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Fetal Echo Review

Revised and Updated
2nd Edition

Fetal Echocardiography A Q&A Review for the ARDMS Specialty Exam

Continuing Education Activity

SDMS-Approved 12 **CME Credits**

NIKKI C. STAHL | VALRIE KUNES | BRADLEY W. ROBINSON

Fetal Echocardiography Review

A Q&A REVIEW FOR THE ARDMS EXAMINATION

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Preface to the 2nd Edition

THIS MOCK EXAM is a question/answer/reference review of fetal echocardiography for those RDMS and RDCS candidates who plan to take the ARDMS specialty examination in fetal echocardiography. Cardiology fellows and pediatric cardiologists who are learning fetal echocardiography will also find this book very helpful. It is designed as an adjunct to your regular study and as a means of helping you determine your strengths and weaknesses so that you can study more effectively. *Fetal Echocardiography Review, 2nd Edition* covers everything on the current ARDMS exam content outline, which you will find at the end of this book with cross-references to the questions in this mock exam.

Facts about *Fetal Echocardiography Review*:

- This mock exam covers the material on the ARDMS exam content outline in effect as of 2019. Readers are advised to check the ARDMS website, www.ardms.org, for the latest updates. This mock exam itself is continuously updated and revised as necessary.
- This mock exam focuses exclusively on the Fetal Echocardiography specialty exam to ensure thorough coverage of even the smallest subtopic on the exam. (For the Sonography Principles and Instrumentation exam, see *Ultrasound Physics Review: SPI Edition*, by Cindy Owen and James Zagzebski, available at www.DaviesPublishing.com.)
- We use the most current ARDMS content outline as a guideline for coverage. It is, in fact, our table of contents. At the same time, we provide on pages xiii–xv a cross-referenced list of contents by specific topics and subtopics. Why? The ARDMS exam content outline provides a generalized categorical overview together with very specific clinical tasks, but it can miss key intermediate topics you must know to pass your exam. Hence our subject-driven cross-references give you the best of both worlds.
- This second edition of *Fetal Echocardiography Review* contains 513 questions—33% more than the first edition. Many of these are illustrated with images and schematics.
- Explanations are clear and conveniently referenced for fact-checking or further study.
- While otherwise in ARDMS exam format, this Davies mock exam makes deliberate and judicious use of multiple-choice items with five, not four, possible choices—thereby increasing both the difficulty of each question and the time needed to answer it. We also sprinkle in a few answer-choice variants to exercise those neural pathways in more than one direction. Registry candidates who master these items at an average rate of 1 minute apiece will be exceptionally well prepared for the actual exam.
- The ARDMS exams include new Advanced Item Type (AIT) questions that assess practical sonography instrumentation skills. For the Fetal Echocardiography exam, these AIT questions include what ARDMS calls "Hotspot" questions. Hotspot items display an image and question, requiring you to indicate the correct answer by marking directly on the image using your cursor; this type of question is called "advanced" because it requires a higher level of thinking and processing than you perform when answering a conventional multiple-choice question. In Davies' mock exam, similar questions are identified as "AIT—Hotspot" questions. These items ask you to identify what an arrow in the image is pointing at or to indicate the label on an image that corresponds to the correct answer. Another type of AIT question, the "AIT—SIC" (Semi-Interactive Console) item, requires the examinee to use a semi-interactive console to correct a problem with

the image presented. These items are currently limited to the Sonography Principles and Instrumentation (SPI) examination, but as a bonus feature we have identified such items as "AIT—SIC" questions. Finally, PACSim items—case-based Picture Archive and Communication Simulation questions—are not included in the Fetal Echo mock exam because this type of question is specifically designed for and limited to physicians taking the Physician in Vascular Interpretation (PVI) exam.

- A new "Bonus Questions" section has been added with 38 new questions that cover additional tasks appearing on the current ARDMS exam content outline. Answers to these Bonus Questions appear at the end of Part 9 on pages 170–179.
- The expanded ARDMS exam content outline, complete with *all* questions that apply to specific clinical tasks, appears on pages 206–210. We have cross-referenced each task to the relevant question numbers in this Fetal Echo mock exam for your convenience in targeting your study on specific tasks. For the latest information on the Fetal Echo examination, please visit the ARDMS website at www.ardms.org.

