

# Advances in the Diagnosis of Coronary Atherosclerosis

## Chapter 1 Advances in the Diagnosis of Coronary Artery Disease

1. Coronary artery disease (CAD) is one of the \_\_\_\_\_ cardiovascular diseases and has a high incidence of morbidity and mortality.
  - a. Deadliest
  - b. Most common
  - c. Debilitating
  - d. Difficult
2. True or false. Despite attempts to establish the molecular and genetic determinants that could account for variations in CAD, the etiology and complex multigenic basis of atherosclerosis are still not completely understood.
  - a. True
  - b. False
3. The success of CAD gene mapping is dependent on its \_\_\_\_\_.
  - a. Genetic architecture
  - b. Origin
  - c. Etiology
  - d. Mechanisms
4. Resistin is a 10kDa protein composed of \_\_\_\_\_ amino acids.
  - a. 52
  - b. 65
  - c. 87
  - d. 92
5. What are patients with end-stage renal disease at high risk for?
  - a. Cancer
  - b. Cardiovascular events
  - c. Sudden death
  - d. Birth defects
6. Renalase is secreted into the blood by the \_\_\_\_\_.
  - a. Pancreas
  - b. Pituitary
  - c. Kidney
  - d. Adrenal gland
7. P-selectin is an \_\_\_\_\_ molecule.
  - a. Adhesion
  - b. Inhibitor
  - c. Functional
  - d. Detectable
8. The selectin family of adhesion molecules also comprises E and \_\_\_\_\_selectin.
  - a. G
  - b. L
  - c. M
  - d. P

## Chapter 2 Coronary Angiography Indications

9. Who performed the first selective coronary angiography?
  - a. Dr. James Puckett
  - b. Dr. Elaine Bahner
  - c. Dr. Mason Sones
  - d. Dr. Mike Lamke
10. What is the general indication for coronary angiography?
  - a. Define the coronary artery anatomy
  - b. Evaluate LV function
  - c. Chest pain
  - d. Shortness of breath
11. Coronary angiography involves the opacification of the \_\_\_\_\_ in the coronary artery.
  - a. Stenosis
  - b. Lumen
  - c. Blockage
  - d. Flow
12. Which of the following is a clinical indication for coronary angiography?
  - a. Suspected coronary artery disease
  - b. ST elevation MI
  - c. Congestive cardiac failure
  - d. All the above
13. The assessment of patients with symptoms of CAD depends on what key factors?
  - a. The clinical assessment of the quality of symptoms
  - b. Clinical risk profile
  - c. Presence of existing abnormalities on ECG
  - d. All the above
14. Substernal chest pain provoked by exertion or emotional stress is the definition of \_\_\_\_\_.
  - a. Probable angina
  - b. Non-anginal chest pain
  - c. Definite angina
  - d. Indigestion
15. According to ACC guidelines what level of evidence does a positive stress test with high-risk features carry?
  - a. Level A
  - b. Level B
  - c. Level C
  - d. Level D
16. True or false. There is no role for routine coronary angiography in stable asymptomatic patients with known CAD.
  - a. True
  - b. False
17. Which of the following demonstrates clinical instability in acute coronary syndrome?
  - a. Cardiogenic shock
  - b. Hemodynamic instability
  - c. Recurrent/persistent ischemia
  - d. All the above

18. What is the cornerstone of management in ST elevation ACS?
- Timely restoration of flow
  - Bed rest
  - Medication
  - Open-heart surgery

### Chapter 3 History of Coronary Angiography

19. What is the risk of a major complication from cardiac catheterization?
- Less than 0.5%
  - Less than 1.0%
  - Less than 1.5%
  - Less than 2.0%
20. What year was the visualization of human blood vessels achieved?
- 1892
  - 1894
  - 1896
  - 1898
21. In 1896 Haschek and Linderthal injected into the blood vessels of an \_\_\_\_\_.
- Amputated hand
  - Amputated foot
  - Amputated arm
  - Amputated leg
22. What year did Berberich and Hirsch report the first human arteriogram and venogram was obtained?
- 1921
  - 1923
  - 1925
  - 1927
23. What year did Moniz describe carotid angiography and its application to the study of cerebral lesions?
- 1925
  - 1926
  - 1927
  - 1928

### Chapter 4 Coronary Angiography Physical and Technical Aspects

24. Which of the following is a version of coronary angiography?
- Conventional coronary angiography (CCA)
  - CT Angiography (CTA)
  - SPECT CT
  - A and B
25. Which of the following is a requirement for x-ray systems used for CCA?
- 80kW generator
  - Over couch image detector
  - Dose-area product meter
  - All of the above
26. In x-ray dosimetry for CCA, what is necessary for the evaluation of a possible effect for an exposed human?
- Absorbed organ doses
  - Surface dose
  - Effective dose
  - Entrance dose

