MONASH ULTRASOUND FOR WOMEN

Take Home Messages

Melbourne Fetal Cardiac Symposium 2016

Arch Coarctation Messages

Remember this is a standout cardiac anomaly where it is so easy to make an incorrect diagnosis when all your looking at is a sonographic variant in a fetal circulation which disappears after birth

We have no crystal ball

This has to be balanced against knowledge of failing to make a diagnosis may eventuate in Neonatal death .

Beware of the muscular VSD

Compare Mitral valve width to Tricuspid valve width to unveil ‘smallness’ of the LV

Interrupted Aortic Arch
Messages

Rare and not an easy diagnosis

Aorta disappearing from 3 Vs → 3 VsT View is key to making the diagnosis

Posterior override is a serious clue

Don’t forget to look at the thymus

Aortic Stenosis and Critical Aortic Stenosis Messages

If you don’t like charts just remember 100 cms/sec !

Diagnosis is made on colour on 5- chamber view

Mitral Atresia with VSD
Messages

Clue 1) Flow in LV is seen on colour + forward flow is seen in small aorta, 2 features which distinguish mitral atresia with VSD from HHLHS

Clue 2) No flow across the mitral distinguishes this mitral atresia with VSD from coarctation

Hypoplastic Left Heart Syndrome Messages

One of the most complex cardiac malformations which requires 3 staged surgical procedures and is associated with long term morbidity in most with include intellectual disability rates of up to 70% reported in some series

Beware hypoplastic left heart is frequently misinterpreted as a complete AV canal defect

In view of the strong association of IUGR with HHLHS fetal growth surveillance is recommended

Aberrant Subclavian Artery Messages

Turn down your PRF to 20 cms /sec

NIPT a reasonable option if isolated

Right Aortic Arch Messages

The first clue of RAA is the 4 chamber view of heart

Most isolated RAA are however are identified on the 3Vst view

Most represent a benign variant and are of no clinical significance but genetic testing should be considered

Once a RAA is identified then exclude DAA

The trachea and Oesphagus are entrapped in DAA and elective surgery is indicated.

Isolated RAA and RAD is rare and do not produce a vascular ring

Ventricular Septal Defects
Key Questions

Q1. What are the sonographic sections where I might be expected to identify a VSD?

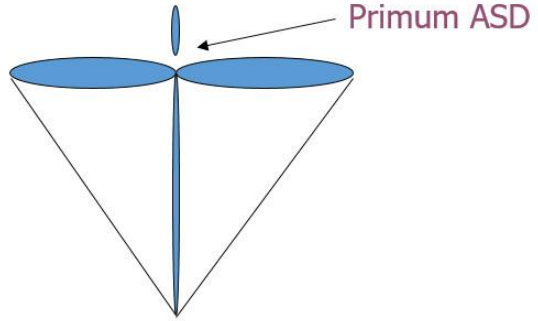
Q2. What are the Tips and Traps in making a VSD diagnosis?

Q3. Aneuploidy? (Yes/No)

Q4. Associated with CHD – if yes, which anomalies?

[1] Rubio AE, Lewin MB. Ventricular 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; 2012:713–721.

Atrial Septal Defects Messages



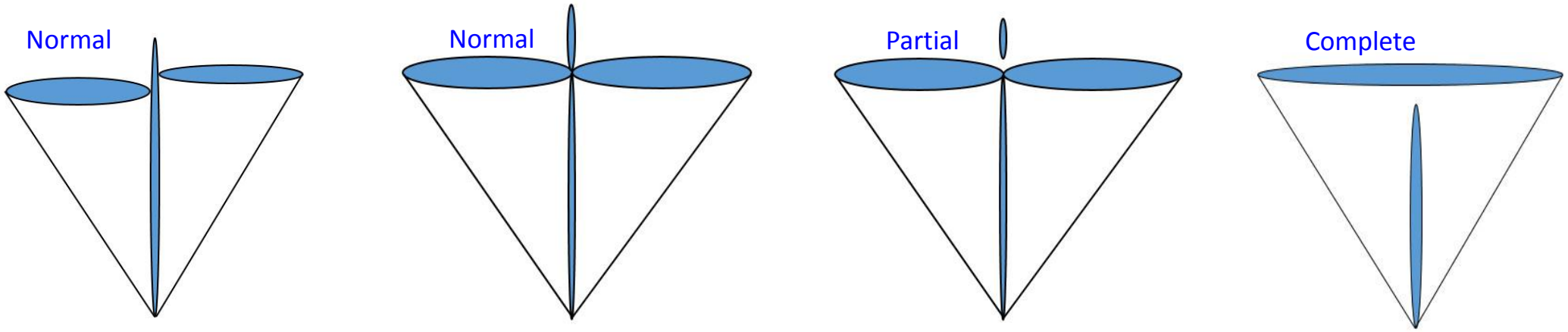
In Isolation rarely diagnosed on prenatal ultrasound

