MONASH ULTRASOUND
FOR WOMEN

Book 2

Test Questions

Coartation

Test Questions

1. T/F Only around 50 % of CoA are diagnosed prenatally.

2. T/F Prenatal diagnosis of neonatal Coarctation makes little difference to survival or morbidity

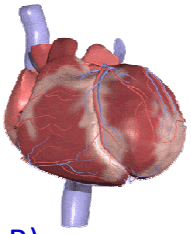
3. T/F False positive diagnosis at the mid trimester 30-50% and as high as 80% in the 3rd trimester
   Difficult diagnosis because of patency of DA and parallel circulation before birth

4. T/F In Coarctation 1/3 present with extracardiac anomalies

5. T/F In Coarctation 2/3 present with Chromosomal anomalies

6. T/F Surveillance is the key and informing patient of the variable natural history and limitation of accurate prenatal diagnosis

Aortic Interruption
Test Questions



7. T/F Rare abnormality – 1% of CHD

8. T/F Usually interruption occurs between left common carotid and left subclavian artery (type B)

9. T/F Typically there is ventricular disproportion especially for Type B

10. T/F Majority with VSD (90% with Type B and 50% with Type A)

11. T/F Dilated ascending Aorta

12. T/F In 2/3 of the cases subaortic stenosis will develop later

13. T/F Rarely associated with 22q11.2 deletion

Aortic Stenosis
Test Questions

14. T/F Mild isolated Aortic Stenosis in often identified prenatally

15. T/F In mild Aortic stenosis the 4- Chamber view of heart is generally normal

16. T/F In most cases the diagnosis of Aortic stenosis is made upon colour examination of the 5- Chamber view of heart

17. T/F Post stenotic dilatation may occur and in some cases may extend up to the transverse aortic arch and thus be appreciated on the 3 vessel and 3-Vessel tracheal view

18. T/F Normal aortic flow on color and Doppler evaluation excludes the diagnosis of mild aortic stenosis at 18-20 weeks.

19. T/F Mild isolated Aortic stenosis is often associated with aneuploidy or extra-cardiac anomalies

[1] Braunwald E, Goldblatt A, Aygen MM, et al. Congenital aortic stenosis. I. Clinical and hemodynamic findings in 100 patients. II. Surgical treatment and the results of operation. Circulation. 1963;27:426–462.

Critical Aortic Stenosis (CAS)

Test Questions

20. T/F CAS is rare cardiac anomaly which may evolve as pregnancy progresses and thus the presence of a normal appearing 4-chamber heart at 18-20 weeks does not exclude the diagnosis

21. T/F Characteristic features of CAS include RV dilatation and fibroelastosis

22. T/F CAS is an evolving lesion where at the outset the LV may be apex forming and later the RV apex forming

23. T/F In critical aortic stenosis the stenotic aortic valve is always patent with increased flow velocities up to 250cm/s

24. T/F Mitral regurgitation may be severe and lead to LA dilatation

25. T/F M-Mode is of value in demonstrating reduced poor LV contractility in the early stages of the disease

26. T/F Associated cardiac malformations occur in about 50% of patients with CAS and include coarctation of the aorta and septal defects.

27. T/F CAS (isolated) is often associated with aneuploidy or extra-cardiac anomalies

Hypoplastic Left Heart Syndrome and Hypoplastic Left Heart

Test Questions

28. T/F HLH is associated with aneuploidy in 25-30% (including XO) and genetic testing should be considered [1,2,sm] ?

29. T/F Approximately 40% present with an increased nuchal translucency [2,sm]

30. T/F Extra-Cardiac anomalies have been reported in up to 25% of cases [3]?

31. T/F IUGR develops in 40% of fetuses with HLH syndrome [4]?

32. T/F Tick the findings which may help distinguish HLHS from Coarctation
    LV Contractility
    RV contractility,
    Endocardial Fibroelastosis,
    RV form Apex of the heart,
    Forward flow across Aortic Valve,