27. True or false. The entrance surface dose to the patient **does not** dramatically increase when the focus-to-skin distance becomes too short.
- True
  - False
28. Which of the following is not a recommendation to staff to reduce radiation exposure?
- Time of exposure as short as possible
  - Distance to the patient as long as possible
  - Use protective shielding effectively
  - Use new equipment
29. Improvements in which of the following advanced CTA into an important diagnostic tool?
- Spatial and temporal resolution
  - Scan time
  - Scan range
  - All the above
30. The real development of CTA came with \_\_\_\_\_.
- Four-slice scanners
  - 8 slice scanners
  - 16 slice scanners
  - 64 slice scanners
31. Which of the following **is not** a positive feature of CTA in comparison to conventional angiography?
- Better detection of stenosed lesions
  - Faster procedure time
  - Possibility to delineate a cross-sectional cut of the artery
  - Non-invasive procedure contrary to conventional angiography or intravascular ultrasound

For questions 32 and 33, choose the absorbed dose for the listed organ for patients undergoing CTA.

32. Lungs on a 16-slice CT
- 5.7
  - 25.8
  - 1.5
  - 10.9
33. Heart on a 64-slice CT
- 64.5
  - 44.2
  - 77.7
  - 31.4

## Chapter 5 Coronary Angiography Procedural Techniques

34. What is the "gold standard" to diagnose coronary disease?
- CTA
  - SPECT
  - Coronary angiography
  - A & B
35. According to the text, more than \_\_\_\_\_ of all coronary angiographies are completed using Judkins left 4 and Judkins right 4 catheters.
- 95%
  - 96%
  - 97%
  - 98%

36. What year was the Seldinger arterial puncture technique developed?
- 1949
  - 1953
  - 1955
  - 1957
37. What is the most commonly used vascular access site?
- Right femoral artery
  - Right radial artery
  - Left femoral artery
  - A & B
38. Utilizing figure 10, what number illustrates the inguinal ligament?
- Number 1
  - Number 2
  - Number 3
  - Number 4
39. Which of the following is the main issue when using a radial artery approach?
- Small diameter of the vessel
  - Patient discomfort
  - radial artery is prone to spasm
  - A & C
40. Under what circumstances should the femoral approach be used instead of the radial approach?
- Evaluation of LV function
  - Evaluation for chest pain
  - Acute myocardial infarction, page 105, 1
  - Evaluation of the aorta
41. The brachial artery is the continuation of the \_\_\_\_\_ artery.
- radial
  - ulnar
  - axillary
  - subclavian
42. The complication rate for the brachial approach does not exceed what percentage?
- 1%
  - 2%
  - 3%
  - 4%
43. What artery is rarely used today for vascular access?
- Axillary artery
  - Femoral artery
  - Radial artery
  - Brachial artery
44. What is the usual size of the J-wire used after vascular access?
- 0.014 inch
  - 0.025 inch
  - 0.035 inch
  - 0.038 inch

45. What is the best view to see and cannulate the coronary ostia?
- 35 degree left anterior oblique
  - 50 degree left anterior oblique
  - 55 degree left anterior oblique
  - 60 degree left anterior oblique
46. What is the common reason the right coronary artery may be hard to find and cannulate?
- Origin of the RCA is superior
  - Origin of the RCA is more toward the left than usual
  - Origin of the RCA is completely occluded
  - A & B
47. What should be monitored during cannulation of the coronary artery ostia?
- Blood pressure
  - Heart rate
  - Patient pain level
  - None of the above
48. There are usually \_\_\_\_\_ obtuse marginal branches.
- One
  - Two
  - Three
  - Four
49. What is the "spider" view to evaluate the LMCA and its bifurcation into the LAD and CX branches?
- AP-cranial
  - AP-caudal
  - Right anterior oblique
  - LAO-caudal
50. What projection displays the ostium of the LMCA similarly to the LAO-cranial view?
- AP-cranial
  - AP-caudal
  - Right anterior oblique
  - Left anterior oblique
51. What view is very good for evaluating the distal LAD?
- AP-cranial
  - AP-caudal
  - RAO-caudal
  - LAO-caudal
52. True or false. Today, with skilled echocardiographers and excellent cardiac ultrasound equipment there is far less need to perform left ventriculography.
- True
  - False
53. What is the most common volume of contrast used for aortography?
- 50 ml
  - 60 ml
  - 65 ml
  - 70 ml
54. What is the best projection to visualize aortic regurgitation?
- 45 degree RAO
  - 45 degree LAO
  - AP
  - Lateral

55. What is the best projection to visualize aortic coarctation?

- a. 45 degree RAO
- b. 45 degree LAO
- c. 20 degree LAO
- d. Lateral

### Chapter 6 Coronary Angiography Risks and Complications

56. What year did Wilhelm Rontgen win the first Noble Prize in physics?

- a. 1899
- b. 1900
- c. 1901
- d. 1902

57. At the time the text was written more than \_\_\_\_\_ cardiac catheterization procedures are performed a year using contrast media.

