HeBee
FETAL HEART MODEL
FOR PRENATAL DIAGNOSIS

M3C

HOW TO DIAGNOSE FETAL TGA ?

HOW NOT TO UNDIAGIAGNOSE TGA ?

B. Stos, M3C Academy, 22-23 november 2018

WHY IS IT IMPORTANT TO DIAGNOSE TGA PRENATALY ?

- PD increases survival if delivery is planned in specific and dedicated centers

	Postnatal Group	Prenatal Group	*P*
Isolated TGA	204	57	NS
Associated defects	46	11	NS
VSD	31	8	NS
VSD+CoA	14	3	NS
CoA	1	1	NS
Age at admission, h	73±210	2.2±2.8	<0.01
Mechanical ventilation	95 (38)	12 (17.6)	<0.01
Metabolic acidosis±MOF	56	8	<0.05
PGE_1 infusion	95	32	NS
BAS	168	54	NS
Preoperative mortality	15	0	<0.05
Coronary artery pattern	233 ASO	68 ASO	
Normal	168	47	NS
Abnormal	65	21	NS
Postoperative mortality	20	0	<0.01
Hospital stay, d	30±17	24±11	<0.01

Bonnet et al, circ 1999

IS IT EASY TO DIAGNOSE TGA PRENATALY ?

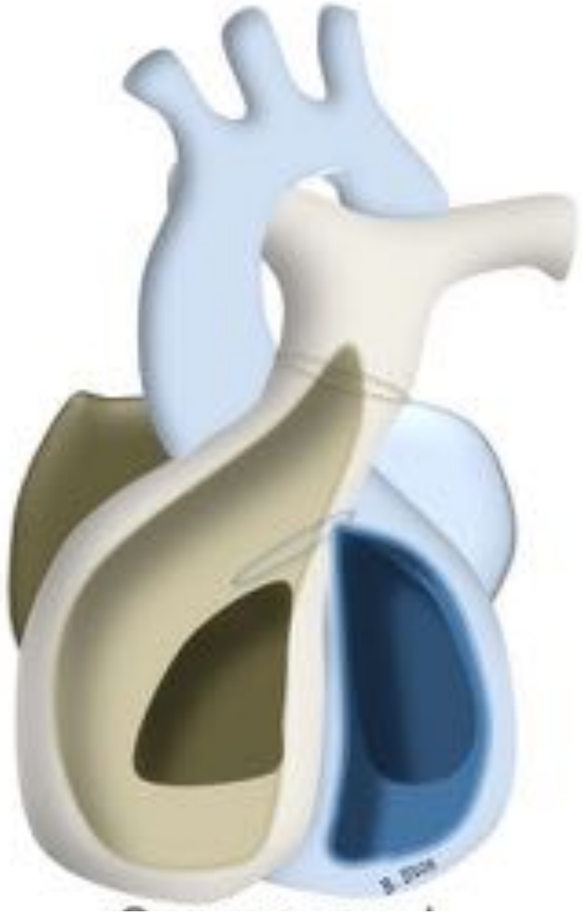
ACC-CHD categories	N	Prenatal diagnosis %	Prenatal diagnosis 95% CI	Postnatal ≤7 days %
1. Heterotaxy, including isomerism and mirror-imagery	37	89.2	74.6 to 97.0	8.1
2. Anomalies of the venous return	25	16.0	4.5 to 36.1	32.0
3. Anomalies of the atria and interatrial communications	164	4.3	1.7 to 8.6	29.3
4. Anomalies of the atrioventricular junctions and valves	91	67.0	56.4 to 76.5	19.8
5. Complex anomalies of atrioventricular connections	13	100.0	75.3 to 1.0*	0.0
6. Functionally univentricular hearts	133	92.5	86.7 to 96.3	6.0
7. Ventricular septal defects (VSD)	1353	9.6	8.1 to 11.3	67.4
8. Anomalies of the ventricular outflow tracts (ventriculoarterial connections)	503	39.2	34.9 to 43.6	29.6
9. Anomalies of the extrapericardial arterial trunks	143	44.7	36.4 to 53.3	28.7
10. Congenital anomalies of the coronary arteries	9	0.0	0.0 to 33.6*	0.0
All, excluding cases with chromosomal anomalies	2471	25.6	23.9 to 27.3	48.0
All, excluding cases with chromosomal anomalies or genetic syndromes	2387	24.8	23.1 to 26.6	48.8
All, excluding cases with chromosomal, genetic syndromes or other anomalies	2036	23.1	21.2 to 24.9	50.9
All, excluding cases with chromosomal or other anomalies and IVSD*	930	40.2	37.0 to 43.4	28.6

Prevalence, timing of diagnosis and mortality of newborns with congenital heart defects: a population-based study

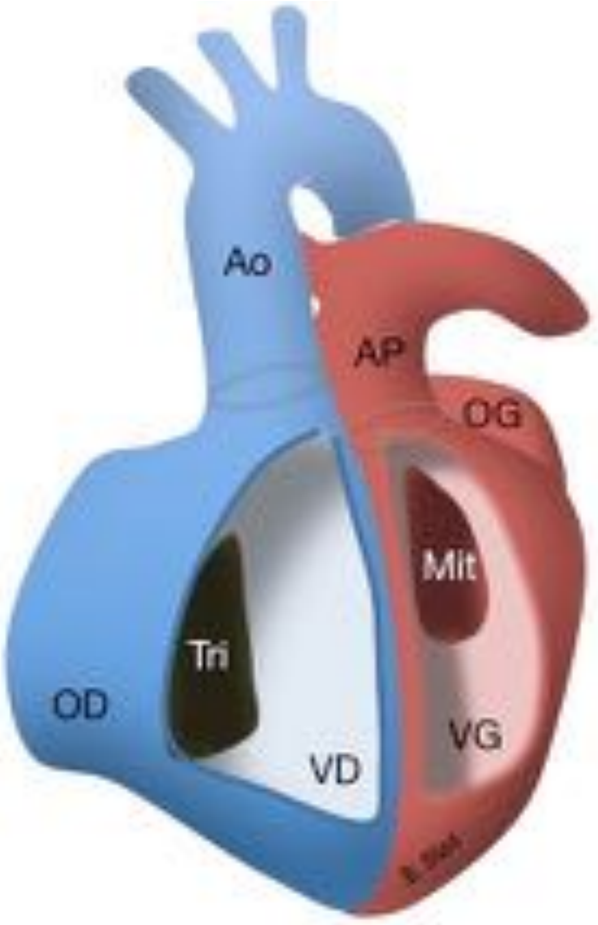
Babak Khoshnood,[1] Nathalie Lelong,[1] Lucile Houyel,[2] Anne-Claire Thieulin,[1] Jean-Marie Jouannic,[3] Suzel Magnier,[4] Anne-Lise Delezoide,[5] Jean-François Magny,[6] Caroline Rambaud,[7] Damien Bonnet,[8] François Goffinet,[1,9] on behalf of the EPICARD Study Group