33. T/F Intact intra-atrial septum occurs in approximately 50% of HLHS patients

[1] Raymond FL, Simpson JM, Sharland GK, et al. Fetal echocardiography as a predictor of chromosomal abnormality. Lancet. 1997;350:930.
[2] Hypoplastic left heart syndrome diagnosed in fetal life: associated findings, pregnancy outcome and results of palliative surgery GALINDO*, MENDOZA et al Ultrasound Obstet Gynecol 2009; 33: 560–566.(SM)
[3] Callow LB. Current strategies in the nursing care of infants with hypoplastic left-heart syndrome undergoing first-stage palliation with the Norwood operation. Heart Lung. 1992;21:463–470..
[4[. Rosenthal GL. Patterns of prenatal growth among infants with cardiovascular malformations: possible fetal hemodynamic effects. Am J Epidemiol. 1996;143:505–513.
[5] The hypoplastic left heart syndrome with intact atrial septum: atrial morphology, pulmonary vascular histopathology and outcome Rychik J, Rome JJ, Collins MH, DeCampli WM, Spray TL J Am Coll Cardiol, 1999

Ventricular Septal Defects
Test Questions

34. T/F VSDs are the most commonly diagnosed CHD on prenatal ultrasound

35. T/F VSD's are the most common anomaly diagnosed on postnatal scan (Bicuspid valve)

36. T/F 80% of prenatally detected VSD's are perimembranous whereas 80% of VSD's diagnosed in the neonatal period are muscular

37. T/F The lateral or transverse view of the heart on B-mode can help reduce false-positive and false-negative diagnoses of VSD

38. T/F Close to 80% of small muscular VSDs close spontaneously before birth or by the first 2 years of life

39. T/F 75% of isolated VSD 's confirmed at birth close within the first year of life [1]

40. T/F 5% of VSD's confirmed on prenatal ultrasound close before birth [1]

41. T/F 65 % of prenatally diagnosed VSD's are associated with cardiac defects

42. T/F Isolated muscular VSDs diagnosed prenatally have an increased risk of chromosomal abnormalities

43. T/F Excluding muscular defects VSD's are associated with aneuploidy in greater than 50% of cases [2]

[1] Gomez O, Martinez JM, Olivella A, et al. Isolated ventricular septal defects in the era of advanced fetal echocardiography: risk of chromosomal anomalies and spontaneous closure rate from diagnosis to age of 1 year. *Ultrasound Obstet Gynecol*. 2014;43:65–71.
[2] Axt-Fliedner R, Schwarze A, Smrcek J, et al. Isolated ventricular septal defects detected by color Doppler imaging: evolution during fetal and first year of postnatal life. *Ultrasound Obstet Gynecol.* 2006;27:266–273.

Right Aortic Arch

Test Questions

44. T/F A right aortic arch and right arterial duct give rise to a vascular ring effect

45. T/F In Double aortic arch both Trachea and Oesphagus are entrapped inside the vascular ring. Elective surgery is required in all cases.

46. T/F In Double Aortic arch the Duct is to the right of the trachea connecting with the right arterial branch (most cases)

47. T/F Neck vessels most commonly arranged such that 2 arise from left arch and two from right arch
ie there is no innominate artery.

48. T/F Amniocentesis should be offered to patient with RAA only if there are associated markers of aneuploidy or CHD, especially for 22Q deletion (Check face and thymus)

Atrial Septal Defects
Test Questions

49. T/F ASD occurs in 37% of all infants with congenital heart defects

50. T/F Most ASDs can be diagnosed in the fetus, especially atrial secundum and coronary sinus forms and most of sinus venosus forms

51. T/F Septum secundum defects. High False positive and False negative rates and in essence not detectable with acceptable accuracy before birth

52. T/F Septum primum region, is considered a partial atrioventricular septal defect (AVSD)

53. T/F Rare coronary sinus ASD is located at the site of the coronary sinus ostium in the right atrium and is often associated with coronary sinus abnormalities

54. T/F Surgical closure is needed in most cases, especially if significant LT→RT shunt

55. T/F Foramen Ovale aneurysm may mimic Secundum defect

56. T/F ASD's are present in the vast majority of cases of anomalous venous return-Sinus venosus in up to 90% of cases and atrium secundum defects in up to 15% of cases [1,2]

[1] Sachdeva R. Atrial septal defects. In: Allen HD, Driscoll DJ, Shaddy RE, et al, eds. *Moss and Adams' Heart Disease in Infants, Children, and Adolescents*. 8th ed. Baltimore, MD: Williams & Wilkins; 2012:672–690.
[2] Ettedgui JA, Siewers RD, Anderson RH, et al. Diagnostic echocardiographic features of the sinus venosus defect. *Br Heart J*. 1990;64:329–331.