- a. 4 million
- b. 4.5 million
- c. 5 million
- d. 5.5 million

58. When did non-ionic contrast appear on the market?

- a. Late 60s
- b. Late 70s
- c. Late 80s
- d. Late 90s

59. True or false. CIN is a rapid decline in renal function after contrast administration while there is no other cause of acute kidney injury.

- a. True
- b. False

60. CIN is the \_\_\_\_\_ cause of acute kidney injury in hospitalized patients.

- a. Single
- b. Only
- c. Second
- d. Third

61. The cumulative incidence of CIN is \_\_\_\_\_ of all acute kidney injuries.

- a. 7%
- b. 10%
- c. 12%
- d. 14%

62. Which of the following is a factor that increases the incidence of CIN?

- a. Increase in the burden of CKD
- b. Increase in incidence of diabetes
- c. Increase in diagnostic and therapeutic measures requiring CM.
- d. All the above

63. In \_\_\_\_\_ of patients with CIN renal function does not fully recover.

- a. 10%
- b. 20%
- c. 30%
- d. 40%

64. What is the estimated in-hospital mortality rate of CIN?
- 22-25%
  - 23-27%
  - 24-28%
  - 25-29%
65. What is the leading and the single most important risk factor of CIN?
- Cardiac disease
  - Previous kidney disease
  - Diabetes
  - Obesity
66. The safety of a contrast agent depends in large part on the \_\_\_\_\_ of contrast media that must be administered.
- Type
  - Osmolality
  - Amount
  - Ions
67. What is the primary mechanism of CIN?
- Ischemia
  - Direct tubular toxicity to epithelial tubular cells
  - Failure
  - A & B
68. At the time the text was written, what is the most effective measure in nephroprotection of CIN?
- Volume expansion
  - Volume reduction
  - Diuretics
  - Low CM injection volume
69. As a renal replacement therapy, each dialysis can remove what percentage of administered CM?
- 40 – 70%
  - 50 – 80%
  - 60 – 90%
  - 70 – 95%
70. True or false. Case studies and clinical experiences have shown that non-steroid anti-inflammatory drugs may increase the incidence of CIN.
- True
  - False
71. Which of the following causes lactic acidosis in patients with renal failure?
- Metformin
  - Diuretics
  - Mannitol
  - NSAID

## **Chapter 7 Cardiac Catheterization Complications**

72. The risk of a major complication during cardiac catheterization is generally well below \_\_\_\_\_ percent.
- 0.5%
  - 1.0%
  - 1.5%
  - 2.0%

73. Data from patients between 1984 and 1987 revealed the mortality rate for diagnostic cardiac catheterization had fallen to \_\_\_\_\_ percent.
- 0.1
  - 0.2
  - 0.3
  - 0.4
74. Which of the following has an increased mortality rate after catheterization?
- Age above 60 years
  - Age below 1 year
  - Women
  - All the above
75. The New York Heart Association function class IV is associated with an almost \_\_\_\_\_ increase in mortality compared to with class I and II.
- Fivefold
  - Eightfold
  - Ninefold
  - Tenfold
76. Which of the following **is not** a risk factor that predisposes patients to MI during the catheterization procedure?
- Recent non-ST elevation acute coronary syndrome
  - Obesity
  - Extension of disease
  - Diabetes requiring insulin therapy
77. At the time the text was written, recent data was reported the risk of stroke to be as high as \_\_\_\_\_ percent.
- 0.1 to 0.3
  - 0.2 to 0.4
  - 0.3 to 0.5
  - 0.4 to 0.6
78. After cardiac catheterization which of the following is a common problem seen at the site of catheter insertion?
- Acute thrombosis
  - Distal embolization
  - Dissection
  - All the above
79. In a clinical trial comparing manual pressure on the groin versus a mechanical clamp, the mechanical clamp reduced complications by \_\_\_\_\_ percent.
- 50
  - 57
  - 63
  - 67
80. The INR for patients on warfarin should be \_\_\_\_\_ before proceeding with catheterization.
- 1.5
  - 1.7
  - 1.9
  - 2.1
81. Arterial thrombosis occurs slightly more often when the \_\_\_\_\_ approach is used.
- Femoral
  - Brachial
  - Radial
  - Axillary