Heart, 2012

ANATOMY OF THE HEART WITH TGA

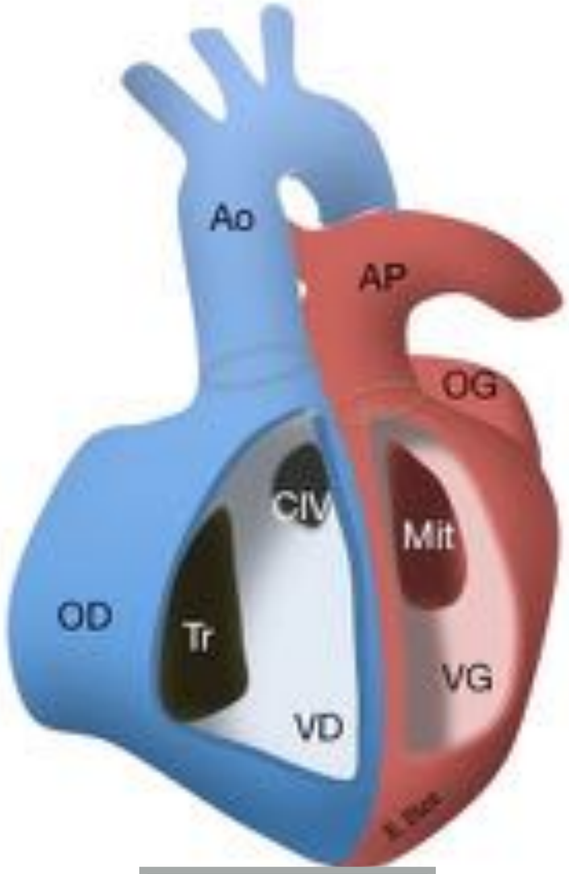


Normal heart

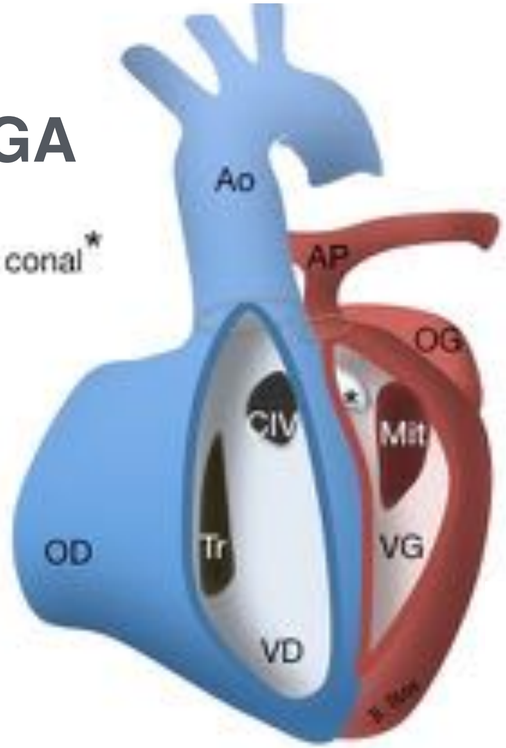


TGA

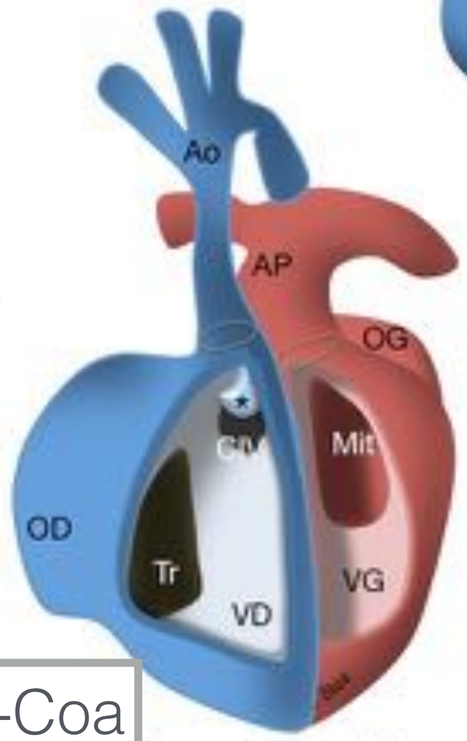
Other complexe malpositions of the GA



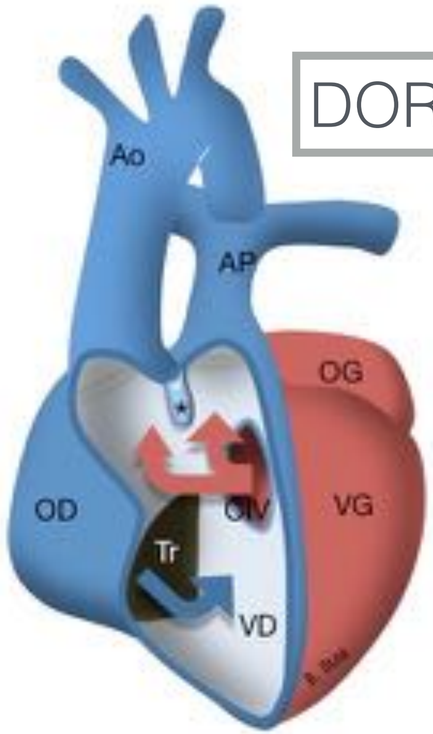
TGA-VSD



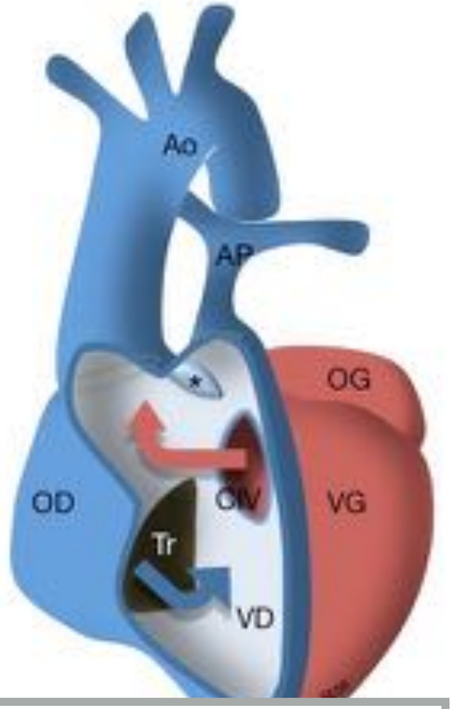
TGA-VSD-PS



TGA-VSD-Coa



DORV-Sub aortic VSD



DORV-Sub aortic VSD-SP

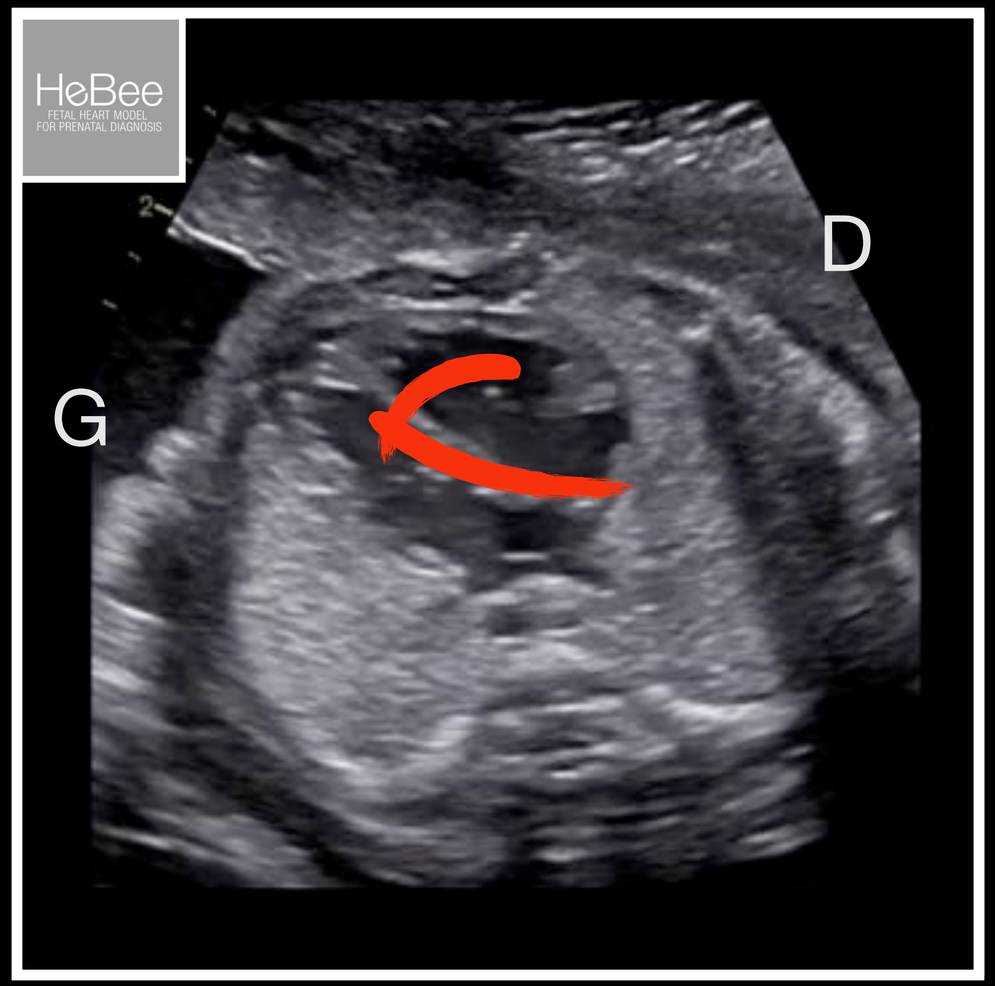
Normal Heart

complete examination in less than 2’

Find the right location of the probe

Normal Heart

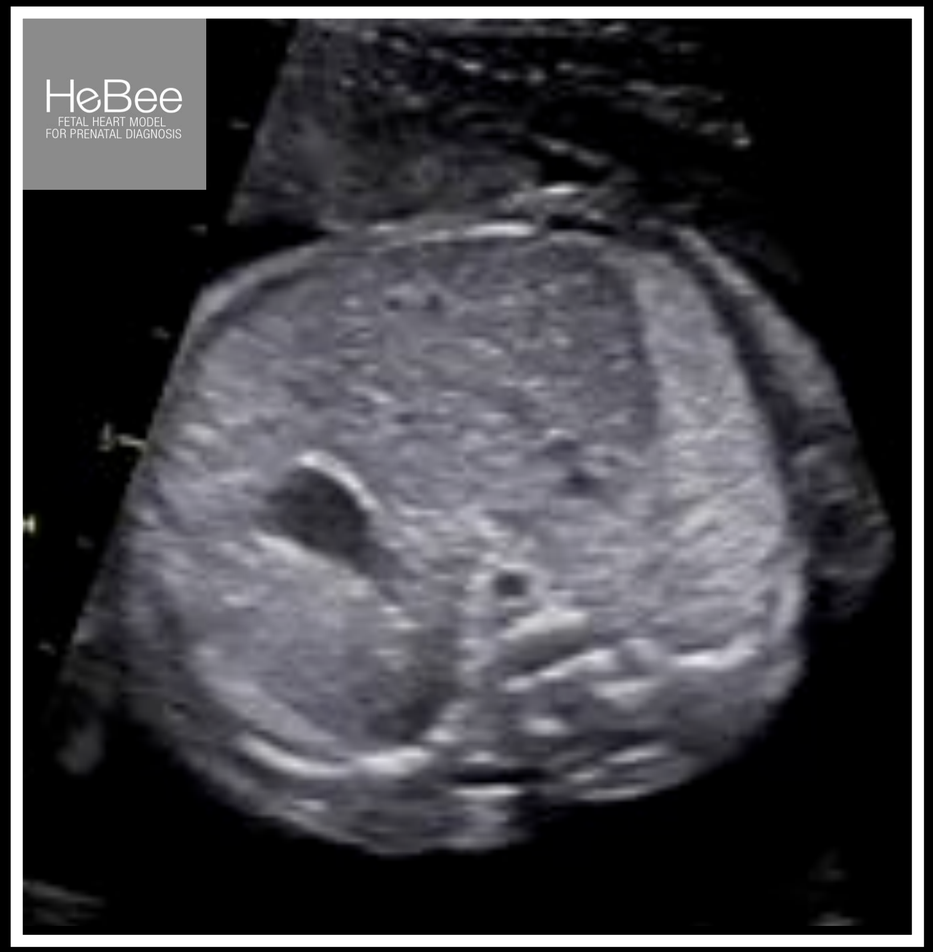
complete examination in less than 2’