Atrio Ventricular Septal Defects

Test Questions

57. T/F AVSD is best detected on lateral transverse views

58. T/F Partial AVSD may present with atrial septum primum defect + a cleft in the mitral valve (MR) and 2 discrete AV valves

59. T/F Partial AVSD may present with ASD +small VSD but 2 discrete AV valve annuli.

60. T/F Complete AVSD presents with an atrial septum secundum defect + VSD + Common atrioventricular valve

61. T/F In complete AVSD a combination of five leaflets is least frequent.

62. T/F In unbalanced AVSD, the atrioventricular connection drains predominantly to one of the two ventricles giving rise to ventricular size disproportion.

63. T/F Unbalanced AVSD is typically found in association with heterotaxy syndrome. When AVSD is associated with heterotaxy, the risk of chromosomal abnormality is virtually absent.

64. T/F 40% of foetuses with Down syndrome present with AVSD .

65. T/F Long-term outcome of isolated AVSD cases is poor.

Ebsteins
Test Questions

66. T/F A rare condition occurring 1 in 30,000 live births but more frequent in utero 1:10.000 pregnancies?

67. T/F Ebsteins may present with minimal displacement of the tricuspid valves with the singular finding of mild tricuspid regurgitation

68. T/F Pulmonary Stenosis is present in the minority of Ebsteins and is explained by a reduction in flow across the pulmonary valve (ie functional stenosis) ?

69. T/F ASD (secundum type) may arise secondary to severe tricuspid regurgitation and right atrial dilatation

70. T/F The position of the septal leaflet is a key feature which helps differentiate Ebstein anomaly from tricuspid valve dysplasia

71. T/F Anterior tricuspid leaflet has abnormal attachment to the tricuspid valve annulus in Ebstein anomaly

72. T/F Supraventricular arrhythmias are present in up to 57% of fetus with ebsteins but only present after birth [1]

73. T/F Generally a condition that carries a poor prognosis ~ 45% die prenatally and ~ 90% die postnatally [3] ?

[1] Delhaas T, Sarvaas GJ, Rijlaarsdam ME, et al. A multicenter, long-term study on arrhythmias in children with Ebstein anomaly. Pediatr Cardiol. 2010;31:229–233
[2] Chaoui R, Bollmann R, Goldner B, et al. Fetal cardiomegaly: echocardiographic findings and outcome in 19 cases. Fetal Diagn Ther. 1994;9:92–104..
[3] Hornberger LK, Sahn DJ, Kleinman CS, et al. Tricuspid valve disease with significant tricuspid insufficiency in the fetus: diagnosis and outcome. J Am Coll Cardiol. 1991;17:167–173.

Tricuspid Regurgitation
Test Questions

74. T/F Tricuspid regurgitation is a hemodynamic event detected by colour and pulsed Doppler evaluation

75. T/F The Doppler sample gate should be placed across tricuspid valve with the crossbar inside RV and other inside RA

76. T/F The cause of 'Trivial' tricuspid regurgitation is unknown but can be due to immature fetal myocardium (less compliant) and an increased pulmonary vascular bed pressure in early gestation ?

77. T/F In first-trimester risk assessment for aneuploidy, tricuspid regurgitation is diagnosed if the peak systolic velocity of the regurgitant jet is greater than 100 cm/s , regardless of the duration of the jet

78. T/F Isolated mild Tricuspid Regurgitation resolves in the vast majority patients by the end of the first trimester

[1] Messing B, Porat S, Imbar T, et al. Mild tricuspid regurgitation: a benign fetal finding at various stages of pregnancy. Ultrasound Obstet Gynecol. 2005;26:606–609; discussion 610.
[2] Messing B, Porat S, Imbar T, et al. Mild tricuspid regurgitation: a benign fetal finding at various stages of pregnancy. Ultrasound Obstet Gynecol. 2005;26:606–609; discussion 610.

Tricuspid Dysplasia

Test Questions

79. T/F Tricuspid valve leaflets are normal but inserted at the level of the tricuspid valve annulus (DDX Ebsteins)

80. T/F Includes a wide range of valvular malformations : Ranging from mild thickening of the valve leaflets to → severe dysplastic leaflets with anomalous chordae tendineae .