82. Radial artery cannulation is associated with a \_\_\_\_\_ percent chance of radial artery occlusion.
- 2 to 10
  - 3 to 15
  - 4 to 17
  - 5 to 19
83. According to the second registry of the Society for Cardiac Angiography, ventricular tachycardia or fibrillation occurred in what percent of cases?
- 0.3 percent
  - 0.4 percent
  - 0.5 percent
  - 0.6 percent
84. What percent of patient experience a vasovagal reaction which includes bradycardia?
- 1 percent
  - 2 percent
  - 3 percent
  - 4 percent
85. Which of the following may cause an allergic reaction during catheterization?
- Local anesthetic
  - Contrast agent
  - Protamine sulfate
  - All the above
86. Infection is approximately \_\_\_\_\_ times more common with the brachial approach compared to the femoral approach.
- 10
  - 12
  - 14
  - 16
87. True or false. Patients undergoing diagnostic and interventional cardiac catheterization receive a substantial radiation dose.
- True
  - False

## **Chapter 8 Managing Invasive Coronary Angiography Complications**

88. Who recommended the use of sodium iodide for retrograde pyelography which led to current angiography practices?
- Mike Lamke
  - Jim Puckett
  - Douglas Cameron
  - Spence Bahner
89. What is the most important characteristic of contrast agents?
- Osmolarity
  - Viscosity
  - Cost
  - A & C
90. What is the iodine concentration of high-osmolar contrast?
- 300 mg/mL
  - 320 mg/mL
  - 320-370 mg/mL
  - 240 mg/mL

91. What is the iodine concentration of low-osmolar contrast with meglumine ioxaglate component?
- 240 mg/mL
  - 300 mg/mL
  - 320 mg/mL
  - 370 mg/mL
92. Most of the adverse side effects occur within \_\_\_\_\_ minutes after administration of contrast agents.
- 15
  - 20
  - 25
  - 30
93. What is a common consequence of a vasovagal response associated with high-osmolar contrast infusion?
- Hypotension
  - Bradycardia
  - Tachycardia
  - A & B
94. Cholesterol embolization syndrome (CES) is also known as what?
- Blue toe syndrome
  - Blue leg syndrome
  - Black toe syndrome
  - Black leg syndrome
95. What is the inhouse mortality rate for CES?
- 10%
  - 12%
  - 14%
  - 16%
96. Stroke occurred in what percentage of patients after a femoral approach diagnostic coronary angiogram?
- 0.11%
  - 0.14%
  - 0.16%
  - 0.18%
97. Severe bleeding and hematoma requiring transfusion occur in \_\_\_\_\_ of cases.
- 1.0~3.4%
  - 1.3~4.8%
  - 1.5~5.8%
  - 1.6~6.8%
98. Pseudoaneurysm occurs in what percentage of interventional procedures?
- 2.1% to 4.2%
  - 3.5% to 5.5%
  - 3.7% to 5.8%
  - 4.1% to 6.2%
99. What is the best diagnostic tool to diagnose a pseudoaneurysm?
- Color-Doppler ultrasound
  - Fluoroscopy
  - Palpation
  - CT angiography

100. Retroperitoneal hematoma occurs in less than \_\_\_\_\_ of cases of percutaneous coronary intervention.
- a. 0.5%
  - b. 0.7%
  - c. 1.0%
  - d. 1.2%
101. Which of the following is a clinical symptom of retroperitoneal hematoma?
- a. Decreased hematocrit
  - b. Back or inguinal pain
  - c. Abdominal pain
  - d. All the above
102. What is the most common complication of a transradial approach for coronary angiography and angioplasty?
- a. Dissection
  - b. Spasm
  - c. Hematoma
  - d. Occlusion

### Chapter 9 Coronary Angiography and Contrast Induced Nephropathy

103. Renal failure requiring dialysis after contrast administration is associated with a \_\_\_\_\_ in-hospital mortality rate.
- a. 20%
  - b. 30%
  - c. 40%
  - d. 50%
104. What is a major risk factor of CIN?
- a. Pre-existing renal failure
  - b. Diabetes mellitus
  - c. Obesity
  - d. A & B
105. True or false. The pathogenesis of CIN is unclear.
- a. True
  - b. False
106. Approximately \_\_\_\_\_ is spent annually to manage CIN in the US.
- a. \$180 million
  - b. \$182 million
  - c. \$186 million
  - d. \$188 million

For questions 107 through 110 choose the odds ratio for the development of CIN based on the risk factor.

