> 8. | <input type="checkbox"/> 9. | <input type="checkbox"/> 10. |
| Pseudoaneurysm | <input type="checkbox"/> 11. | <input type="checkbox"/> 12. | <input type="checkbox"/> 13. |
| Mural thrombus | <input type="checkbox"/> 14. | <input type="checkbox"/> 15. | <input type="checkbox"/> 16. |

RIGHT VENTRICLE

- 17. Normal
- 18. Dilated
- 19. Right to left shunt

AORTIC VALVE

- 20. Regurgitation
- 21. Bioprosthesis
- 22. Mechanical prosthesis
- 23. Calcific disease

MITRAL VALVE

- 24. Restricted motion/stenosis
- 25. Prolapse or flail leaflet
- 26. Systolic anterior motion
- 27. Bioprosthesis
- 28. Mechanical prosthesis
- 29. Regurgitation
- 30. Congenital cleft
- 31. Calcific disease

PULMONARY VALVE

- 32. Bioprosthesis
- 33. Mechanical prosthesis
- 34. Regurgitation
- 35. Stenosis

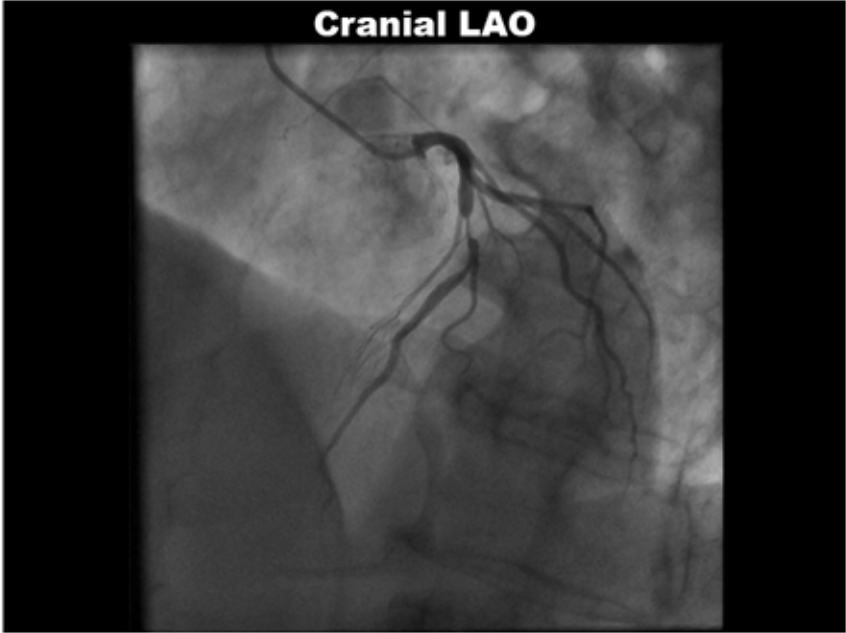
AORTA

- 36. Aneurysm
- 37. Pseudoaneurysm
- 38. Dissection
- 39. Left to right shunt from aortic root
- 40. Supravalvular stenosis
- 41. Patent ductus arteriosus
- 42. Coarctation
- 43. Perivalvular abscess
- 44. Penetrating aortic ulcer

RENAL ARTERY STENOSIS

| | Right | Left |
|------------------------|------------------------------|------------------------------|
| Mild (<50%) | <input type="checkbox"/> 45. | <input type="checkbox"/> 46. |
| Significant (50 - 99%) | <input type="checkbox"/> 47. | <input type="checkbox"/> 48. |
| Total occlusion | <input type="checkbox"/> 49. | <input type="checkbox"/> 50. |

- 51. Fibromuscular disease



Angiogram Sample Case: A 50-year-old man who has chest pain with minimal exertion