Fetal Echocardiography Review effectively simulates the content of the exam. Current ARDMS standards call for 150 multiple-choice questions to be answered during a three-hour period. That is, you will have an average time of just over 1 minute to answer each question. Timing your practice sessions will help you prepare for the pressure of taking the exam. Identifying your strengths and weaknesses will help you study more efficiently in the limited time you are able to devote to preparation.

IMPORTANT NOTE: *Although many of our customers remark on similarities between our questions and those of the actual exam, do not be misled into thinking you should memorize these questions and answers. They are here to give you practice, to teach you things you may not know, and to reveal your strengths and weaknesses so that you know where to put your energy as you prepare for the exam.*

ARDMS test results are reported as a "scaled" score that ranges from a minimum of 300 to a maximum of 700. A scaled score of 555 is the passing score—the "passpoint" or "cutoff score" for all ARDMS examinations. Also known as the Angoff method, scaled scoring takes the difficulty of each question into account, which helps ensure the fairness of the exam. We include below and strongly recommend that you read *Taking and Passing Your Exam*, by Don Ridgway, RVT, who offers useful tips and practical strategies for taking and passing the ARDMS examinations.

Finally, you have not only our best wishes for success but also our admiration for taking this big and important step in your career.

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Taking and Passing Your Exam

by Don Ridgway, RVT*

Preparing for Your Exam . . .

Study. And then study some more. Knowing your stuff is the most important factor in your success. Start early, set a regular study schedule, and stick to it. Make your schedule specific so you know exactly what to study on a particular day. Write it down. Establish realistic goals so that you don't build a mountain you can't climb.

As to *what* you study, don't just read aimlessly. Focus your efforts on what you need to know. Rely on a core group of dependable references, referring to others as necessary to firm up your understanding of specific topics. Let the ARDMS exam outline guide you. And use different but complementary study methods—texts, flashcards, and mock exams—to exercise those neural pathways.

Ease down on studying the week before. Wind down, reduce stress, build confidence, and rest up. Don't cram! And no studying the night before. You had your chance. Watch a movie, relax, go to bed early, and sleep well.

Organize your things the night before. Lay out comfortable clothes (including a sweater or sweatshirt in case the testing center is cold), pencils, your ARDMS test-admission papers, car and house keys, glasses, prescriptions, directions to the test center, and any other personal items you might need. Remember that the only thing you can take into the testing room is you—there will be lockers for your personal items. Read about necessary documentation and examination admission compliance requirements for your exam at www.ardms.org. Be prepared!

The Day of Your Exam . . .

Eat lightly. You do not want to fall asleep during the exam. Go easy on the coffee or tea so your bladder doesn't distract you halfway through the exam.

Arrive early. Plan to arrive at the test center early, especially if you haven't been there before. Take directions, including the telephone number of the testing center in case you have to make contact en route. You don't need a wrong-offramp adventure.

Be confident. As you wait for the exam to begin, smile, lift both hands, wave them toward yourself, and say, "Bring it on."

During the Exam . . .

Read each question twice before answering. Guess how easy it is to get one word wrong and misunderstand the whole question!

Try to answer the question before looking at the choices. Formulating an answer before peeking at the possibilities minimizes the distractibility of the incorrect answer choices, which in the test-making business are called—guess what?—*distractors*.

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*Don Ridgway is the author of *Introduction to Vascular Scanning: A Guide for the Complete Beginner* and editor of *Vascular Technology Review*. He is Professor Emeritus at Grossmont College in El Cajon, California.

Knock off the easy ones first. First answer the questions you feel good about. Then go back for the more difficult items. Next, attack the really tough ones. Taking notes on long or tricky questions often can jog your memory or put the question in new light. For questions you just cannot answer with certainty, eliminate the obviously wrong answer choices and then guess.

Guessing. Passing the exam depends on the number of correct answers you make. Because unanswered questions are counted as incorrect, it makes sense to guess when all else fails. The ARDMS itself advises that it is to the candidate's advantage to answer all possible questions. Guessing alone improves your chances of scoring a point from 0 (for an unanswered question) to 25% (for randomly picking one of four possible answers). Eliminating answer choices you know or suspect are wrong further improves your odds of success. By using your knowledge and skill to eliminate two of the four answer choices before guessing, for example, you increase your odds of scoring a point to 50%.

Pace yourself; watch the time. Work methodically and quickly to answer those you know, and make your best guesses at the gnarly ones. Leave no question unanswered.