107. Class III-IV congestive heart failure
- a. 1.57
  - b. 2.00
  - c. 2.20
  - d. 2.50
108. Age >75 years
- a. 1.90
  - b. 3.24
  - c. 4.94
  - d. 5.28

109. ACE inhibitors
- 1.57
  - 2.50
  - 3.37
  - 5.28
110. Hypertension
- 2.00
  - 2.20
  - 2.50
  - 2.51
111. Patients with diabetic nephropathy and a mean serum creatine of 6.8 mg/dl had a \_\_\_\_\_ incidence of CIN after coronary angiography.
- 90%
  - 92%
  - 94%
  - 96%
112. What class of drugs have been identified as a risk factor for CIN because of their potential to reduce renal function?
- ACE inhibitors
  - Antibiotics
  - Statins
  - Insulins
113. Patients on metformin should be instructed to not take this drug for \_\_\_\_\_ after CM administration.
- 12 hours
  - 24 hours
  - 48 hours
  - 72 hours
114. A baseline hematocrit value of less than \_\_\_\_\_ for men is a risk factor for CIN.
- 36%
  - 37%
  - 38%
  - 39%
115. In patients with diabetes or preexisting renal disease, what is the recommended time interval between exposure to additional contrast media?
- 24 hours
  - 48 hours
  - 36 hours
  - 72 hours

For questions 116 through 119 choose what should not be used in conjunction with the clinical evidence listed to prevent CIN.

116. Saline or sodium bicarbonate
- Loop diuretics
  - Mannitol
  - Large doses of contrast
  - High-osmolar contrast

117. Minimizing the dose of contrast
- Large doses of contrast
  - High-osmolar contrast
  - Multiple use of contrast with 72 hours
  - Mannitol
118. Monitoring serum creatinine
- Large doses of contrast
  - High-osmolar contrast
  - Mannitol
  - Loop diuretics
119. Alternative imaging techniques
- Mannitol
  - Loop diuretics
  - High-osmolar contrast
  - Large doses of contrast

### **Chapter 10 Coronary Angiography in Patients with Chronic Kidney Disease**

120. In patients with chronic renal disease, about 50% to 60% of cardiovascular deaths are due to what?
- Heart failure
  - Acute myocardial infarction
  - Stroke
  - Aortic disease
121. The majority of serious cardiovascular events in renal transplant patients are related to \_\_\_\_.
- CAD
  - Stroke
  - Embolism
  - Heart failure
122. Fewer than \_\_\_\_\_ of dialysis patient with acute myocardial infarction present with chest pain.
- 25%
  - 35%
  - 50%
  - 65%
123. What test has been associated with better and more consistent results for detecting significant coronary stenosis in patients with CKD?
- Coronary CTA
  - Coronary angiography
  - SPECT
  - Dobutamine-atropine stress echocardiography
124. The definition of contrast-induced AKI is an increase in serum creatinine occurring within the first \_\_\_\_ after contrast exposure and peaking up to 5 days afterwards.
- 12 hours
  - 24 hours
  - 36 hours
  - 48 hours
125. True or false. Central to the pathophysiology of contrast-induced AKI is the presence of a reduced nephron mass.
- True
  - False

126. Which of the following is a risk marker for contrast-induced acute kidney injury?
- Previous renal disease
  - Prior renal surgery
  - Diabetes mellitus
  - All the above
127. Achieving a good urine output in the \_\_\_\_\_ after a contrast procedure has been associated with reduced rates of AKI.
- 2 hours
  - 4 hours
  - 5 hours
  - 6 hours
128. Which of the following have been found to not be effective in the prevention of contrast-induced AKI?
- Fenoldopam
  - Dopamine
  - Calcium-channel blockers
  - All the above

### **Chapter 11 Cardiac Catheterization in Patients with Cardiomyopathy**

129. Cardiomyopathies are a group of heart diseases that directly influence \_\_\_\_\_.
- Muscles
  - Valves
  - Arteries
  - Vessels
130. What is not a grouping of primary cardiomyopathy?
- Genetic
  - Mixed
  - Stable
  - Acquired
131. What is the most common cardiomyopathy?
- Hypertrophic
  - Dilated
  - Restrictive
  - Primary
132. What is the major cause of congestive heart failure?
- Coronary artery disease
  - Peripheral vascular disease
  - Valvular disease
  - Dilated cardiomyopathy
133. What is a cause of secondary CMP?
- Alcohol
  - HIV infection
  - Metabolic impairments
  - All the above
134. DCM is more frequent in \_\_\_\_\_.
- Middle-aged men
  - Elderly men
  - Middle-aged women
  - Elderly women

135. What is the most common cause of heart failure?
- Aortic valve disease
  - Mitral valve disease
  - Ischemic CMP
  - Pulmonary embolism
136. In patients with severe LV dysfunction, but with viable myocardium, coronary artery revascularization results in an average \_\_\_\_\_ percent improvement in LV ejection fraction.
- 6 to 7
  - 8 to 10
  - 11 to 13
  - 15 to 18
137. Catheterization of the right and left sides of the heart is performed to measure which of the following?
- Intracardiac pressure
  - Cardiac outputs
  - Vascular resistances
  - All the above
138. CVA, myocardial infarction and deaths from cardiac cauterization is \_\_\_\_\_.
- Less than .0.5%
  - Less than 1%
  - Less than 1.5%
  - Less than 2%

