Directed Reading Continuing Education Quiz

Computed Tomography

Angiography

To receive Category A+ continuing education credit for this Directed Reading, read the preceding article and circle the correct response to each statement. Choose the answer that is most correct based on the text. Transfer your responses to the answer sheet on Page 288CT and then follow the directions for submitting the answer sheet. You also may take Directed Reading quizzes online at www.asrt.org. New and reinstated members are ineligible to take DRs from journals published prior to their most recent join date unless they have purchased access to the quiz from the ASRT. Your access to Directed Reading quizzes for continuing education credit is determined by your CE preference. For access to other quizzes, go to www.asrt.org/store.

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1. African Americans face a first-stroke risk ______ as high as that seen among whites.
   a. twice
   b. equally
   c. two-thirds
   d. one-half

2. More than 83 million Americans currently live with:
   a. high levels of low-density lipoprotein (LDL) cholesterol.
   b. cardiovascular disease.
   c. thrombosis.
   d. angina pectoris.

3. The total direct and indirect costs of cardiovascular disease are an estimated $______ billion annually.
   a. 240
   b. 340
   c. 440
   d. 540

4. ______ is a progressive, life-threatening chronic inflammatory disorder of vascular walls.
   a. Pulmonary embolism
   b. Atherosclerosis
   c. Thrombosis
   d. Hyperlipidemia

5. Clinical signs of coronary artery disease include:
   1. infarction.
   2. oxygen deprivation.
   3. angina pectoris.
   a. 1 and 2
   b. 1 and 3
   c. 2 and 3
   d. 1, 2, and 3

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Directed Reading Continuing Education Quiz

6. Pulmonary embolism is a common emergency resulting from atherosclerotic disease, and 1 in _____ patients who die of unsuspected pulmonary embolism could have survived with proper diagnosis.
   a. 5
   b. 7
   c. 10
   d. 12

7. Atherosclerosis risk factors with genetic components include:
   1. elevated levels of LDL.
   2. elevated levels of homocysteine.
   3. clinical depression.
   a. 1 and 2
   b. 1 and 3
   c. 2 and 3
   d. 1, 2, and 3

8. _____ has been implicated as a contributing factor in 36% of first heart attacks.
   a. Diabetes
   b. LDL oxidation
   c. Tobacco smoking
   d. Low dietary intake of antioxidants

9. Autopsies suggest most men and women have _____ by age 15 to 34.
   a. aortic fatty streaks
   b. ruptured atherosclerotic lesions
   c. atheromas
   d. fibrous plaques

10. Symptomatic stenosis of the arterial lumen usually occurs during the _____ phase of atherosclerosis development.
    a. fatty streak
    b. foam cell
    c. atheroma
    d. fibrous plaque

11. The degree of calcification is a useful indicator of plaque stage.
    a. true
    b. false

12. The predictable range of computed tomography (CT) values for muscle is _____ HU.
    a. -50 to -100
    b. 10 to 40
    c. 300 to 500
    d. 130 to 1500

13. Nonionic contrast agents have a reported overall adverse reaction rate of approximately _____ %.
    a. 3
    b. 4
    c. 5
    d. 6

14. Dose-dependent adverse reactions to contrast agents include:
    1. nephrotoxicity.
    2. pulmonary embolism.
    3. cardiac collapse.
    a. 1 and 2
    b. 1 and 3
    c. 2 and 3
    d. 1, 2, and 3

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15. Contraindications for iodinated contrast agent injections include patient use of:
   a. nonaminoglycoside antibiotics.
   b. gemcitabine chemotherapy.
   c. loop diuretics.
   d. corticosteroids.