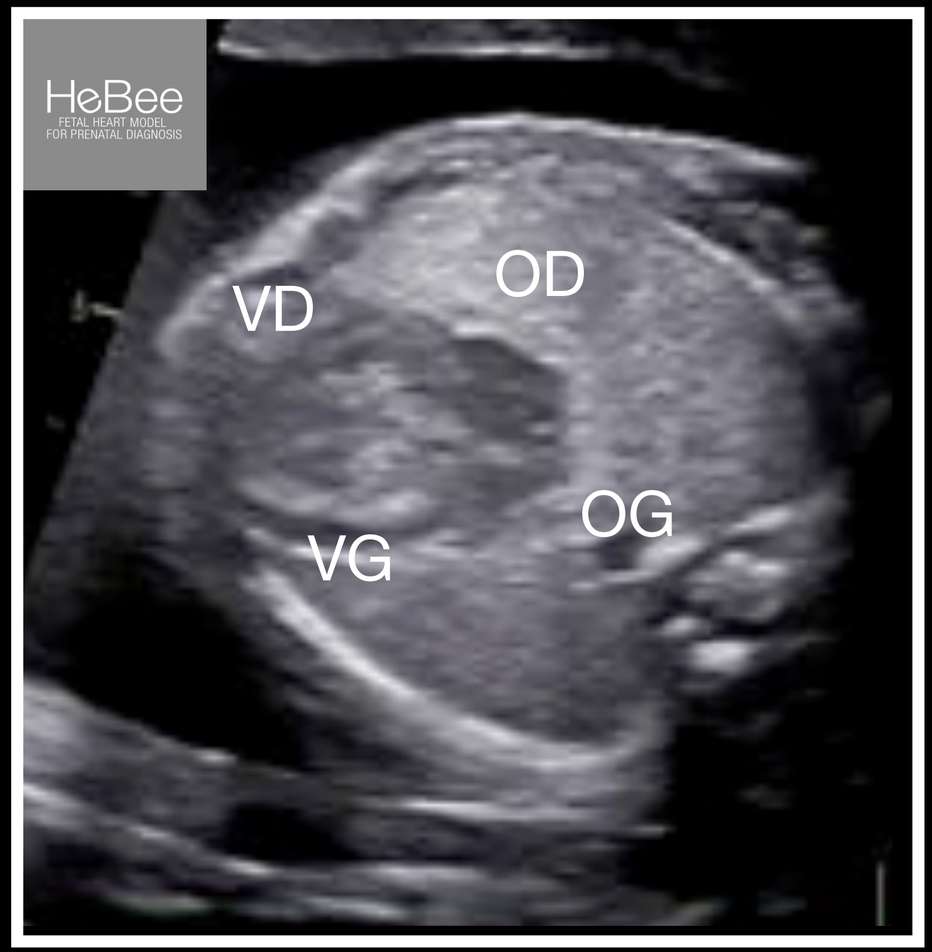


Move the probe from view to view

TGA

situs & 4 chamber view

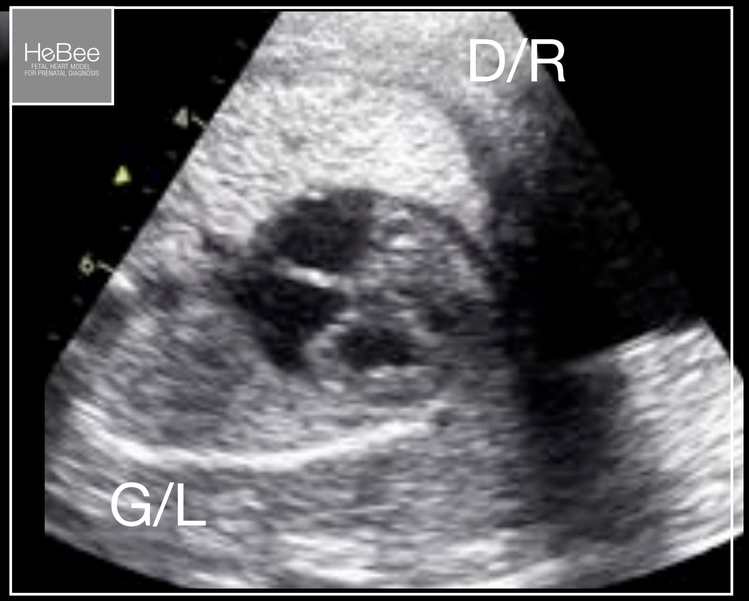




TGA

situs & 4 chamber view

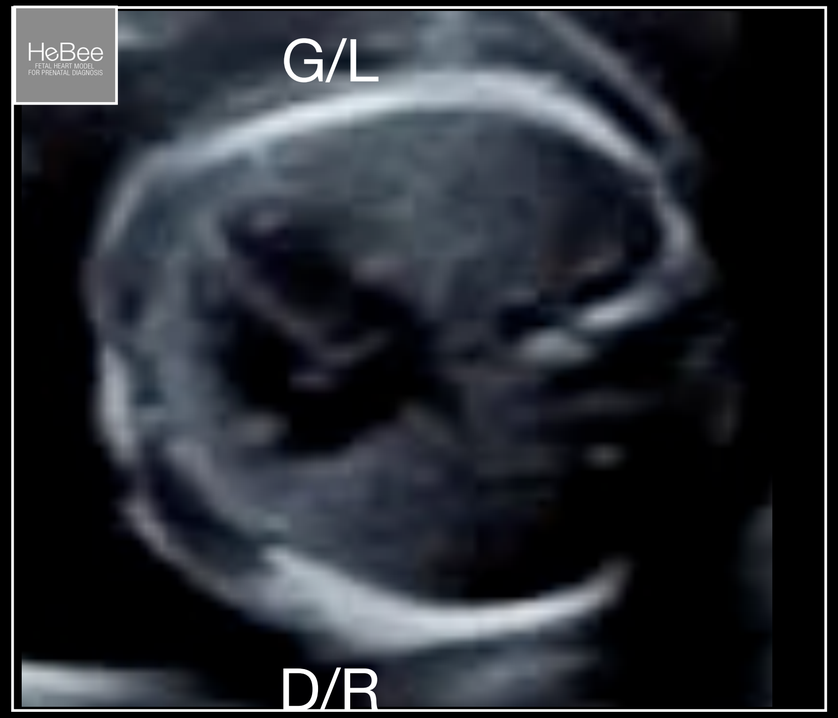
Normal

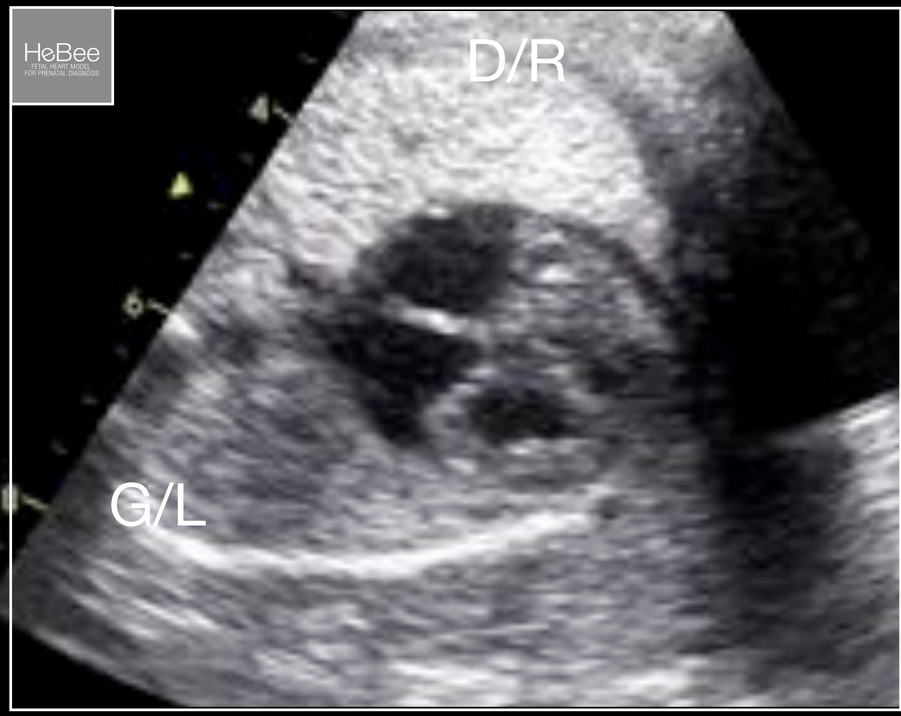


AV Discordance

TGA

situs & 4 chamber view

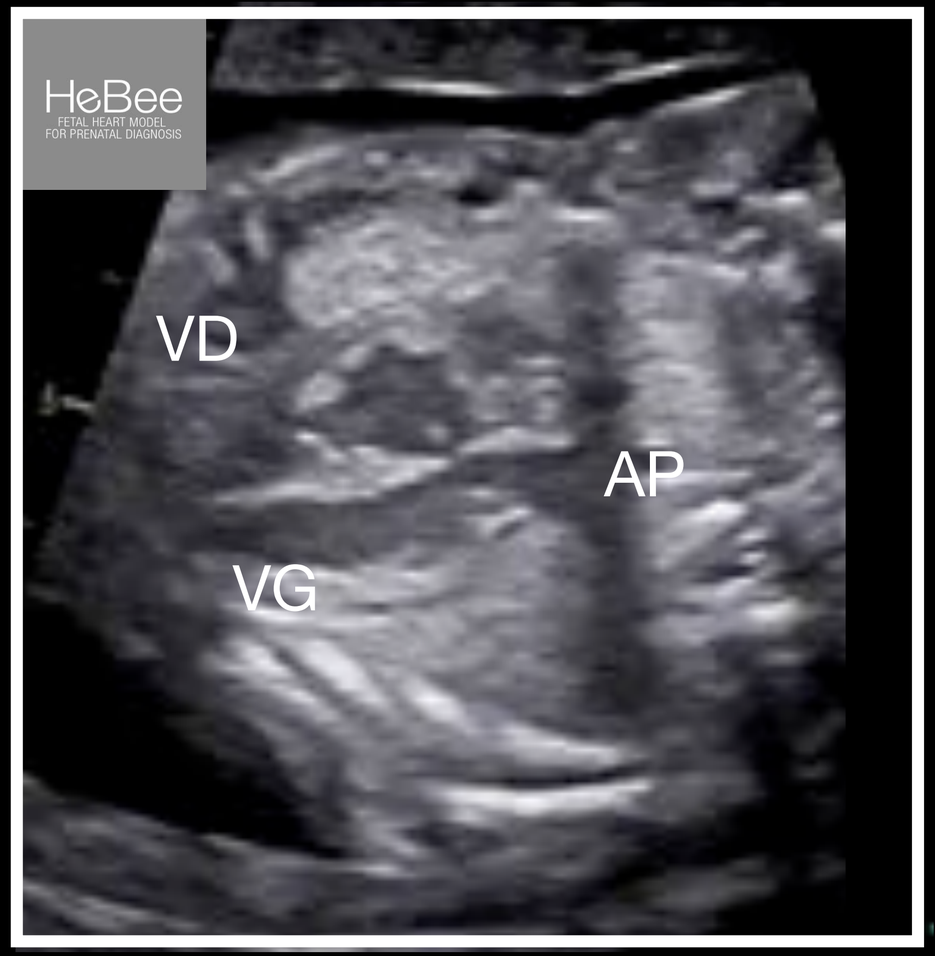