#### **Chapter 12 Contrast Induced Nephropathy in Type 2 Diabetes Patients**

139. What is a major complication of type 2 diabetes?
- Coronary artery disease
  - Low blood sugar
  - High blood sugar
  - Peripheral vascular disease
140. What is the incidence of CIN in patient with normal renal function?
- < 1%
  - < 2%
  - < 5%
  - < 8%
141. What is the 2-year survival rate for patients with acute renal failure after coronary intervention?
- 13%
  - 16%
  - 19%
  - 22%
142. Which of the following contributes to CIN in patient with type 2 diabetes?
- Decreased GFR
  - Endothelial dysfunction
  - Increased reactivity to intrarenal adenosine
  - All the above
143. For type 2 diabetics, an ideal goal for hemoglobin A1C is less than \_\_\_\_\_.
- 7%
  - 8%
  - 9%
  - 10%

144. What medications increase the risk of a patient developing CIN?
- Aspirin
  - Nonsteroidal anti-inflammatory drugs
  - Diuretics
  - B & C
145. True or false. In patients with type 2 diabetes requiring elective angiography, nonsteroidal anti-inflammatory medicines, diuretic and dipyridamole **should not** be held prior to the procedure.
- True
  - False
146. Data revealed that overall \_\_\_\_\_ appears to be the least harmful nonsteroidal anti-inflammatory medicine in terms of cardiovascular outcomes.
- Naproxen
  - Ibuprofen
  - Diclofenac
  - Etoricoxib
147. Which of the following is a microvascular complication of type 2 diabetes?
- Retinopathy
  - Neuropathy
  - Nephropathy
  - All the above
148. What is the most common cause of preventative morbidity and mortality in developed countries?
- Obesity
  - High blood pressure
  - Cigarette smoking
  - Medication overdose
149. Carvedilol in hypertensive patients has been found to have a \_\_\_\_\_ effect on insulin resistance, weight and triglycerides.
- Neutral
  - Negative
  - Positive
  - Specific
150. Which medication is a better alternative to traditional beta-blocker therapy for high risk diabetic patients?
- Carvedilol
  - Tenormin
  - Inderal
  - Timolol

### Chapter 13 Interventional Cardiology Quantitative Coronary Angiography

151. What year did Gensini and his colleagues describe an electronic caliper system to manually define arterial borders by moving cursors?
- 1969
  - 1971
  - 1973
  - 1978

152. What information do 3D QCA programs provide?
- Vessel size
  - Percent diameter stenosis
  - Minimal lumen diameter
  - All the above
153. What is the first step in order to perform a QCA analysis?
- Turn on the equipment
  - Calibrate the equipment
  - Acquire high-quality angiographic images of the coronary artery segment
  - Measure the vessel
154. It is important that the coronary images are obtained when the patient is \_\_\_\_\_.
- In deep inspiration
  - Relaxed
  - Medicated
  - Asleep
155. Which of the following is a step in the analysis of the vessel?
- Digitization
  - Image calibration
  - Arterial automatic contour detection
  - All the above

For Questions 156 through 158 choose the range commonly used for the listed coronary parameter.

156. Minimal Luminal Diameter
- 0 – 6.00 mm
  - 1.5 – 6.00 mm
  - 0 – 60.0 mm
  - 0 – 4.0 mm
157. Reference Vessel Diameter
- 0 – 6.00 mm
  - 1.5 – 6.0 mm
  - 0 – 60.0 mm
  - 0 – 4.0 mm
158. Acute gain
- 0 – 6.00 mm
  - 1.5 – 6.0 mm
  - 0 – 60.0 mm
  - 0 – 4.0 mm

#### Chapter 14 Scoring Cardiac Ischemia

159. It is estimated that sudden death occurs in \_\_\_\_\_ of cardiac disease patients.
- 15% - 24%
  - 25% - 40%
  - 33% - 70%,
  - 36% - 74%

160. True or false. Coronary scores were used for risk stratification because it was determined that the prognosis and outcome in patients were in large part dependent on the extent and severity of CAD.
- True
  - False
161. What year did the American College of Cardiology/American Heart Association present a classification system of coronary lesions to predict the success and complications of balloon angioplasty?
- 1998
  - 2000
  - 2002
  - 2004
162. The SYNTAX scoring system was developed to characterize which of the following?
- Number of lesions
  - Functional impact of lesions
  - Complexity of lesions
  - All the above
163. According to the data of Gibson, the coronary flow in the non-involved arteries in acute MI was \_\_\_\_\_ slower than normal.
- 20%
  - 30%
  - 40%
  - 50%
164. Which of the following **is not** a process in the development and progression of CAD?
- Reduction of the total caliber of coronary arteries
  - Increase in myocardium weight
  - Deterioration of left ventricular pump function
  - Low cholesterol
165. Myocardial quantity does not represent the \_\_\_\_\_ of myocardial tissue nor its viability.
- Performance
  - Quality
  - Type
  - Function