16. Approximately ______ % of patients may not be able to reduce their heart rate to below 65 beats per minute, even with beta-blocker administration.
   a. 15
   b. 20
   c. 25
   d. 30

17. The ______ images use data from multiple primary planar images to reconstruct images in new view-angle planes.
   a. 2-D multiplanar
   b. maximum intensity pixel (MIP)
   c. primary axial
   d. curved planar reformations

18. ______ can be constructed to visualize complex 3-D vasculature, representing tortuous vascular pathways on a single 2-D image and allowing accurate assessment of vessel occlusions and calcifications.
   a. Multiplanar reformations
   b. MIPs
   c. Primary axial images
   d. Curved planar reformations

19. Grayscale settings should not be maximized to white for the ______ because doing so can yield inaccurate visualizations of lumen diameter.
   a. stents
   b. blood vessels
   c. fat
   d. smooth muscle

20. Precontrast scans are rarely used with multidetector CT (MDCT) except in cases of suspected:
   a. pulmonary embolism.
   b. ischemic stroke.
   c. arterial hemorrhage.
   d. coronary stenosis.

21. The risk of respiratory motion artifacts is higher for ______ than for other CT examinations.
   a. chest and abdominal computed tomography angiography (CTA)
   b. CT neuroangiography
   c. neck CTA
   d. abdomen-only CTA

22. Administration of beta-blockers prior to CTA examinations is contraindicated for which of the following medical conditions?
   1. severe bronchial asthma
   2. high blood pressure
   3. heart failure
   a. 1 and 2
   b. 1 and 3
   c. 2 and 3
   d. 1, 2, and 3

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23. _______ is key to vascular enhancement, whereas _______ would be key to enhancement of other organs.
   a. A 30-second breath hold; shallow breathing
   b. Shallow breathing; a 30-second breath hold
   c. Contrast injection flow rate; total iodine dose
   d. Total iodine dose; contrast injection flow rate

24. _______ refers to the time required for contrast to travel from the injection site to a region of interest.
   a. Contrast medium transit time ($t_{CMT}$)
   b. $t_{CMT}$ plus 8 seconds
   c. Scan delay
   d. First pass effect

25. CTA contrast enhancement is proportionate to injection rate and total injection:
   a. dose.
   b. fraction.
   c. duration.
   d. phase.

26. The magnitude of arterial enhancement varies up to _______ -fold between patients, in part because of variation in cardiac output and body mass.
   a. 2
   b. 3
   c. 4
   d. 5

27. Coronary artery disease is an atherosclerotic narrowing of _______ % or more of a major coronary artery or branch.
   a. 20
   b. 30
   c. 40
   d. 50

28. Patient radiation doses below _______ mSv have been reported for ECG tube current-modulated retrospective ECG-gated MDCT coronary CTA.
   a. 7
   b. 8
   c. 9
   d. 10

29. Most calcium scoring is employed using _______ , which has largely replaced _______ calcium scoring.
   a. MDCT; electron-beam CT
   b. MDCT; magnetic resonance
   c. magnetic resonance; MDCT
   d. electron-beam CT; MDCT

30. According to the Directed Reading, the most common indication for diagnostic imaging of pulmonary vasculature is pulmonary:
   a. sarcoidosis.
   b. fibrosis.
   c. embolism.
   d. emphysema.
Directed Reading Evaluation
Computed Tomography Angiography

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Thank you for taking the time to complete this survey. Your opinion helps us serve you better. Your comments will remain confidential and will not affect the scoring of your Directed Reading (DR) test. Choose only ONE response for each question. Use a blue or black ink pen. Do not use felt tip markers. Completely fill in the circles.

1. What is your primary area of practice?
   ○ Administration/Management  ○ Education  ○ Quality Management  ○ RIS/HIS/Information Systems
   ○ Bone Densitometry  ○ Magnetic Resonance  ○ Radiation Therapy  ○ RN
   ○ Cardiovascular-Interventional  ○ Mammography  ○ Radiography  ○ Sonography
   ○ Computed Tomography  ○ Nuclear Medicine  ○ Research  ○ Other

2. Which of the following best describes the highest educational level you have attained?
   ○ Student who has not yet taken Registry exam  ○ Associate degree  ○ Master’s degree
   ○ Certificate  ○ Bachelor’s degree  ○ Doctoral degree (e.g., Ph.D. or Ed.D.)