AV d**iscordance**

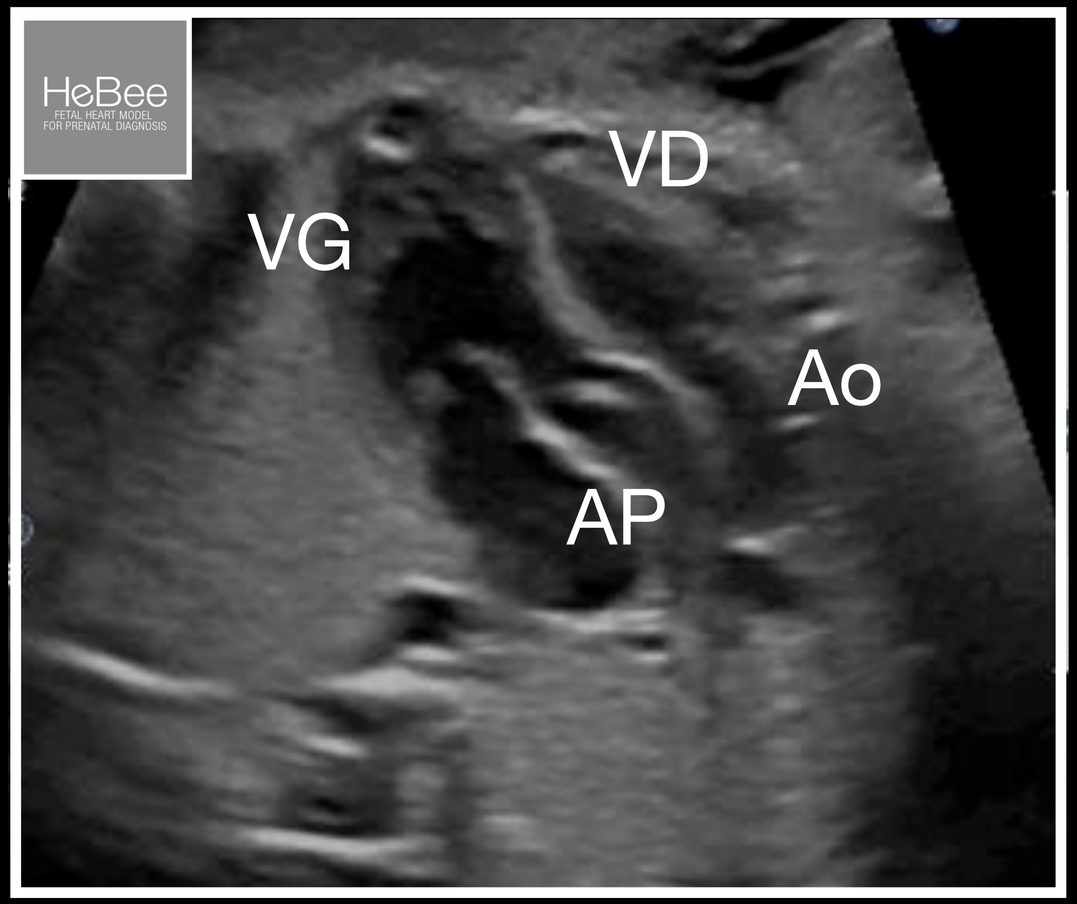
TGA

LVOT view



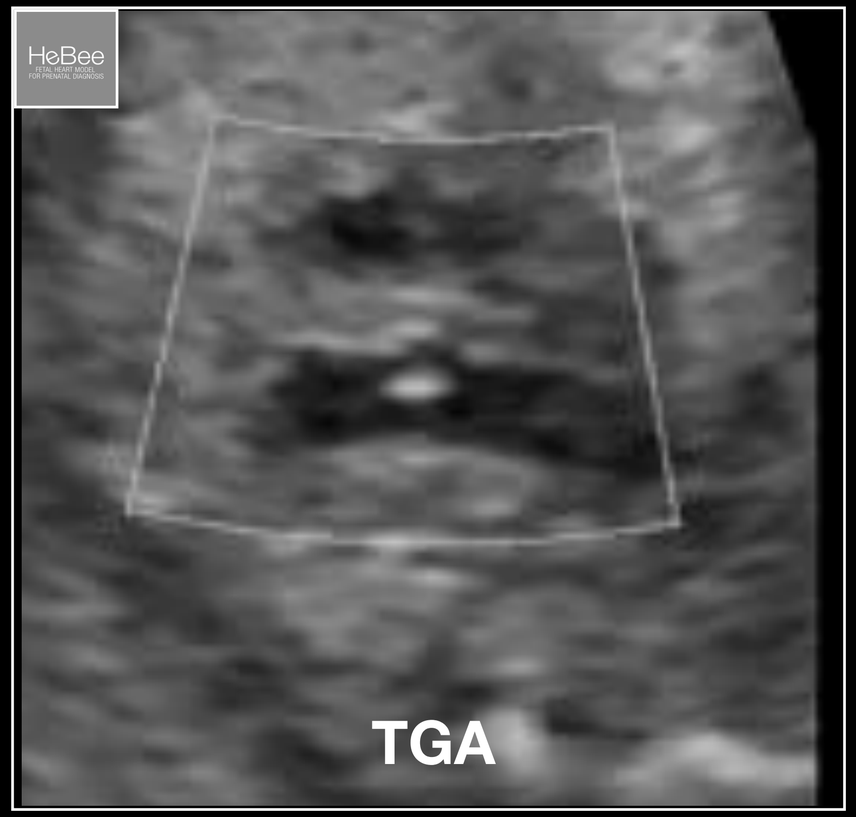
TGA

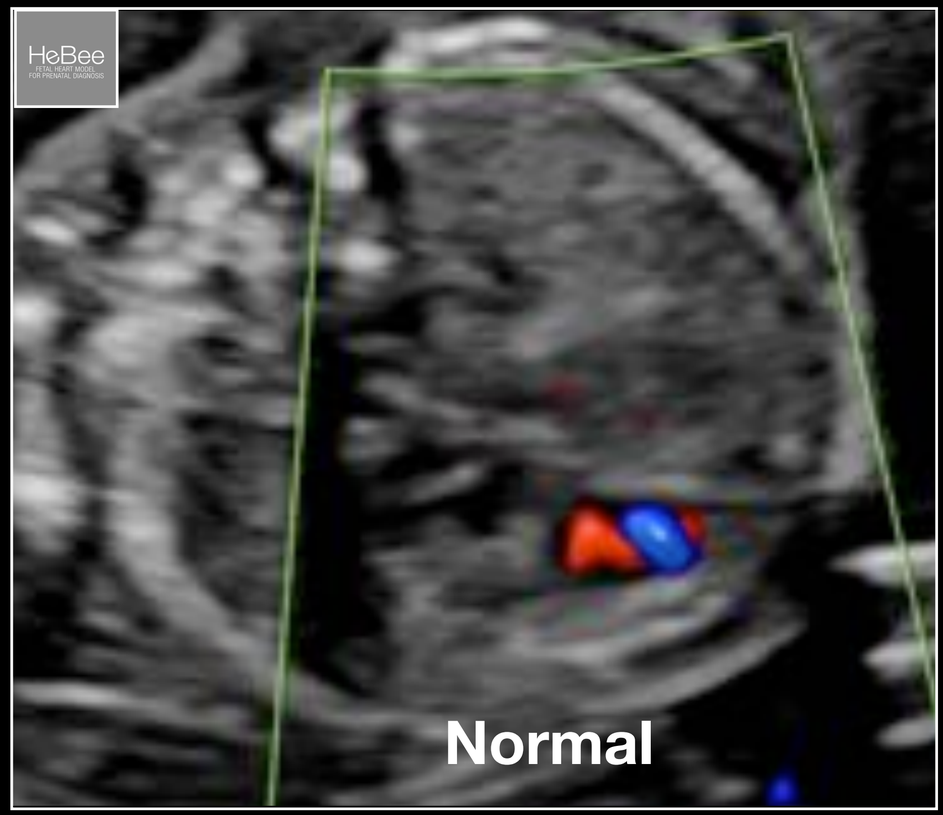
LVOT view



TGA

Outflow tracts: is vessel crossing a good sign of normal position of the GA?



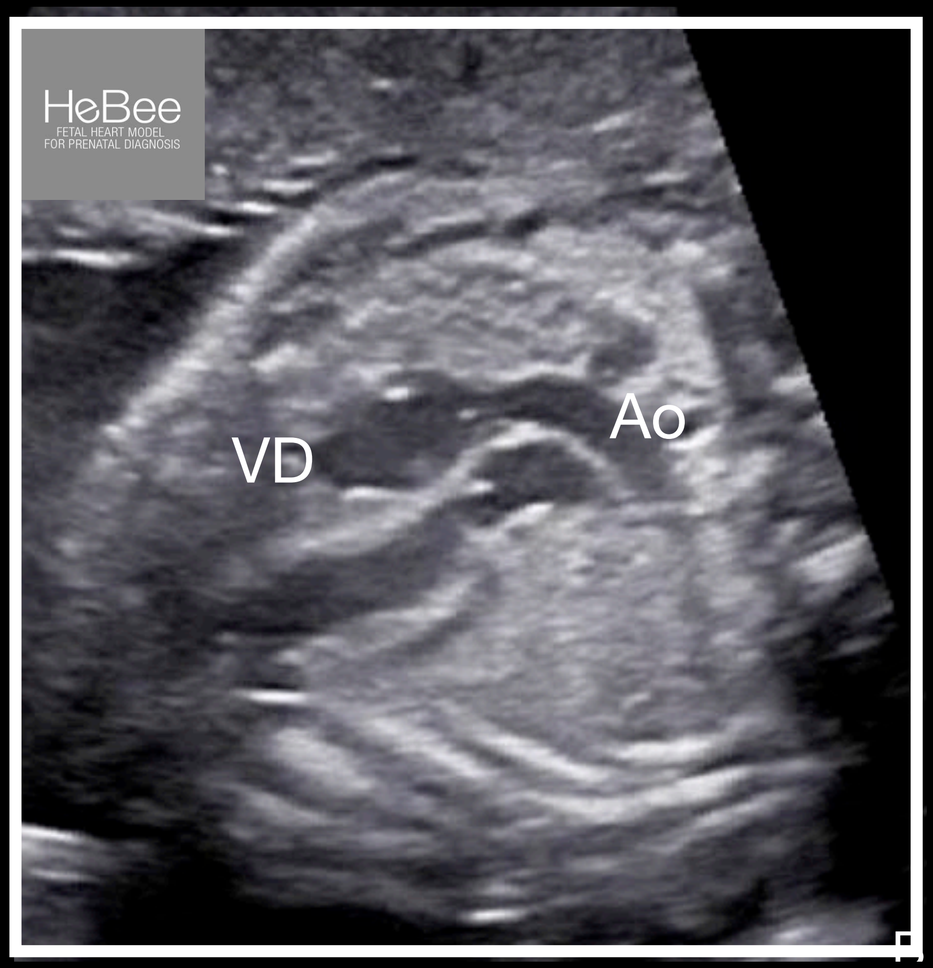


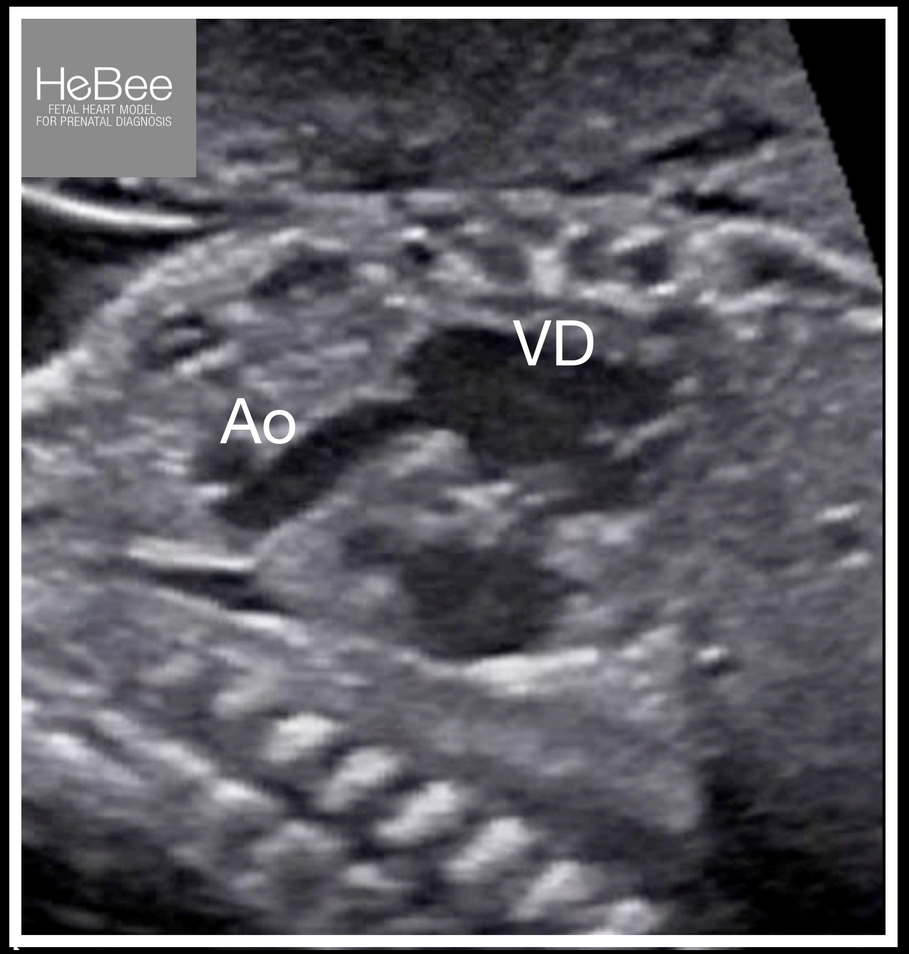
Parallel vessels = TGA ?