1. Normal

ARTERY/GRAFT (includes all branches)

| | Left main | Left anterior descending | Left circumflex | Right | Bypass graft |
|---|------------------------------|------------------------------|------------------------------|------------------------------|------------------------------|
| Fixed stenosis: | | | | | |
| Insignificant stenosis (<50% diameter reduction) | <input type="checkbox"/> 2. | <input type="checkbox"/> 3. | <input type="checkbox"/> 4. | <input type="checkbox"/> 5. | <input type="checkbox"/> 6. |
| Moderate stenosis (50 to 75% diameter reduction) | <input type="checkbox"/> 7. | <input type="checkbox"/> 8. | <input type="checkbox"/> 9. | <input type="checkbox"/> 10. | <input type="checkbox"/> 11. |
| Severe stenosis (>75% diameter reduction) | <input type="checkbox"/> 12. | <input type="checkbox"/> 13. | <input type="checkbox"/> 14. | <input type="checkbox"/> 15. | <input type="checkbox"/> 16. |
| Complete occlusion | <input type="checkbox"/> 17. | <input type="checkbox"/> 18. | <input type="checkbox"/> 19. | <input type="checkbox"/> 20. | <input type="checkbox"/> 21. |
| Filled by collaterals | | <input type="checkbox"/> 22. | <input type="checkbox"/> 23. | <input type="checkbox"/> 24. | <input type="checkbox"/> 25. |
| Spasm | | <input type="checkbox"/> 26. | <input type="checkbox"/> 27. | <input type="checkbox"/> 28. | <input type="checkbox"/> 29. |
| Thrombus present | | <input type="checkbox"/> 30. | <input type="checkbox"/> 31. | <input type="checkbox"/> 32. | <input type="checkbox"/> 33. |
| Myocardial bridge | | <input type="checkbox"/> 34. | <input type="checkbox"/> 35. | <input type="checkbox"/> 36. | |
| Anomalous origin | <input type="checkbox"/> 37. | <input type="checkbox"/> 38. | <input type="checkbox"/> 39. | <input type="checkbox"/> 40. | |
| Coronary fistula | <input type="checkbox"/> 41. | <input type="checkbox"/> 42. | <input type="checkbox"/> 43. | <input type="checkbox"/> 44. | |
| Aneurysm/Severe ectasia | <input type="checkbox"/> 45. | <input type="checkbox"/> 46. | <input type="checkbox"/> 47. | <input type="checkbox"/> 48. | <input type="checkbox"/> 49. |
| Bypass graft to (indicate observed anatomical connection) | | <input type="checkbox"/> 50. | <input type="checkbox"/> 51. | <input type="checkbox"/> 52. | |
| Dissection | <input type="checkbox"/> 53. | <input type="checkbox"/> 54. | <input type="checkbox"/> 55. | <input type="checkbox"/> 56. | <input type="checkbox"/> 57. |
| Stent: patent | <input type="checkbox"/> 58. | <input type="checkbox"/> 59. | <input type="checkbox"/> 60. | <input type="checkbox"/> 61. | <input type="checkbox"/> 62. |
| Stent: occluded | <input type="checkbox"/> 63. | <input type="checkbox"/> 64. | <input type="checkbox"/> 65. | <input type="checkbox"/> 66. | <input type="checkbox"/> 67. |

NOTE: You must select a description for the degree of the most severe stenosis in each diseased vessel shown.

SCORING OF SAMPLE CASES

Electrocardiograms (option list on page 3): The correct answer for this case is atrial flutter (number 17). Selecting sinus tachycardia (number 10) **OR** atrial tachycardia (number 14) **OR** atrial fibrillation (number 18) would invalidate your answer because these findings could not coexist with the correct finding in this patient.

Echocardiograms (option list on page 5): The correct answers for this case are enlarged left ventricle (number 2) **AND** [Grade 2 (pseudonormal) diastolic dysfunction **OR** Grade 3 (restrictive) diastolic dysfunction (number 6 **OR** 7)], **AND** global hypokinesis (number 9), **AND** severely reduced left ventricular ejection fraction <35% (number 14), **AND** enlarged left atrium (number 68), **AND** mild to moderate mitral regurgitation (number 108), **AND** dilated cardiomyopathy (number 118).

Ventriculograms-Aortograms (option list on page 7): The correct answers for this case are inferior wall motion abnormality (number 6) **AND** mitral valve regurgitation (number 29).

Angiograms (option list on page 9): The correct answers for this case are insignificant stenosis of the LCx (number 4) **AND** insignificant stenosis of the RCA (number 5) **AND** severe stenosis of the LAD (number 13).