3. Why did you choose to complete this DR?
   ○ Interested in the topic  ○ Topic pertained to my area of practice  ○ Other
   ○ DR had the right number of CE credits  ○ Needed CE credits immediately

4. How relevant is this DR to your practice?
   ○ Extremely relevant  ○ Very relevant  ○ Relevant  ○ Somewhat relevant  ○ Not relevant

5. How beneficial is this DR to your professional or personal development?
   ○ Extremely beneficial  ○ Very beneficial  ○ Beneficial  ○ Somewhat beneficial  ○ Not beneficial

6. How would you rate the level of difficulty of this DR?
   ○ Too difficult  ○ Somewhat difficult  ○ Just the right level  ○ Somewhat easy  ○ Too easy

7. How would you rate the length of this DR?
   ○ Too long  ○ Somewhat long  ○ Just the right length  ○ Somewhat short  ○ Too short

8. Did this DR meet your expectations?
   ○ Yes  ○ No  ○ Partially

9. Would you recommend this DR to a colleague?
   ○ Yes  ○ No

10. Overall, how valuable are the Directed Readings to you?
    ○ Very valuable  ○ Considerably valuable  ○ Valuable  ○ Slightly valuable  ○ Not very valuable

If you have comments about this Directed Reading, please write them below or send them separately to Ellen Lipman, Director of Professional Development, ASRT, 15000 Central Ave SE, Albuquerque, NM 87123-3909 or elipman@asrt.org.
Computed Tomography Angiography

Expires: February 28, 2014
Approved for 2.0 Category A+ CE Credits

- A passing score is 75% or better.
- Take the quiz online at www.asrt.org/DRquiz for immediate results and your CE certificate.
- If you don't have Internet access, mail your answer sheet to ASRT, PO Box 51870, Albuquerque, NM 87181-1870.
- ASRT must receive the original answer sheet before the quiz expires and before the end of the CE biennium for which you want credit.
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We need your Social Security number to track your CE credits.
Please fill in your SSN in the boxes on top, then fill in the circle corresponding to each number under the box. The circles must be filled in accurately.

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To ensure proper credit please PRINT the following information.

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CE Answers Section

USE A BLUE OR BLACK INK PEN. Completely fill in the circles.

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Note: For true/false questions, A=true, B=false.

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5 O O O O O 15 O O O O O 25 O O O O O
6 O O O O O 16 O O O O O 26 O O O O O
7 O O O O O 17 O O O O O 27 O O O O O
8 O O O O O 18 O O O O O 28 O O O O O
9 O O O O O 19 O O O O O 29 O O O O O
10 O O O O O 20 O O O O O 30 O O O O O

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Stroke and CT Perfusion

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1. Approximately ______ Americans older than 20 years of age have a new or recurrent stroke each year.
   a. 795 000
   b. 820 000
   c. 875 000
   d. 900 000

2. The 18% increase in hospital admissions for intracerebral hemorrhage in the past 10 years is largely because of:
   a. reliable screening procedures.
   b. an increase in the number of elderly people who lack adequate blood pressure control.
   c. increased numbers of obese patients.
   d. an increase in the number of patients with diabetes.

3. The risk of recurrence is greatest immediately following a stroke.
   a. true
   b. false

4. Most of the cost associated with caring for stroke patients during the first 90 days of their care comes from:
   a. rehabilitation.
   b. physician costs.
   c. medications.
   d. initial hospitalization.

5. ______ is a type of ischemic stroke.
   a. Intracerebral
   b. Thrombotic
   c. Subarachnoid
   d. Hypotensive

6. An episode of cerebrovascular insufficiency usually associated with partial occlusion of the cerebral artery by an atherosclerotic plaque or an embolus is known as:
   a. transient ischemic attack (TIA).
   b. subarachnoid hemorrhage.
   c. arteriovenous malformation (AVM).
   d. hypotensive episode.

Continued on next page
7. Without treatment, one-third of patients who have had a TIA experience a stroke within:
   a. 1 month.
   b. 5 months.
   c. 1 year.
   d. 5 years.

8. Stroke symptoms in the retina or cerebral hemisphere are an indication of:
   a. subarachnoid hemorrhage.
   b. hypotensive stroke.
   c. TIA in the carotid arteries.
   d. AVM.