~~vessel crossing = Normal heart ?~~

TGA

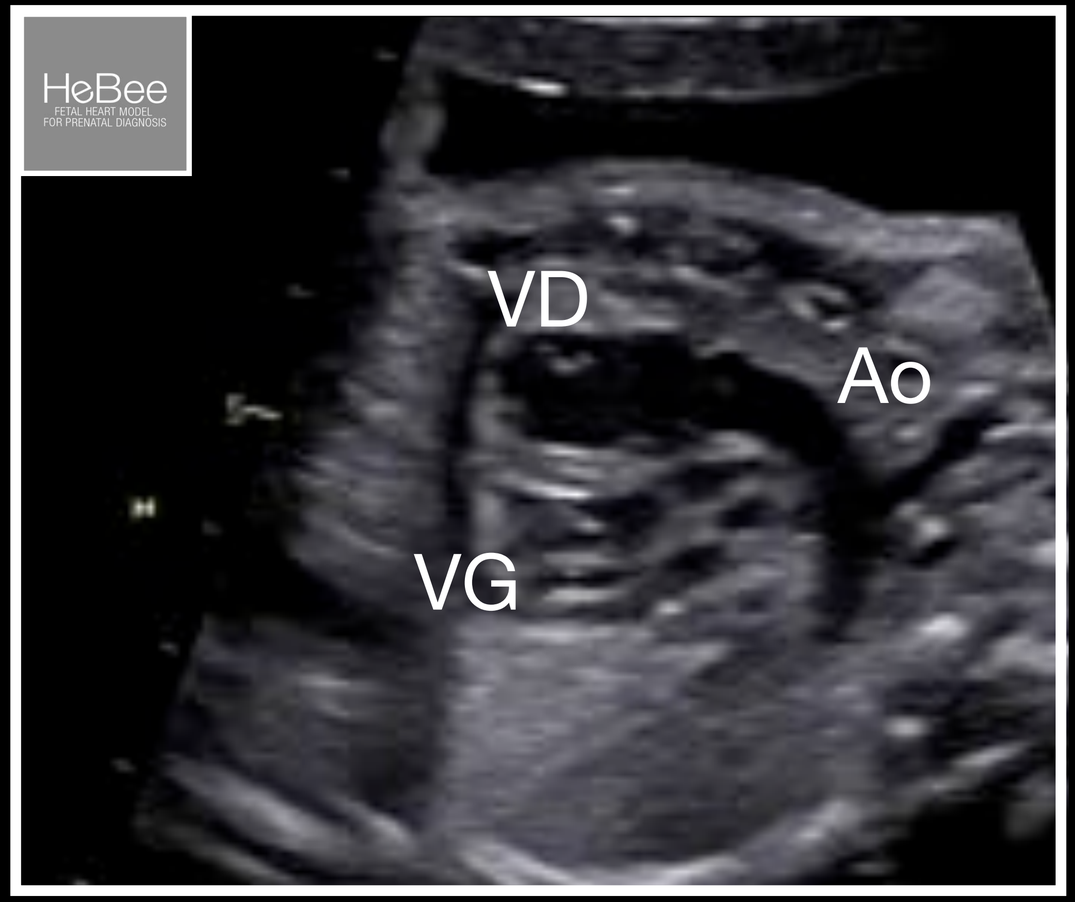
LVOT/RVOT view





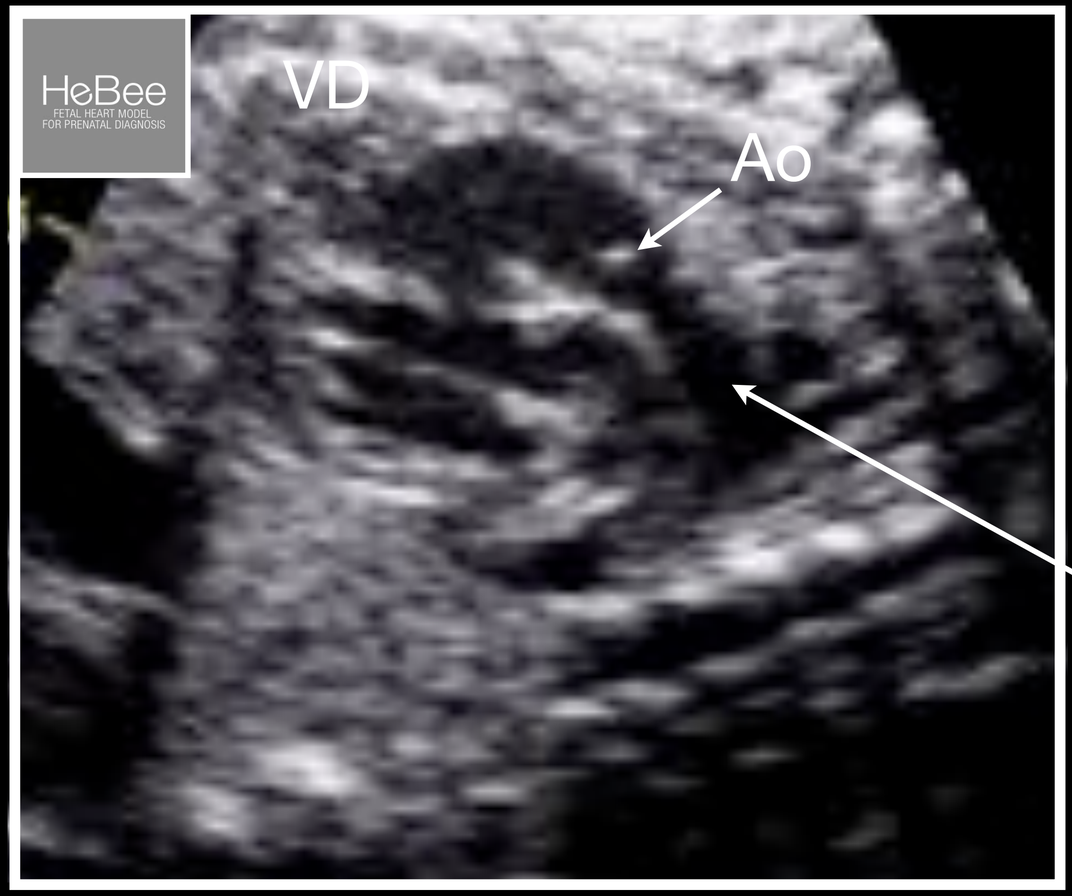
TGA

RVOT view



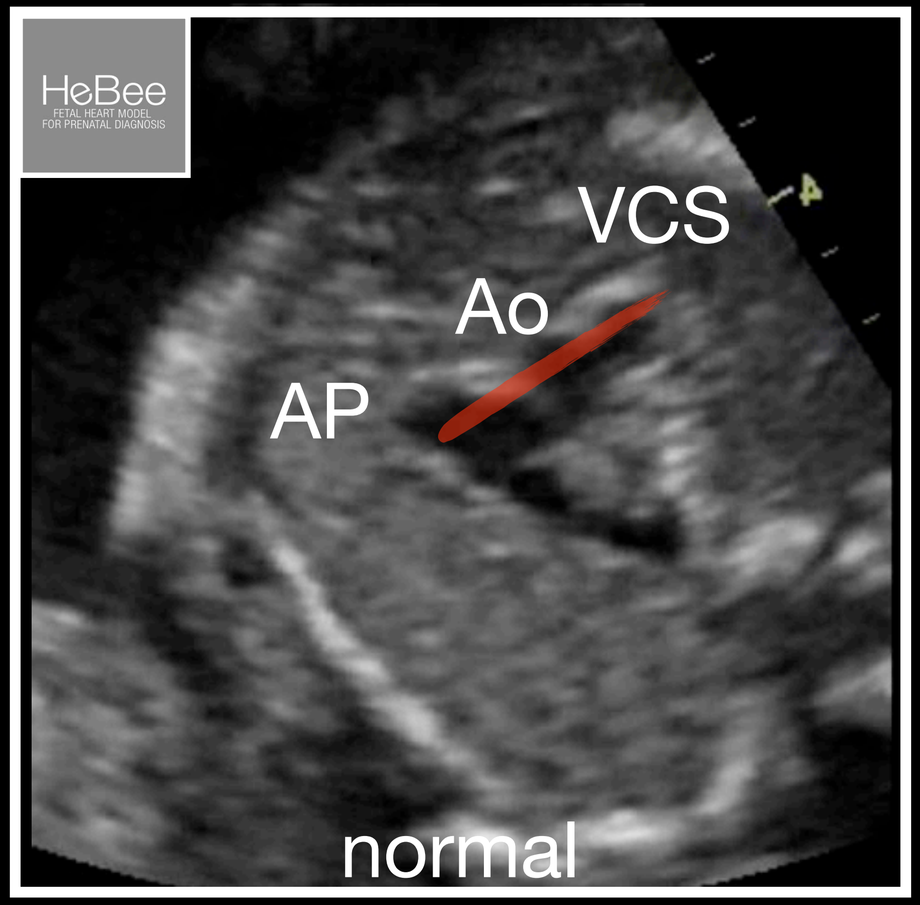
TGA

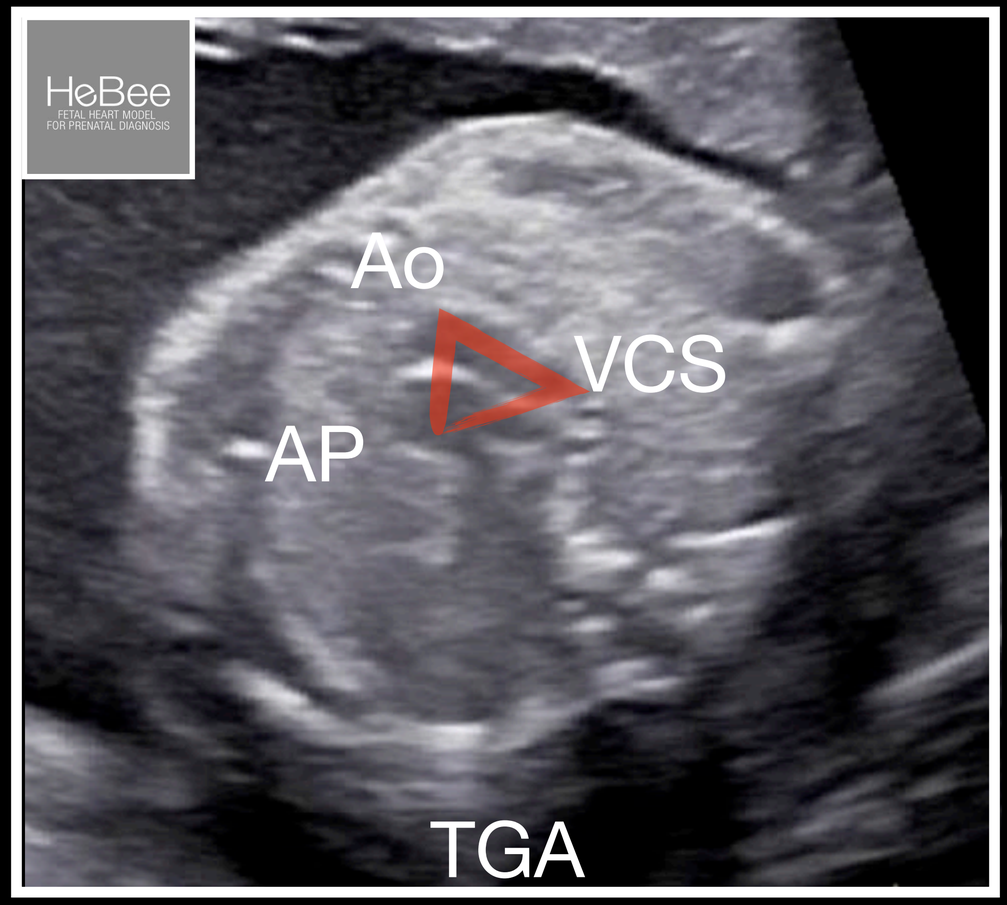
RVOT view



TGA

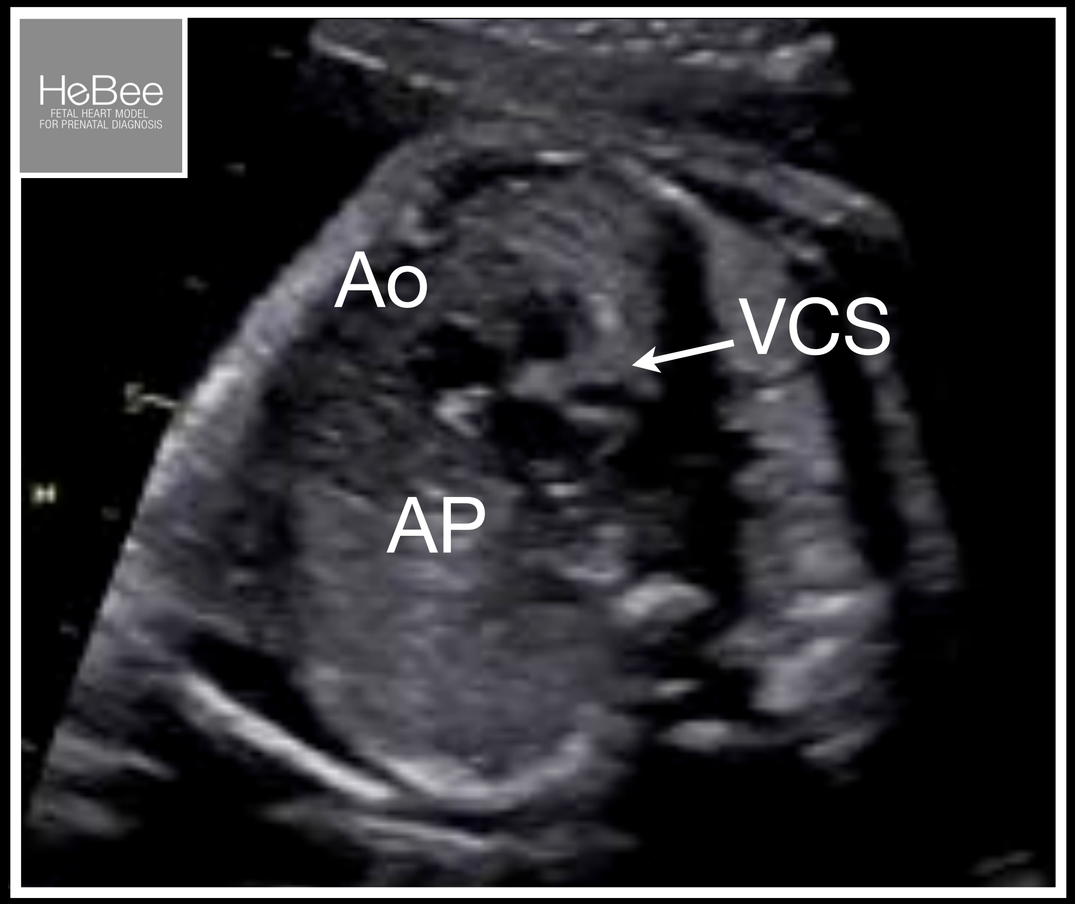
3 vessel view





TGA

3 vessel view

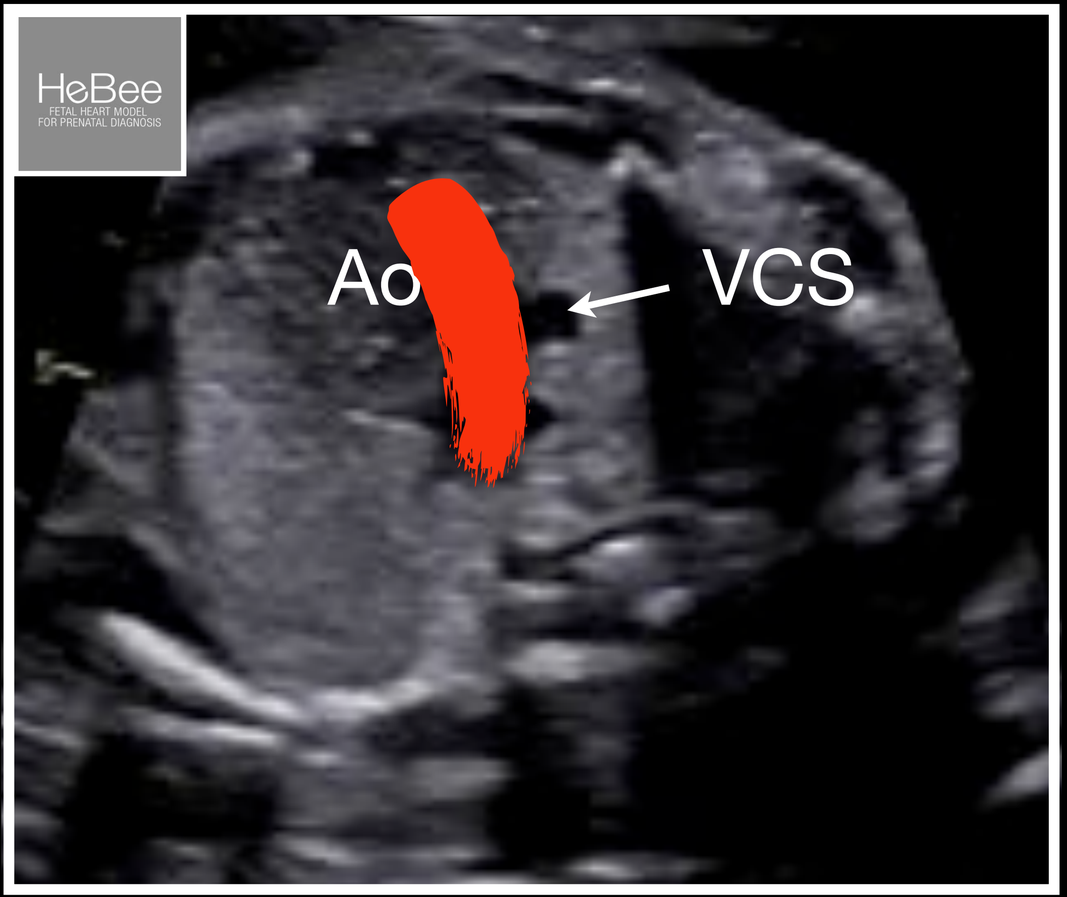


TGA

3 vessel view

TGA

3 vessel view



Ultrasound Obstet Gynecol 2013; **41**: 667–671
Published online in Wiley Online Library (wileyonlinelibrary.com). **DOI:** 10.1002/uog.12312