## Chapter 15 Woven Coronary Artery

166. What is the incidence of coronary anomalies?
- 0.3% - 1.3%
  - 0.5% - 1.6%
  - 0.7% - 1.8%
  - 0.9% - 2.1%
167. Woven coronary artery was first described by Sane in \_\_\_\_\_.
- 1995
  - 1996
  - 1997
  - 1998
168. At the time the text was written, how many patients with woven coronary had been reported?
- Eight
  - Nine
  - Ten
  - Eleven

169. Woven coronary artery is mostly seen in the \_\_\_\_\_ coronary artery.
- Left
  - Right
  - Left anterior descending
  - Circumflex
170. What is the gold standard to diagnose woven coronary artery?
- CTA
  - SPECT
  - Coronary angiography
  - Echocardiogram
171. During coronary angiography a woven coronary artery may be misdiagnosed as \_\_\_\_\_.
- Complicated plaque with thrombus formation
  - Coronary artery stenosis
  - Spontaneous coronary artery dissection
  - All the above

### **Chapter 16 CT Angiography Post Processing and Interpretation**

172. What is defined as the process of integrating a series of axial images into a form that is often easier to interpret than the sections themselves?
- Image post-processing
  - Image stacking
  - Image sorting
  - Image structuring
173. According to the text, how long do experienced users spend segmenting and interpreting cardiac CT studies?
- 5 minutes
  - 10 minutes
  - 15 minutes
  - 20 minutes
174. What is a high-resolution reconstruction format that allows display of planar images at any angular section through the acquisition volume, which permits visualization in not only the axial plane but also in orthogonal or oblique planes.
- Image processing
  - Image rendering
  - Multiplanar reformation
  - Multiplanar stacking
175. What is a projection technique in which only the highest density pixel in the projection direction is displayed to reconstruct the two-dimensional images?
- Multiplanar reformation
  - Maximum intensity projection
  - Multiplanar intensity projection
  - Maximum reformation
176. What is the advantage of thin-slab MIP?
- Creation of a vascular map quickly without modifications of several parameters
  - Thin-slab MIP is user friendly
  - Thin-slab MIP is cost effective
  - Easy selection of data

177. At the time the text was written, what was the minimum vessel diameter seen with MIP?
- 0.4 mm
  - 0.5 mm
  - 0.6 mm
  - 0.7 mm
178. The development of \_\_\_\_\_ format made it possible for the interpreter to follow the course of a tortuous vessel for longer distances as it changes direction.
- Multiplanar reformation
  - Maximum intensity projection
  - Curved multiplanar reformation
  - Maximum curved projection
179. Using curved MPR, significant coronary stenosis and occlusions can be visualized with an accuracy that exceeds \_\_\_\_\_ percent.
- 87%
  - 89%
  - 90%
  - 92%
180. What is the term taken from computer graphics and represents the process of generating a 3D model from a 2D image?
- Rendering
  - Resolving
  - Planning
  - Slighting
181. What is an whole heart MIP image in which contrast media of the ventricles is eliminated?
- Anterior view
  - Angiographic view
  - Ascending view
  - Automatic view
182. True or false. At the time the text was written, there was no post-processing technique that displays an overview image of the lumen and vessel wall of the whole heart in one image.
- True
  - False
183. Which of the following is a coronary CT angiography artifact category?
- Cardiac motion-related artifact
  - Voluntary motion
  - High-attenuating artifact
  - All the above
184. Improper scan parameter causes poor signal-to-noise mainly due to \_\_\_\_\_.
- Motion of the heart
  - Obesity
  - Patient movement
  - Poor machine calibration

For questions 185 choose the solution for the listed artifact.