81. T/F Clinical presentation ranges from mild TR only detected after birth → severe TR→ Cardiomegaly→ Hydrops→ FDIU

82. T/F Occurs often in association with aneuploidy and ASD's.

83. T/F Outcome is general good unless associated with severe TR and cardiomegaly or pulmonary stenosis and ASD's

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Ductus Ateriosus Constriction

Test Questions

84. T/F During normal fetal life the DA starts to narrow from the origin of the duct progressing along its length to the point of insertion into the aorta (progressive deposition of elastin and collagen)

85. T/F During this process total occlusion in fetal life may occur quite commonly

86. T/F DA Constriction is mostly iatrogenic and related to indomethacin or Polyphenols

87. T/F Risk of closure is related to duration and dose of drugs used

88. T/F Therapy after 32 weeks is the time of least risk

89. T/F Interruption of NSAID therapy unfortunately does not reverse the constriction

90. T/F The most reliable diagnostic finding is Peak systolic velocities > 200 cm/sec

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Transposition of the Great Arteries

Test Questions

91. T/F In D-TGA, both great arteries display a parallel course with the aorta more commonly posterior and to the left of the pulmonary artery

92. T/F VSDs occur in about 40% of D-TGA cases and are typically muscular

93. T/F Pulmonary stenosis coexists with a VSD in about 30% of D-TGA cases.

94. T/F In TGA with pulmonary stenosis sonographic evidence is generally not present at mid-trimester and thus surveillance in the 3rd trimester is recommended

95. T/F Aneuploiudy and Extracardiac anomalies are common so Testing for 22Q should be considered

96. T/F Premature closure of the foramen ovale or ductus arteriosus is associated with a better prognosis

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Absent Pulmonary Valve Syndrome

Test Questions

97. T/F Absent pulmonary Valve syndrome always coexists with Tetralogy of Fallot

98. T/F Di George Syndrome occurs in up to 90% of cases of Absent pulmonary valve syndrome

99. T/F The ductus arteriosus is absent in almost all cases especially when it coexists with Tetralogy of Fallot

100. T/F The Pulmonary artery may appear normal on both B-Mode and Colour at the mid trimester and present for the first time in the 3rd trimester.

101. T/F Colour Doppler demonstrating 'to and fro' motion across the main pulmonary artery is a rare feature of the anomaly

102. T/F Dilatation of the right ventricle, tricuspid regurgitation, cardiomegaly and heart failure may all evolve in the 1st trimester

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Common Arterial Trunk

Test Questions

103. T/F Common arterial trunk is a rare cardiac anomaly

104. T/F Usually the trunk arises from the RV

105. T/F Di George is found in up to 10% with CAT.

106. T/F Associated structural fetal malformation is seen in up to 40% of cases.

107. T/F In up to 50% of cases associated anomalies include absent ductus arteriosus or arch anomalies (coarctation / interruption) especially type 1&2

108. T/F Fetal death in uterus occurs in 1:2 cases of CAT

Double Outlet Right Ventricle

Test Questions

109. T/F Subclassification is based on the spatial relationship of the great arteries at the level of the semilunar valves and the location of the VSD

110. T/F The four-chamber view is rarely normal in the first and second trimesters in DORV fetuses.

111. T/F Pulmonary stenosis is present in 70% of foetuses with DORV

112. T/F The minority of foetuses with DORV are associated with additional complicating features including aneuploidy and extra-cardiac malformation

113. T/F The presence of subpulmonic VSD and aortic coarctation can be associated with suboptimal postsurgical outcomes in DORV fetuses.

114. T/F For isolated cases of uncomplicated DORV without extra cardiac malformation and normal chromosomes long-term survival rates of up to 90% have been reported [1]

Tetralogy of Fallot

Test Questions

115. T/F The majority of TOF present with a visible but narrowed pulmonary artery

116. T/F One of the most striking findings in TOF is a *Dilated Aorta* on the 5-chamber view. Aortic root dilatation increases with advancing gestation especially in third trimester

117. T/F In contrast the pulmonary artery decreases in diameter later in the pregnancy so a reasonable size pulmonary artery at 18-20 weeks may progress to pulmonary atresia in the 3rd trimester

118. T/F The four-chamber view appears abnormal in most cases except where the subaortic VSD is large

119. T/F Microdeletion of 22q11 is found in up to 85% of TOF cases.

120. T/F Atrial septal defects and / or a patent foramen ovale is seen in ~80% of TOF cases.

121. T/F A right-sided aortic arch and a persistent left superior vena cava have been found in ~25% and ~10% of TOF cases, respectively.