'I-shaped' sign in the upper mediastinum: a novel potential marker for antenatal diagnosis of d-transposition of the great arteries

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Ultrasound Obstet Gynecol 2013; **41**: 168–171
Published online in Wiley Online Library (wileyonlinelibrary.com). **DOI:** 10.1002/uog.11171

Rightward convexity of the great vessel arising from the anterior ventricle: a novel fetal marker for transposition of the great arteries

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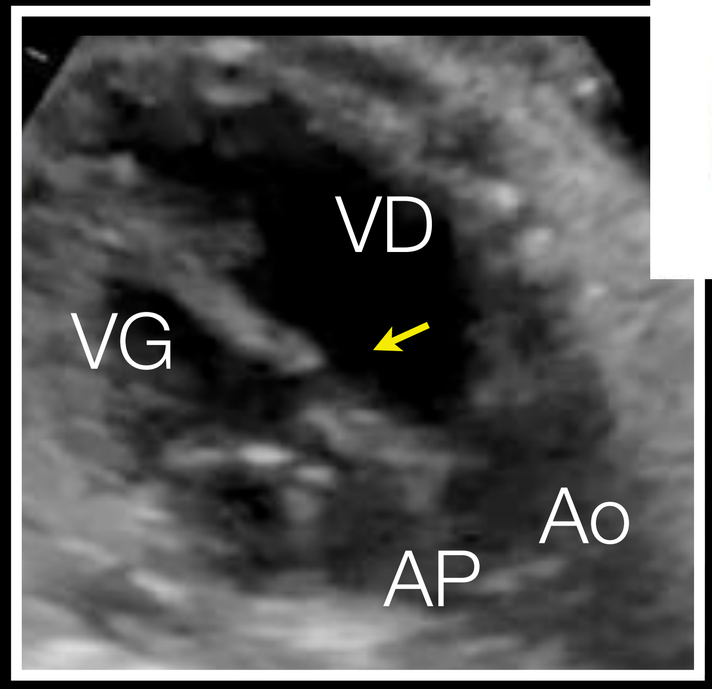
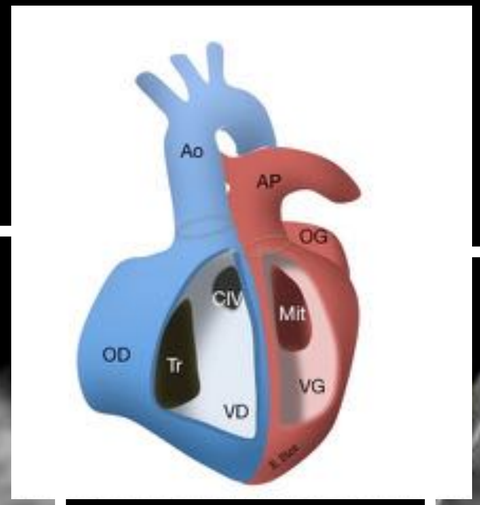
TGV