185. Cardiac motion – cause high heart rate
- Prior administration of beta-blocker
  - Removing data from undesirable beats
  - Selection of appropriate reconstruction window
  - Oxygen supplementation

## Chapter 17 Coronary Stenosis Insights

186. The visual estimation of coronary stenosis may vary \_\_\_\_\_ among readings by experienced angiographers.
- 15%
  - 20%
  - 25%
  - 30%
187. What is an invasive index calculated from coronary pressure measurements used to identify a stenosis responsible for reversible ischemia?
- CFR
  - PCI
  - FFR<sub>myo</sub>
  - CCS
188. Intra-coronary flow velocity can be measured with a \_\_\_\_\_ inch doppler guide wire.
- 0.014
  - 0.015
  - 0.016
  - 0.018
189. An FFR<sub>myo</sub> value of \_\_\_\_\_ distinguishes stenoses associated with inducible ischemia.
- 0.75
  - 0.80
  - 0.85
  - 0.90
190. Which of the following factors contribute to impaired exercise capacity?
- Increasing age
  - Sedentary lifestyle
  - Depression
  - All the above
191. True or false. The initial management strategy of patients with stenosis on coronary angiography should be to reduce not only the risks for major cardiac events but also to eliminate angina and allow a return to normal activity.
- True
  - False
192. What is triggered by microscopic ulcerations of vulnerable atherosclerotic plaques?
- Acute coronary syndrome
  - Peripheral vascular disease
  - Aortic dissection
  - Mitral valve disease

## Chapter 18 Cardiac Catheterization Radiation Dose and Image Quality Optimization

193. What forms of dynamic imaging are used in cardiac imaging systems?
- Fluoroscopy
  - Cineangiography
  - Static imaging
  - A & B

194. What is the mean energy imparted per unit mass by ionizing radiation called?
- Gray
  - Beam
  - Absorbed dose
  - Dose area product
195. What dose includes the scatter from the patient?
- Entrance skin dose
  - Absorbed dose
  - Overall dose
  - Useful beam dose
196. Painful dermal necrosis occurs after exposure of about \_\_\_\_\_.
- 14 Gy
  - 16 Gy
  - 18 Gy
  - 20 Gy
197. What do stochastic effects include?
- Cancer risk
  - Skin redness
  - Genetic risk
  - A & C
198. For staff working in cardiac catheterization what is the major worry about radiation exposure?
- Cancer
  - Cataracts
  - Birth defects
  - All the above
199. What does the ALARA principle stand for?
- As low as reasonably achievable
  - As long as reasonably achievable
  - As low as reasonably available
  - As long a reasonably achievable
200. Dosimetry for deterministic effects focuses on \_\_\_\_\_ dose assessment.
- Thyroid
  - Skin
  - Eye
  - Organ
201. What study is performed to evaluate abnormal electrocardiograms and to assess complex arrhythmias?
- Diagnostic coronary angiograms
  - Interventional coronary angiograms
  - Electrophysiology study
  - Peripheral angiograms
202. According to data collected by Trianni from 90 EP procedures, what was the mean local skin dose for atrial fibrillation?
- 0.03 Gy
  - 0.17 Gy
  - 0.20 Gy
  - 0.22 Gy

203. True or false. In children, the purpose of diagnostic catheterization examinations is to study complex congenital heart diseases.
- True
  - False
204. What is the occupational radiation dose limit per year?
- 20 mSv
  - 22 mSv
  - 24 mSv
  - 26 mSv
205. The equivalent dose should not exceed \_\_\_\_\_ for the lens of the eye.
- 140 mSv
  - 145 mSv
  - 150 mSv
  - 155 mSv
206. The equivalent dose for skin and for hands and feet should not exceed \_\_\_\_\_.
- 450 mSv
  - 500 mSv
  - 550 mSv
  - 600 mSv
207. In the x-ray imaging chain, the \_\_\_\_\_ ensures relatively constant image brightness.
- X-ray tube
  - Image intensifier
  - Image detector
  - Automatic exposure control
208. The detector entrance dose is known to influence which of the following?
- Image quality
  - Patient dose
  - Staff dose
  - X-ray system Efficiency

### **Chapter 19 Patient and Staff Radiation Protection During Fluoroscopy Guided Cardiology Procedures**

209. Stochastic effects of radiation add to the natural risk of developing \_\_\_\_\_.
- Cataracts
  - Cancer
  - Thyroid dysfunction
  - Skin rash

For questions 210 through 212, choose the threshold radiation dose for the listed skin effect.

210. Early transient erythema
- 2 Gy
  - 3 Gy
  - 6 Gy
  - 7 Gy
211. Dermal atrophy
- 6 Gy
  - 10 Gy
  - 11 Gy
  - 12 Gy

212. Necrosis
- 10 Gy
  - 12 Gy
  - 15 Gy
  - 18 Gy
213. For radiographic examinations, the operational quantity used is called \_\_\_\_\_ on the surface at the entrance of the beam in the patient.
- Absorbed dose
  - Entrance dose
  - Area dose
  - Dose-area product
214. How is absorbed dose (ESD) expressed?
- mSv
  - $\mu\text{Gy}\cdot\text{m}^2$
  - $\text{cGy}\cdot\text{cm}^2$
  - mGy
215. What radiation protection principle should be respected?
- Justification of the practice
  - Optimization of the protection
  - Individual dose limits
  - All the above