Knowledge of conditions that lead to significant RT→LT or LT→ atrial shunts is a serious clue. Eg majority of Ebsteins and Tricuspid have secundum type defects

Atrio Ventricular Septal Defects Messages

Not examining the heart in an apical position brings the risk of failing to detect both a partial and complete AVSD, more so the former

Loss of offset valves in an otherwise normal heart (i.e valves appearing on apical view as a single horizontal line) may represent a variation of normal



Ebsteins Anomaly Messages

Ebsteins anomaly do not all present with gross atrial dilatation, atrialisation of the RV and cardiomegaly

In the setting of mild moderate TR examine with the apex anterior and assess for 2 markers

Movement of the tricuspid valve leaflet
Origin of TR Jet

Tricuspid Regurgitation Messages

Q1. Tricuspid regurgitation (TR) is present in 1:20 scans you perform and thus a common finding. Precise description and quantification is key in distinguishing benign from a pathological process

Q 2. Resolution of physiological TR occurs by the 3rd trimester

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First Trimester Fetal Cardiac Malformation Messages

Transvaginal echocardiography superior to the transabdominal route between 11 and 13 . weeks' gestation, both methods were similar at 14 weeks and the transabdominal route more accurate after 15 weeks 1,2

The majority of complex CHD demonstrate T1 markers → NT + DV + TR + CAD HX

Anomaly sequences are sonographically no different than the second trimester

Current data suggests while it is possible to identify the majority of CHD T1 markers and deploying key personnel there in high risk population

Early diagnosis facilitates early advanced screening tests or invasive diagnoses of genetic anomaies

Can you make false positive diagnoses ?

Currently routine Early Echogardiogram offered routinely only in Specialist Fetal Echo units

Book Patients no earlier than 12 weeks

Can you raise suspicion in the first trimester and create unnecessary anxiety ?

No evidence to suggest a 11-13 week scan should replace the 20-22 week scan neither for cardiac nor extra-cardiac malformation

Congenitally Corrected Transposition of the Great Arteries (cCTGA)
Messages

Key clue →The left posterior ventricle AV Valve appears ‘Low’ i.e. closer to the apex

The left posterior ventricle moderator band and triangular shaped left posterior ventricle are far more subtle signs

cCTGA presents with a smorgasbord of additional complicating factors including cardiac rhythm disturbances, Right AV valve anomalies, Pulmonary artery and aortic arch anomalies

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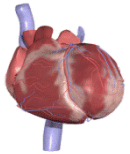

Transposition of the Great Arteries
Messages

1. Left axis deviation is a useful first trimester marker of TGA

2. On making a diagnosis of TGA remember to Doppler the pulmonary valves

3. In TGA interrogate the intraventricular septum for both membranous and muscular VSD’s

Absent Pulmonary Valve Syndrome Messages

APVS is a condition that presents with striking dilatation of the main and branch pulmonary arteries. In a small % of cases however on 2D the Pulmonary artery may appear normal at 18-22 weeks.

The ‘too & from’ motion of blood across the dysplastic pulmonary valves is a key diagnostic feature.