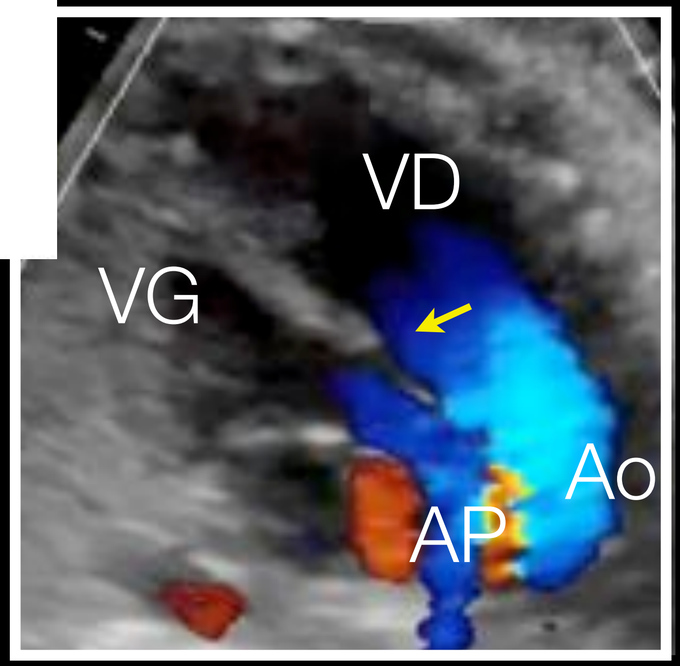
Complexe forms

TGA

Complex forms



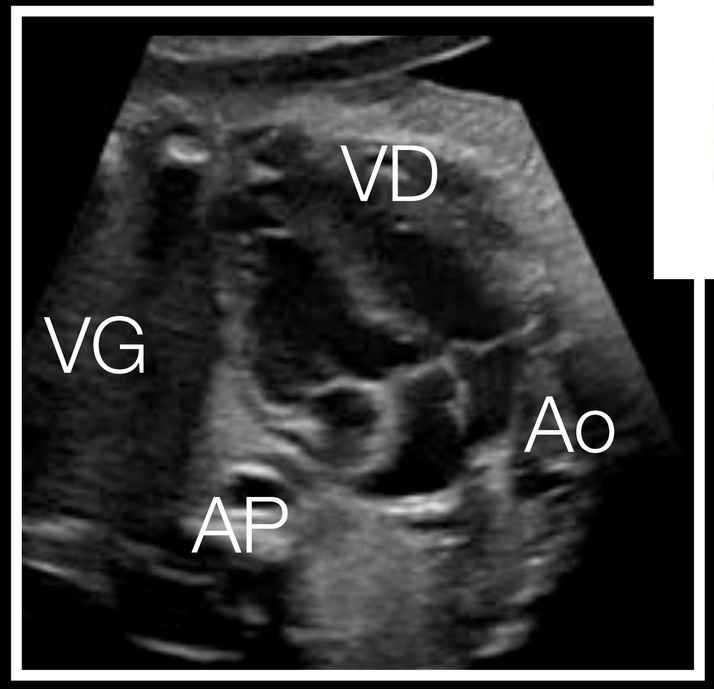


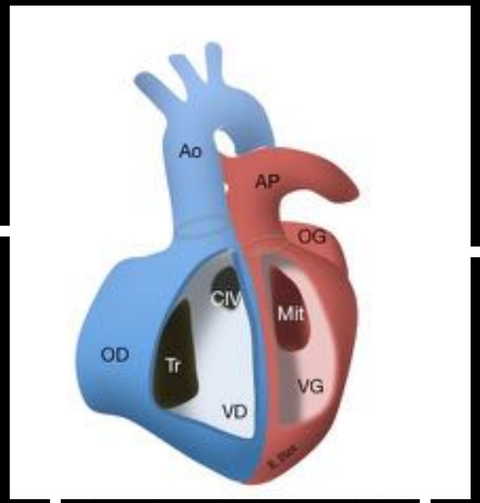


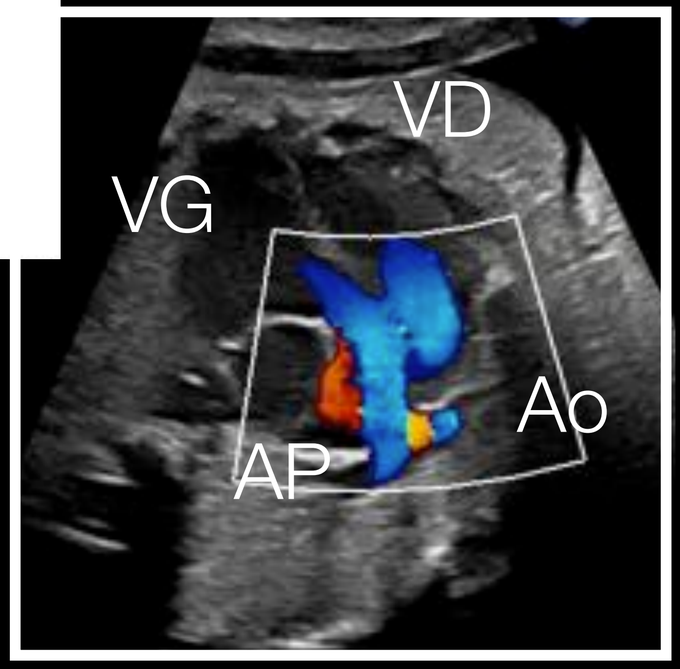
TGA-membranous VSD

TGA

Complex forms



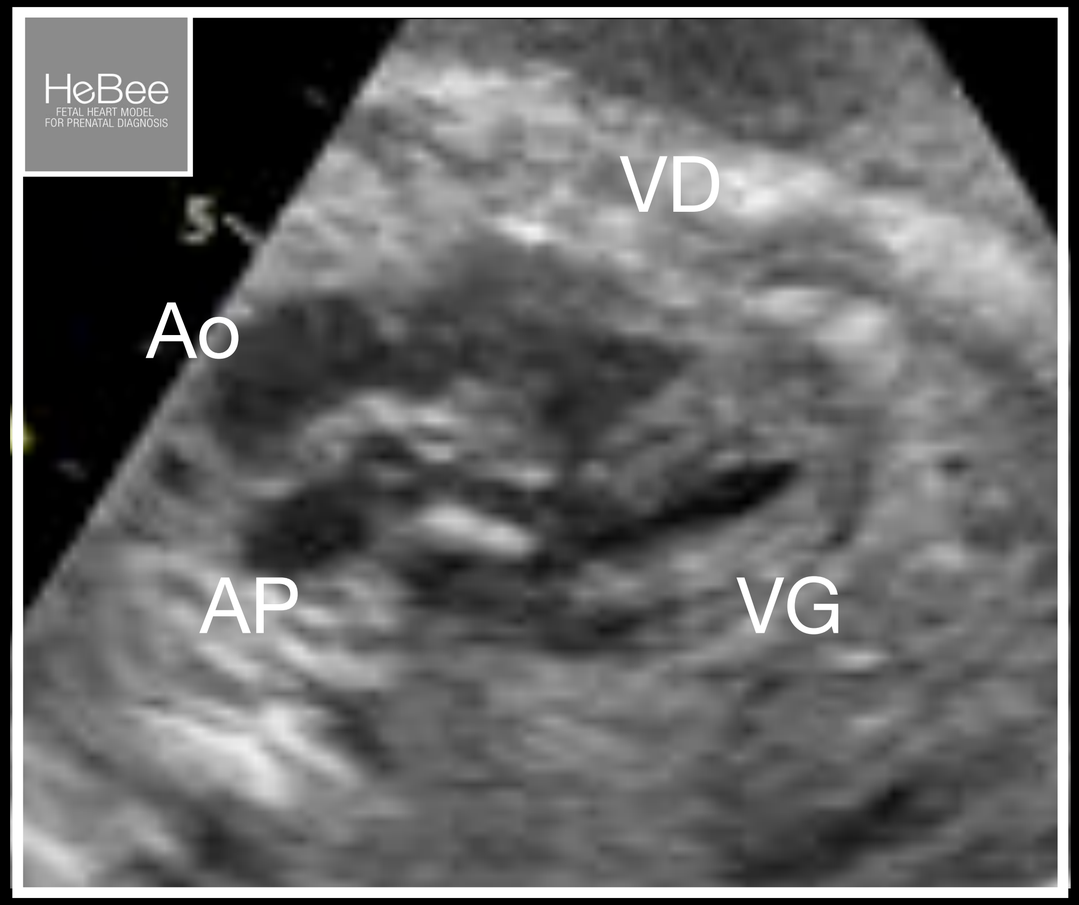




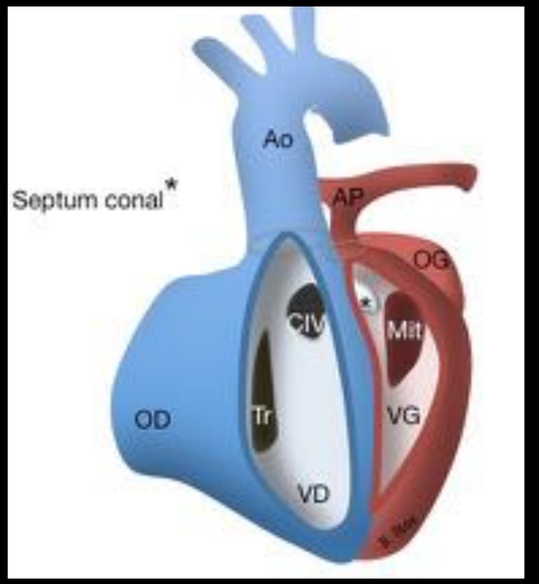
TGA-membranous VSD

TGA

Complex forms

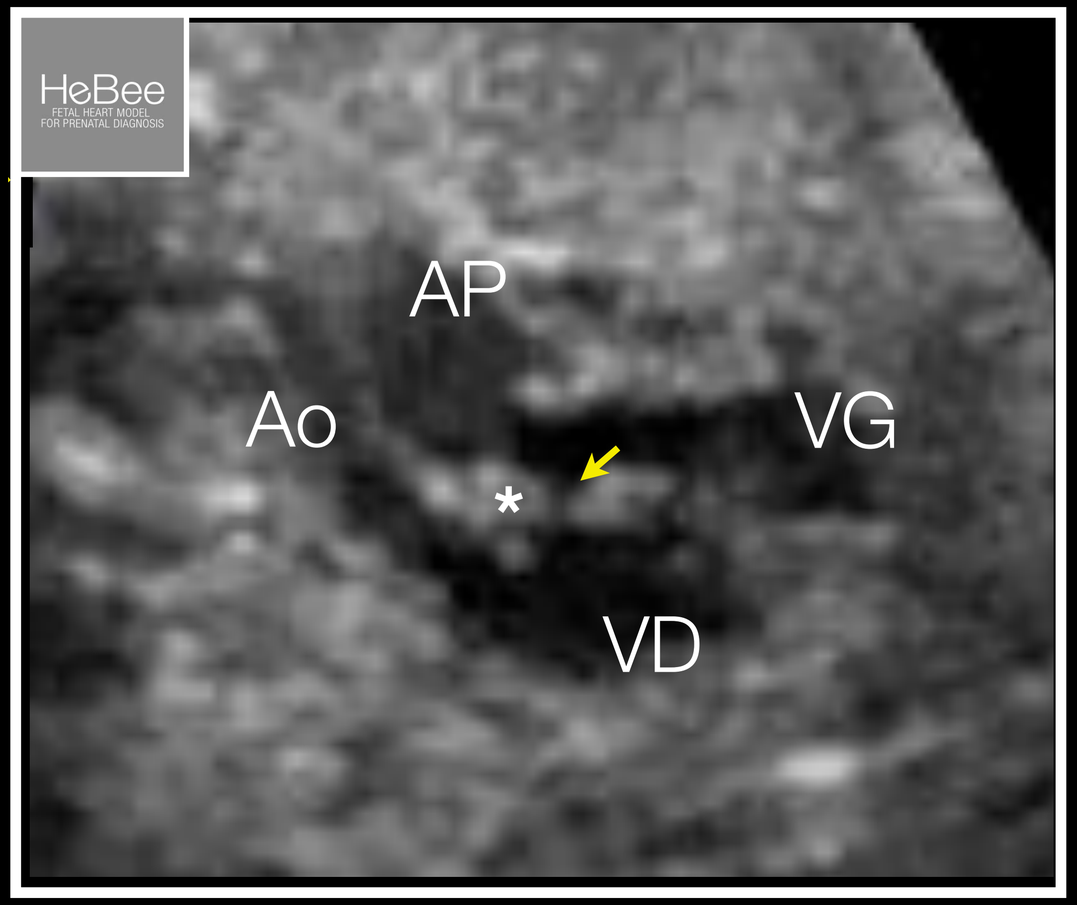


TGA-VSD-PS

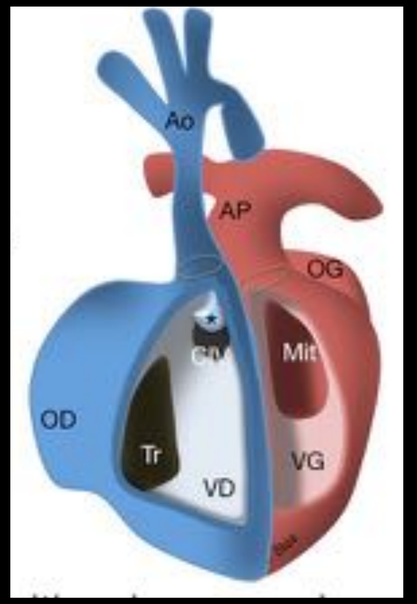


TGA

Complex forms



TGA-VSD-Coa



TGV

Is the future predictable?

Sensitivity and Specificity of Prenatal Features of Physiological Shunts to Predict Neonatal Clinical Status in Transposition of the Great Arteries

Jean-Marie Jouannic, MD; Laurent Gavard, MD; Laurent Fermont, MD; Jérôme Le Bidois, MD; Sophie Parat, MD; Pascal R. Vouhé, MD; Yves Dumez, MD; Daniel Sidi, MD; Damien Bonnet, MD, PhD

Background—Although prenatal diagnosis of transposition of the great arteries (TGA) reduces neonatal mortality, the preoperative course can be complicated in infants with a restrictive foramen ovale (FO) or a ductus arteriosus (DA) constriction. We sought to determine the specificity and sensitivity of prenatal features of physiological shunts in predicting postnatal clinical status in prenatally diagnosed TGA in babies delivered in a tertiary care center providing all facilities for neonatal urgent care.

Methods and Results—The outcomes of 130 fetuses with TGA were reviewed over a period of 5.5 years. Restriction of the FO and/or constriction of the DA could be analyzed in 119/130 fetuses at 36±2.7 weeks of gestation. Twenty-four out of 119 had at least 1 abnormal shunt (23 FO, 5 DA, and 4 both). Thirteen of 130 neonates had profound hypoxemia (PaO_2<25 mm Hg) and metabolic acidosis (pH <7.15) in the first 30 minutes and required immediate balloon atrioseptostomy. Two who had abnormal FO and DA died despite aggressive resuscitation. The specificity and sensitivity of the fetal echo in predicting neonatal emergency were 84% and 54%, respectively. The specificity and sensitivity of a combination of restrictive FO and DA constriction were 100% and 31%, respectively.