Don't despair 50 minutes into the exam. At some point you may feel that things just aren't going well. Take 10 seconds to breathe deeply—in for a count of five, out for a count of five. Relax. Recall that you need only about three out of four correct answers to pass. If you've prepared reasonably well, a passing score is attainable even if you feel sweat running down your back.

Taking the Exam on Computer . . .

Some candidates express concern about taking the registry exam on a computer. Most folks find this to be pretty easy; some find it offputting, at least in prospect. But the computerized exams are quite convenient: You can take the exam at your convenience (a far cry from the days of one exam per year), you know whether or not you passed before you leave the testing center (compare that to waiting weeks and even months, as used to be the case), and if you do not pass the first time you can reschedule for the next exam, given twice annually (visit www.ardms.org). Another good point: The illustrations are said to be clearer on computer than in the booklets at a Scantron-type exam.

Taking the test by computer is not complicated. The center even gives you a tutorial to be sure you know what you need to do. You sit in a carrel with a computer and answer the multiple-choice questions by pointing and clicking with a mouse. There is a clock on the display letting you know how much time is left. Use it to pace yourself. White boards are available to take notes. You can mark questions for answering later. A display shows which questions have not been answered so you can return to them. When you have finished, you click on "DONE," and you find out immediately whether you passed.

It's nothing to be afraid of. The principles are the same as those for any exam. Be methodical and keep breathing.

Summary . . .

Preparing for the exam:

- Study.
- Use flashcards.
- Join a study group.
- Wind down a week before.
- Don't cram.
- Relax!

The day of your exam:

- Eat lightly, avoid coffee.
- Arrive early.
- Take a sweater.
- Be confident!

During the exam:

- Read each question twice.
- Answer the question before looking at the answer choices.
- Answer the easy ones first.
- Guess when necessary.
- Pace yourself.
- Don't despair.

Taking the exam on computer:

- Just point and click.
- Take notes.
- Mark and return to the hard questions.
- Use the on-screen clock to pace yourself.
- Be methodical.
- Breathe!

Contents

Contents by Subject Category

For your convenience, the questions in this mock exam are arranged here by subject.

Normal Fetal Heart Anatomy

See questions 1, 2, 3, 8, 9, 10, 11, 12, 13, 26, 29, 30, 31, 36, 37, 39, 40, 44, 46, 50, 58, 61, 62, 71, 81, 377, 378, 379, 387, 389, 401, 487, 499, 501, 504, 506, 508.

- size
- venous connections
- atria and septum
- atrioventricular valves
- ventricles and septum
- outflow tracts
- semilunar valves
- great arteries
- pericardium
- other

Normal Fetal Heart Physiology

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- heart rate
- blood flow and cardiac output
- in utero shunts
- series circulation
- structural heart anomalies

Structural Heart Anomalies

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- cardiac malposition
- enlarged heart
- venous abnormalities
- atria and septum
- atrioventricular valves
- ventricles and septum
- semilunar valves

- great arteries
- pericardium
- complex cardiac anomalies

Dysrhythmias and Conduction Anomalies

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- bradyarrhythmias
- tachyarrhythmias
- ectopy

Acquired Pathology

See questions 112, 328, 331, 333, 335, 337, 338, 339, 342, 344, 473, 486, 505, 510.

- metabolic/endocrine
- infection
- twin-to-twin transfusion
- intrauterine growth restriction
- drugs

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- hydrops fetalis
- extracardiac anomalies
- syndromes

Physical Principles and Instrumentation

See questions 355, 356, 358, 392, 393, 394, 396, 404, 405, 406, 407, 408, 409, 410, 411, 412, 413, 414, 415, 416, 417, 418, 419, 420, 421, 422, 423, 424, 425, 426, 427, 428, 429, 430, 431, 432, 433, 434, 435, 436, 437, 438, 439, 440, 441, 442, 443, 444, 445, 446, 447, 448, 449, 450, 454, 455, 456, 457, 458, 459, 460, 461.

Patient Care

See questions 295, 296, 297, 298, 299, 300, 301, 464, 465, 475, 512.