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Common Arterial Trunk Messages

A rare cardiac anomaly ~ 1% of CHD

Strong association with chromosomal anomalies and extra cardiac malformation

Key factor in distinguishing from TOF and DORV is the presence of pulmonary arteries arising from trunk

Key sonographic findings are a large overriding vessel with retrograde flow across the truncal valve , turbulence and velocities up to 300cm/sec

Surgical outcomes and long term survival based on fetal series is worse when compared with Tetralogy of Fallot and DORV with mortality rates ~ 70% for all cases detected in utero

Fetal death in utero occurs in 5% of cases

Double Outlet Right Ventricle Messages

DORV is defined as a cardiac abnormality where both the pulmonary artery and Aorta arise either entirely or predominantly from the right ventricle.

Sub-classification is based on the spatial relationship of the great arteries at the level of the semilunar valves and the location of the VSD

The four-chamber view is usually normal in the first and second trimesters in DORV fetuses.

Pulmonary stenosis is present in 70% of foetuses with DORV

Pulmonary stenosis is best assessed by size discrepancy of the great vessels rather than Doppler flow measurements.

[1] Kirklin JW, Pacifico AD, Blackstone EH, et al. Current risks and protocols for operations for double-outlet right ventricle. Derivation from an 18 year experience. *J Thorac Cardiovasc Surg*. 1986;92:913–930

Double Outlet Right Ventricle Messages cont…

The majority of foetuses with DORV are associated with additional complicating features including aneuploidy and extra-cardiac malformation

The overall prognosis for fetuses with DORV is generally poor, when associated with chromosomal and extra cardiac abnormalities.

The presence of subpulmonic VSD and aortic Coarctation can be associated with suboptimal postsurgical outcomes in DORV fetuses.

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]

[1] Kirklin JW, Pacifico AD, Blackstone EH, et al. Current risks and protocols for operations for double-outlet right ventricle. Derivation from an 18 year experience. *J Thorac Cardiovasc Surg*. 1986;92:913–930

Tetralogy of Fallot
Messages

Beware a small peri-membraneous VSD

Beware PA may look normal at 18-20 weeks and progress to pulmonary atresia by term

Absent Ductus Venosus
Messages

1) Largest series, show showed that those Isolated ADV in the absence of cardiomegaly had a favourable outcome with a survival rate of 100%

2) Association with aneuploidy unclear . Reported numbers are few.

3) Close monitoring for cardiomegaly throughout the pregnancy

Interrupted IVC Messages

1) Most striking finding 2 vessels behind LA on 4 chamber view as sagittal imaging of the IVC is not routine in clinical practice

2) 1 in 5 are Isolated

3) 4 out of 5 are associated with CHD especially LAI. Fetal echocardiogram is mandatory

4) Failure to see the IVC and seeing a dilated azygous is not pathognomic of Interrupted IVC

Persistent Right Umbilical Vein and Variations Messages

Prevalence of an intrahepatic persistent right umbilical vein is 0.13%

¾ are isolated

8% are associated with CHD

Indication for targeted assessment of the fetal heart

J hook curves away from stomach

Gallbladder between Stomach and IHV but lies inferiorly and may be difficult to appreciate

J Ultrasound Med. 2016 Jan;35(1):1-5. doi: 10.7863/ultra.15.01008. Epub 2015 Dec 3.

Umbilical Vein Varix Messages

Most detected in the 3rd trimester but may present at 18-22 weeks

No Nomogram for IHV. Defined as cut off of greater or equal to 8mm in maximum diameter

Most demonstrate Yin Yang flow appearances

Monitor for rapid increase in diameter

Monitoring Varix Doppler indices is of no proven Value

Cardiac Markers of Aneuploidy Messages

Isolated Intracardiac echogenic foci in low risk patients are an incidental finding and are of no clinical significance

Pericardial fluid < 2mm is present in 70% of mid trimester scans

There is an 8 fold increase risk of a underlying cardiac anomaly when tricuspid regurgitation is identified in the first trimester [1]

75% of CHD present with either right or left cardiac axis deviation !

The finding of an isolated ARSA carries only a 3.9 fold increase in Trisomy 21 and for most low risk patients NIPT is a reasonable option when compared to invasive genetic testing

Faiola S, Tsoi E, Huggon IC, et al. Likelihood ratio for trisomy 21 in fetuses with tricuspid regurgitation at the 11 to 13+6 week scan. Ultrasound Obstet Gynecol 2005; 26:22-27.