122. T/F TOF may present at 18-20 weeks with a subtle perimambraneous subaortic VSD without evidence of override or pulmonary stenosis only to present later in the 3rd trimester with these more classic findings – Beware of this atypical presentation!

123. T/F Right ventricular hypertrophy (4th component of tetralogy) is evident prenatally

Persistent left SVC
Test Questions

124. T/F PLSVC present in 1:100 of the normal adult population [1]

125. T/F LSVC joins the coronary sinus and drains into the right atrium in 92% of cases

126. T/F In 8% of cases the PLSVC drains into left atrium and has an unroofed coronary sinus either partial or complete

127. T/F Increased nuchal translucency has been shown in 59% of fetuses with LSVC.

128. T/F May be associated with CHD most commonly heterotaxy syndromes and LVOT obstruction mainly coarctation and VSD and isomerisms

129. T/F Chromosomal anomalies are more often than not associated with LSVC

130. T/F Isolated LSVC is often associated with clinical problems postnatally.

[1] Freedom RM, Culham JAG, Moes CAF (1984). Angiography of Congenital Heart Disease. New York: Macmillan Publishing

Azygous continuation of the IVC (interrupted IVC) □ (LAI)

Test Questions

131. T/F The normal azygos vein courses along the right side of the spine receives the hemiazygous before draining into the SVC

132. T/F IVC interruption is strongly associated with CHD (~ 80% of cases) and usually the heterotaxy syndromes (LAI).

133. T/F Close evaluation of the atrial appendages can in this setting unveil the presence of left or right atrial isomerism.

134. T/F In 80% of cases IVC interruption is isolated and carries an excellent prognosis

135. T/F Transverse section through the fetal abdomen demonstrates absence of the RT ANT position of the normal IVC but rather a dilated azygous vein immediately adjacent (and RT / posterior) of the abdominal aorta referred to as the "double-bubble sign'.

136. T/F In hemiazygous IVC continuation then at the level of the stomach the vein is to the LEFT and posterior of the Aorta

137. T/F In sagittal section colour Doppler demonstrates the azygos vein in parallel and opposite colour the descending Aorta also the vein passes along the RT posterior thorax entering the Right atrium (unlike the SVC)

Anomalous Pulmonary Venous Return

Test Questions

138. T/F TAPVR is a condition where all 4 pulmonary veins drain either directly or indirectly into the left atrium.

139. T/F PAPVC is characterized by the direct or indirect anomalous drainage of 1-3 pulmonary veins into the right atrium.

140. T/F Four types of TAPVC exist: type I, supracardiac; type II, cardiac; type III, infracardiac; and type IV, mixed pattern.

141. T/F Infracardiac-type TAPVC (type III) is the most common.

142. T/F Obstruction to pulmonary venous return is a rare association with TAPVC.

143. T/F TAPVC and PAPVC are commonly found in heterotaxy syndromes, primarily in right isomerism.

144. T/F The four-chamber view typically shows an enlarged right atrium and ventricle and a venous confluence behind the left atrium in TAPVC.

145. T/F The three-vessel-trachea view shows a dilated pulmonary artery and a vertical vein as a fourth vessel.

Double Inlet Left Ventricle

Test Questions

146. T/F DILV is the most common form of single ventricle heart and is seen in 80% of cases

147. T/F Left ventricle identified by elongated smooth surfaces and absence of trabeculation

148. T/F Outflow tract obstruction most often affects the vessel arising from the rudimentary ventricle

149. T/F Associated malformations include straddling of the atrioventricular valves, pulmonary (or subpulmonic) outflow obstruction, (sub)aortic outflow obstruction

150. T/F The redundant RV is seen on the 4- chamber view

151. T/F The RRV may be positioned more cranially either on the left or right side of the single ventricle

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Heart Tumours
Test Questions

152. T/F Cardiac tumors are rhabdomyomas in 80% to 90% of cases.

153. T/F Rhabdomyomas develop in utero and are generally detected by 20 weeks gestation

154. T/F Due to large size, cardiac compression and flow obstruction, fetal hemodynamic compromise is common with rhabdomyomas

155. T/F Rhabdomyomas are commonly associated with tuberous sclerosis, especially when multiple tumors are noted

156. T/F Fetal intracranial lesions are found in 80% of cases of rhabdomyomas

157. T/F The diagnosis of tuberous sclerosis is confirmed with the finding of multiple rhabdomyomas on ultrasound either pre or post-natally

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