PART 1

Anatomy and Physiology

Normal anatomy and physiology

Evaluate aortic arch

Evaluate cardiac chambers

Evaluate cardiac septa and related structures

Evaluate cardiac valves

Evaluate coronary vessels

Evaluate ductal arch

Evaluate fetal anatomic structures related to the abdomen/pelvis

Evaluate fetal anatomic structures related to the chest/thorax

Evaluate fetus for normal cardiac axis, cardiac position, and abdominal situs

Evaluate pulmonary vessels

Evaluate systemic vessels

Evaluate tissues composing the heart

Perfusion and function

Evaluate for normal cardiac rhythms

Evaluate for normal fetal circulation

Organ development

Assess for normal embryologic development

Perform various fetal echocardiographic examinations during appropriate time intervals

1. What is the most superior structure in the fetal heart?
   A. Aorta
   B. Mitral valve
   C. Tricuspid valve
   D. Main pulmonary artery
   E. Superior vena cava

2. Approximately how large is the isthmus of the aorta in relation to the ascending and descending aorta?
   A. The same size
   B. 1/3 larger
   C. 1/3 the diameter
   D. 2/3 larger
   E. 2/3 smaller

3. Which of the following is TRUE about the normal left aortic arch?
   A. It gives off an innominate branch coursing to the right.
   B. It gives off the innominate artery, which divides into two branches.
   C. It gives off the brachiocephalic artery, which divides into the right subclavian and right common carotid arteries.
   D. It curves over the right pulmonary artery.
   E. All of the above are true.

Questions 4–7 refer to the following long-axis view of the fetal aortic arch.

4. Number 1 represents the:
   A. Innominate artery
   B. Left common carotid artery
   C. Left subclavian artery

D. Right pulmonary artery
E. Superior vena cava

AIT—Hotspot item.*

5. Number 2 represents the:
   A. Innominate artery
   B. Left common carotid artery
   C. Left subclavian artery
   D. Right pulmonary artery
   E. Superior vena cava

AIT—Hotspot item.

6. Number 3 represents the:
   A. Innominate artery
   B. Left common carotid artery
   C. Left subclavian artery
   D. Right pulmonary artery
   E. Superior vena cava

AIT—Hotspot item.

7. Number 4 represents the:
   A. Right atrium
   B. Left atrium
   C. Superior vena cava
   D. Right pulmonary artery
   E. Persistent left superior vena cava

AIT—Hotspot item.

8. The most anterior structure of the normal fetal heart is the:
   A. Right atrium
   B. Right ventricle
   C. Pulmonary artery
   D. Left ventricle
   E. Aorta

9. The moderator band is the morphologic marker for the:
   A. Left ventricle
   B. Left atrium
   C. Right ventricle
   D. Right atrium
   E. Interventricular septum

*Advanced Item Type (AIT) Hotspot items marked here are similar to Hotspot items on the ARDMS exam. On the exam, these Hotspot items require you to indicate the correct answer by marking directly on the image using your cursor. In Davies' Fetal Echo mock exam, similar questions are identified as **AIT—Hotspot** and ask you to identify what an arrow in the image is pointing at or to indicate the label on an image that corresponds to the correct answer. Another type of AIT question, the **AIT—SIC** (Semi-Interactive Console) item, requires you to use a semi-interactive console to correct a problem with the image presented. These items are limited to the Sonography Principles and Instrumentation (SPI) examination, but as a bonus feature we have also identified these items in the Fetal Echo mock exam.

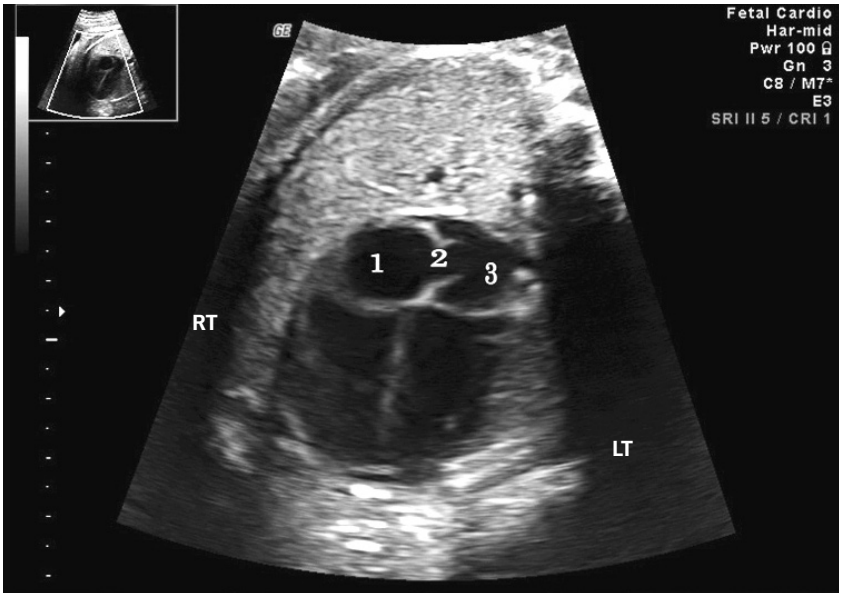
10. Which of the following is NOT true of the normal left atrium?
    A. It accepts the pulmonary veins.
    B. It contains the mitral valve.
    C. It accepts the foramen ovale flap.
    D. It is the chamber closest to the fetal spine.
    E. It is the most posterior heart chamber.