9. _____ is the most powerful modifiable risk factor for stroke.
   a. Cigarette smoking
   b. Obesity
   c. High cholesterol
   d. High alcohol consumption

10. Abnormally high levels of homocysteine can occur with deficiencies of:
    a. niacin.
    b. vitamins B₉ and B₁₂.
    c. vitamins D₃ and D₁₂.
    d. biotin.

11. Which of the following states are included in the “stroke buckle”?
    a. Utah, Nevada, and Wyoming
    b. Illinois, Indiana, and Wisconsin
    c. North Carolina, South Carolina, and Georgia
    d. California, Oregon, and Washington

12. _____ refers to areas of damaged brain cells arranged in a patchwork pattern around areas of dead brain cells following a stroke.
    a. Ischemic penumbra
    b. Infarct
    c. Perfusion
    d. Parenchyma

13. What percentage of acute stroke patients actually receive tissue plasminogen activator (tPA) for stroke treatment?
    a. 4%
    b. 8%
    c. 21%
    d. 33%

14. The FDA-approved window of time for administering tPA to stroke patients is _____ hour(s).
    a. 1
    b. 3
    c. 6
    d. 8

15. Magnetic resonance (MR) diffusion/perfusion imaging has proven to be more effective than CT in imaging:
    a. small ischemic strokes.
    b. salvageable penumbra.
    c. subarachnoid hemorrhage.
    d. acute rapid triage.

16. Which of the following lists correctly identifies the order of the “4 P’s” that must be evaluated in stroke patients?
    a. perfusion, penumbra, parenchyma, and pipes
    b. pipes, perfusion, parenchyma, and penumbra
    c. penumbra, pipes, perfusion, and parenchyma
    d. parenchyma, pipes, perfusion, and penumbra

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Directed Reading Continuing Education Quiz

17. ______ is gradually replacing digital subtraction angiography in the evaluation of intracranial arteries.
   a. CT perfusion
   b. Noncontrast head CT
   c. MR angiography
   d. CT angiography (CTA)

18. Which of the following statements is true regarding noncontrast CT and stroke?
   a. Noncontrast CT can help radiologists distinguish tissue that might be irreversibly damaged from salvageable tissue.
   b. The technique provides high levels of detail to help neurosurgeons before opening cerebral arterial branches to treat clots.
   c. Noncontrast CT can help radiologists detect the presence of a thrombus in a major vessel.
   d. It often can be relied on alone for stroke assessment.

19. Which of the following are calculated during CT perfusion brain scans?
   1. cerebral blood volume (CBV)
   2. cerebral blood flow (CBF)
   3. mean transit time (MTT)
   a. 1 and 2
   b. 1 and 3
   c. 2 and 3
   d. 1, 2, and 3

20. The addition of CTA and CT perfusion to a noncontrast head CT scan typically adds ______ to the total examination time.
   a. 5 minutes
   b. 15 minutes
   c. 50 minutes
   d. 1 hour

21. In addition to diagnosing acute ischemic stroke, CT perfusion is indicated for:
   a. migraines.
   b. tumor grading.
   c. headaches.
   d. concussion.

22. The approximate injection rate of contrast media during a CT perfusion study is ______ mL per second.
   a. 1 to 2
   b. 2 to 3
   c. 4 to 7
   d. 8 to 11

23. The CT perfusion parameter MTT measures:
   a. time between arterial inflow and venous outflow.
   b. time for CBF to reach the penumbra.
   c. time for contrast media to reach the ventricles.
   d. time between CTA and CT perfusion sequencing.

24. Which of the following are recommended imaging parameters for a CT perfusion study?
   a. 70 kVp, 200 mA, and 1-second rotation time
   b. 80 kVp, 200 mA, and 1-second rotation time
   c. 90 kVp, 100 mA, and 2-second rotation time
   d. 100 kVp, 150 mA, and 2-second rotation time

25. The first step in postprocessing the images with the perfusion software is to:
   a. determine the CBF.
   b. calculate the MTT.
   c. select a reference artery and reference vein.
   d. produce 3-D surface shaded images.