11. Which of the following are characteristics of the left ventricle?
    A. Septophobic mitral valve with attachments away from the septum
    B. Smooth walls
    C. Two papillary muscles
    D. Mitral valve more superior than tricuspid valve
    E. All of the above

12. Which of the following characterizes the left atrium?
    A. It has a finger-like, thin appendage.
    B. It receives the superior and inferior venae cavae.
    C. It has a broad-based appendage.
    D. It contains the sinoatrial node.
    E. All of the above.

13. The normal right ventricle:
    A. Has a moderator band
    B. Is very trabeculated
    C. Has a septophilic tricuspid valve with attachments to the septum
    D. Is triangular
    E. Exhibits all of these characteristics

Questions 14–16 refer to the following image of a normal fetal heart with {S, D, S} and normally related great vessels. The fetus is in the vertex presentation.



14. Number 1 represents the:
    A. Left atrium
    B. Right atrium
    C. Foramen ovale
    D. Coronary sinus
    E. Pulmonary veins

AIT—Hotspot item.

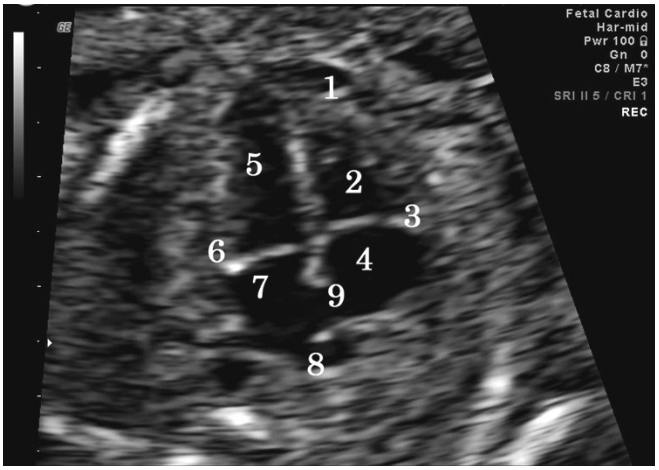
15. Number 2 represents the:
    A. Left atrium
    B. Right atrium
    C. Foramen ovale
    D. Coronary sinus
    E. Pulmonary veins

AIT—Hotspot item.

16. Number 3 represents the:
    A. Left atrium
    B. Right atrium
    C. Foramen ovale
    D. Coronary sinus
    E. Pulmonary veins

AIT—Hotspot item.

Questions 17–25 refer to the following image of a fetus in a vertex presentation, spine down, with a normal heart anatomy {S, D, S}.



17. Number 1 represents the:
    A. Left ventricle
    B. Right ventricle
    C. Moderator band
    D. Foramen ovale
    E. Pulmonary veins

AIT—Hotspot item.

18. Number 2 represents the:
    A. Right ventricle
    B. Left ventricle
    C. Tricuspid valve
    D. Mitral valve
    E. Moderator band

AIT—Hotspot item.

19. Number 3 represents the:
    A. Right ventricle
    B. Left ventricle
    C. Tricuspid valve
    D. Mitral valve
    E. Moderator band

AIT—Hotspot item.

20. Number 4 represents the:
    A. Left ventricle
    B. Right ventricle
    C. Left atrium
    D. Right atrium
    E. Coronary sinus

AIT—Hotspot item.

21. Number 5 represents the:
    A. Right ventricle
    B. Left ventricle
    C. Tricuspid valve
    D. Mitral valve
    E. Moderator band

AIT—Hotspot item.

22. Number 6 represents the:
    A. Right ventricle
    B. Left ventricle
    C. Tricuspid valve
    D. Mitral valve
    E. Moderator band

AIT—Hotspot item.

23. Number 7 represents the:
    A. Left ventricle
    B. Right ventricle
    C. Left atrium
    D. Right atrium
    E. Coronary sinus

AIT—Hotspot item.

24. Number 8 represents the:
    A. Right atrium
    B. Left atrium
    C. Coronary sinus
    D. Foramen ovale
    E. Pulmonary veins

AIT—Hotspot item.

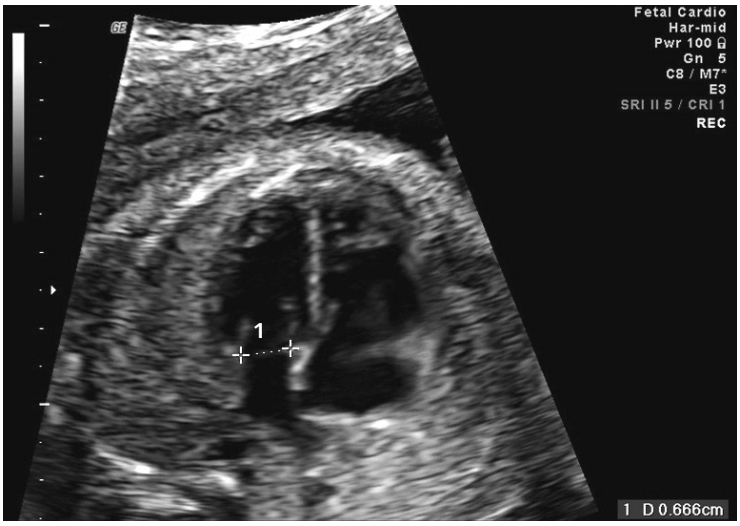
25. Number 9 represents the:
    A. Right atrium
    B. Left atrium
    C. Coronary sinus
    D. Foramen ovale
    E. Pulmonary veins

AIT—Hotspot item.

26. Which of the following statements about evaluating the interventricular septum is TRUE?
    A. Ventricular wall thickness should be measured in the subcostal four-chamber view.
    B. Ventricular wall thickness remains less than 5 mm throughout gestation.
    C. Ventricular septal wall thickness should be measured at end diastole.
    D. Both A and B are true statements.
    E. All of these statements are true.

27. Which of the following would be considered a normal fetal heart shunt?
    A. Ductus venosus
    B. Ductus arteriosus
    C. Patent foramen ovale
    D. B and C
    E. A, B, and C

28. The fetus in this image is in the vertex presentation with the fetal spine down. The heart has {S, D, S} relationship with normally related great arteries. The cardiac structure being measured is the:



A. Mitral valve
B. Tricuspid valve
C. Left atrium
D. Right atrium
E. Coronary sinus

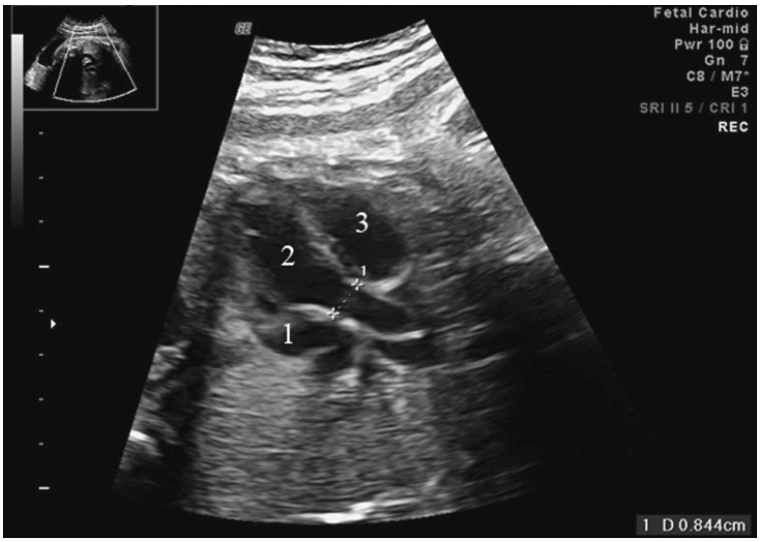
AIT—Hotspot item.