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26. Which of the following signifies irreversible infarction when demonstrated on a CT perfusion study?
   a. an increase in CBF with a stable or decreased CBV
   b. an increase in MTT with a stable or increased CBF
   c. a decrease in CBF with a stable or increased CBV
   d. a decrease in MTT with a stable or decreased CBF

27. Color-coded maps can be used to look for large ischemic areas and rapid assessment with ______% sensitivity.
   a. 60
   b. 70
   c. 80
   d. 90

28. What is the difficulty with interpreting CT perfusion parameters?
   a. performing the quantitative analysis without the perfusion software
   b. assigning a specific threshold value to determine reversible or irreversible ischemia
   c. data support from the CT perfusion software companies
   d. calculating the threshold values for each arterial and venous branch

29. ______ was determined as the main reason for more than 200 patients receiving 8 times the expected amount of radiation during CT perfusion studies conducted in 2009.
   a. Leakage of the x-ray tube in the CT scanner
   b. Malfunction of safety device on the CT scanner
   c. Incorrect settings on the CT scanner console
   d. A technologist repeating the study without patients’ knowledge

30. The 2010 FDA recommendations for facilities and practitioners regarding radiation exposure and CT perfusion included to:
   a. confirm all radiographers who operate CT scanners are ARRT CT certified.
   b. ensure and document technologists’ training on CT scanner and procedures.
   c. verify all CT perfusion protocols have been approved by the American College of Radiology.
   d. ensure that all radiographers who perform CT perfusion have a minimum of 3 years of CT experience.
Directed Reading Evaluation
Stroke and CT Perfusion

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1. **What is your primary area of practice?**
   - ☐ Administration/Management
   - ☐ Education
   - ☐ Quality Management
   - ☐ RIS/HIS/Information Systems
   - ☐ Bone Densitometry
   - ☐ Magnetic Resonance
   - ☐ Radiation Therapy
   - ☐ RN
   - ☐ Cardiovascular-Interventional
   - ☐ Mammography
   - ☐ Radiography
   - ☐ Sonography
   - ☐ Computed Tomography
   - ☐ Nuclear Medicine
   - ☐ Research
   - ☐ Other

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3. **Why did you choose to complete this DR?**
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   - ☐ Other
   - ☐ DR had the right number of CE credits
   - ☐ Needed CE credits immediately

4. **How relevant is this DR to your practice?**
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   - ☐ Relevant
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   - ☐ Not relevant

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   - ☐ Beneficial
   - ☐ Somewhat beneficial
   - ☐ Not beneficial

6. **How would you rate the level of difficulty of this DR?**
   - ☐ Too difficult
   - ☐ Somewhat difficult
   - ☐ Just the right level
   - ☐ Somewhat easy
   - ☐ Too easy

7. **How would you rate the length of this DR?**
   - ☐ Too long
   - ☐ Somewhat long
   - ☐ Just the right length
   - ☐ Somewhat short
   - ☐ Too short

8. **Did this DR meet your expectations?**
   - ☐ Yes
   - ☐ No
   - ☐ Partially

9. **Would you recommend this DR to a colleague?**
   - ☐ Yes
   - ☐ No

10. **Overall, how valuable are the Directed Readings to you?**
    - ☐ Very valuable
    - ☐ Considerably valuable
    - ☐ Valuable
    - ☐ Slightly valuable
    - ☐ Not very valuable

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Stroke and CT Perfusion

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Address _________________________
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CE Answers Section
USE A BLUE OR BLACK INK PEN. Completely fill in the circles.

GET IMMEDIATE DIRECTED READING QUIZ RESULTS AND CE CREDIT WHEN YOU TAKE YOUR TEST ONLINE AT WWW.ASRT.ORG/DRQUIZ.

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1 ○ ○ ○ ○ ○ 11 ○ ○ ○ ○ ○ 21 ○ ○ ○ ○ ○
2 ○ ○ ○ ○ ○ 12 ○ ○ ○ ○ ○ 22 ○ ○ ○ ○ ○
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