29. The normal aortic valve consists of:
    A. 1 cusp
    B. 2 cusps
    C. 3 cusps
    D. 4 cusps
    E. 5 cusps

30. The normal mitral valve:
    A. Is attached more apically than the tricuspid leaflets
    B. Is continuous with the posterior wall of the aorta
    C. Has anterior, posterior, and septal leaflets
    D. Both A and C
    E. All of the above

31. What is the normal relationship of the semilunar valves?
    A. The aortic valve is to the right and posterior to the pulmonic valve.
    B. The aortic valve is to the right and anterior to the pulmonic valve.
    C. The aortic valve is to the right and lateral to the pulmonic valve.
    D. The aortic valve is to the left and anterior to the pulmonic valve.
    E. The aortic valve is to the left and posterior to the pulmonic valve.

Questions 32–35 refer to the following image of a fetus in vertex presentation with a structurally normal heart {S, D, S} and with normally related great vessels.



32. What structure is being measured?
    A. Tricuspid valve
    B. Pulmonic valve
    C. Ascending aorta
    D. Mitral valve
    E. Aortic valve

AIT—Hotspot item.

33. Number 1 represents the:
    A. Left atrium
    B. Right atrium
    C. Left ventricle
    D. Right ventricle
    E. Pulmonary vein

AIT—Hotspot item.

34. Number 2 represents the:
    A. Left atrium
    B. Right atrium
    C. Left ventricle
    D. Right ventricle
    E. Moderator band

AIT—Hotspot item.

35. Number 3 represents the:
    A. Left atrium
    B. Right atrium
    C. Left ventricle
    D. Right ventricle
    E. Moderator band

AIT—Hotspot item.

36. Which structures drain into the right atrium in a normal fetal heart?
    A. Superior and inferior venae cavae
    B. Coronary sinus
    C. Pulmonary veins
    D. A and B
    E. All of the above

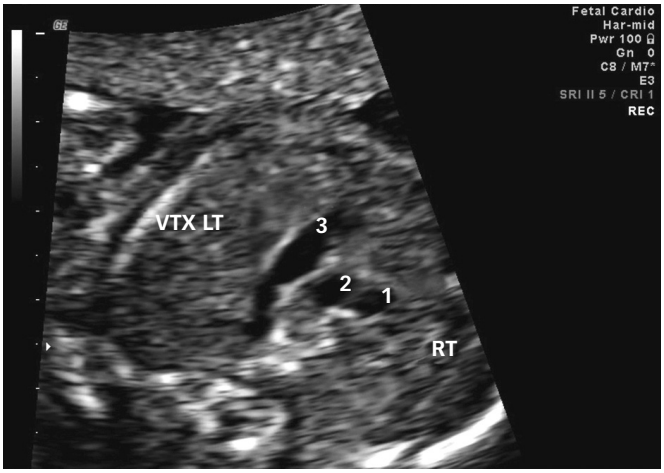
37. What heart structure is normally seen in the left atrioventricular groove?
    A. Coronary sinus
    B. Persistent left superior vena cava
    C. Azygos vein
    D. Pulmonary vein
    E. Left ventricular outflow tract

38. What heart view is best for evaluation of the fetal coronary sinus?
    A. Short-axis view of the great arteries
    B. Short-axis view of the ventricles
    C. Apical four-chamber view
    D. Five-chamber view
    E. Aortic arch view

39. Which vessel supplies blood flow to the left ventricle and left atrium?
    A. Left coronary artery
    B. Right coronary artery
    C. Left superior vena cava
    D. Subclavian artery
    E. Ascending aorta

40. Which artery originates from the left side of the ascending aorta at the level of the aortic root and has two major branches that supply blood flow to the heart muscle?
    A. Ductus arteriosus
    B. Ductus venosus
    C. Abdominal aorta
    D. Azygos artery
    E. Left coronary artery

Questions 41–43 refer to the following image of a fetus with all heart structures normally located. The fetus is in vertex presentation.



41. Number 1 represents the:
    A. Aorta
    B. Superior vena cava
    C. Main pulmonary artery
    D. Ductus arteriosus
    E. Inferior vena cava

AIT—Hotspot item.

Fetal Echocardiography Review

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2nd Edition

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