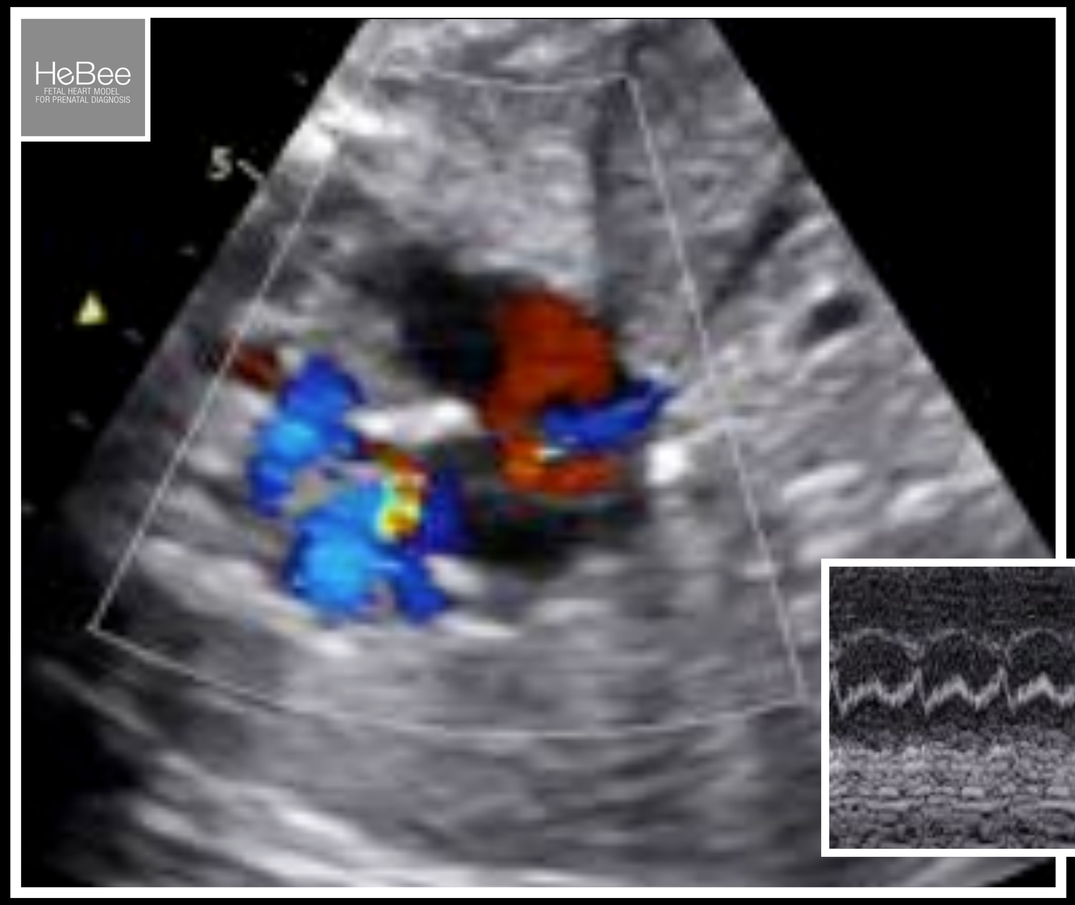
Conclusions—Restriction of the FO and/or of the DA has a high specificity to predict the need for emergency neonatal care in fetuses with TGA, but the sensitivity is too low to detect all high-risk fetuses. Exceptional procedures should be considered for fetuses that have a combination of restrictive FO and DA constriction. (***Circulation*. 2004;110:1743-1746.**)

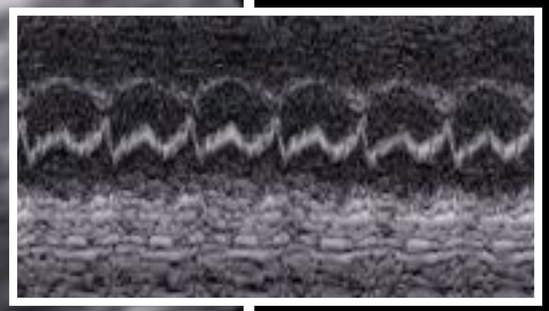
TGA

Foramen Ovale

TGA

Foramen Ovale

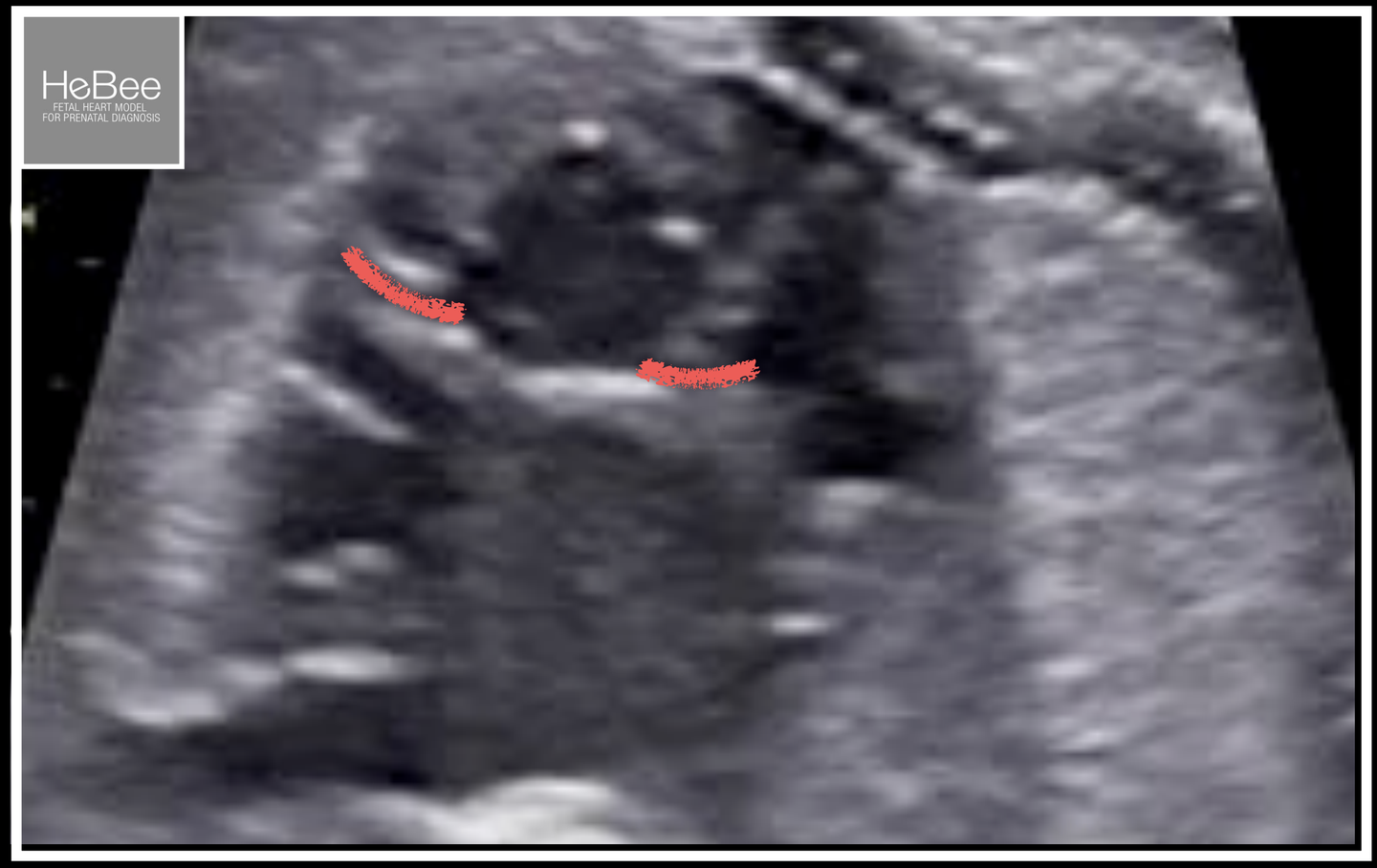




-Floppy Mb
-Small FO
-Small septal length
-pulmonary veins velocity > 0,41 m/s

TGV

Is the analysis of the coronary arteries useful to predict the risks of complications ?



Sometimes It is possible to see them

TGV

Is the analysis of the coronary arteries useful to predict the risks of complications ?

Sometimes It is possible to see them

TGV

Coronary arteries

Sometimes It is possible to see them

TGV

Coronary arteries

No comment about CA in the report !

Pulmonary and aortic commissure alignment

TGA

Counseling and follow up

TGA

Counseling and follow up

Causes and extra cardiac assessment

Neonatal risk

Delivery

Rashkind

Switch

Morbidity/Mortality

Follow up and prognosis (cardiac and neuro developmental)

psychological support

TGA

Summary

VA discordance/parallel vessels in LVOT view

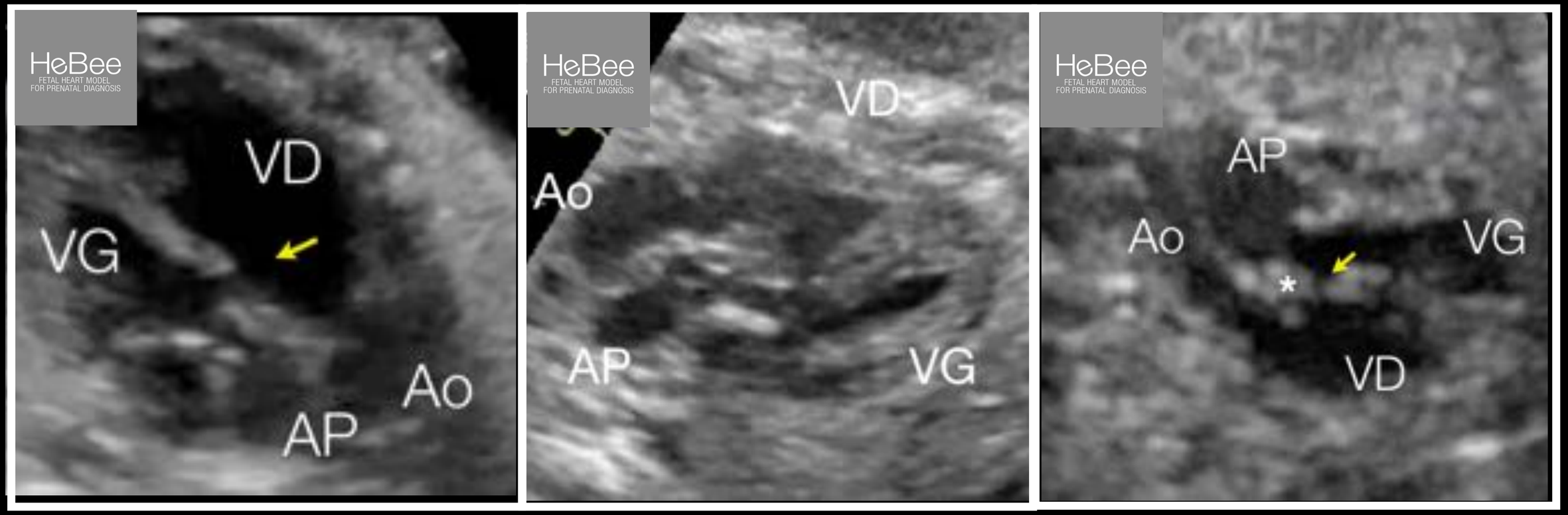
« I » shape sign in 3 vessel view

Triangular configuration in 3 vessel view

Main signs

TGA

Summary



TGA-VSD

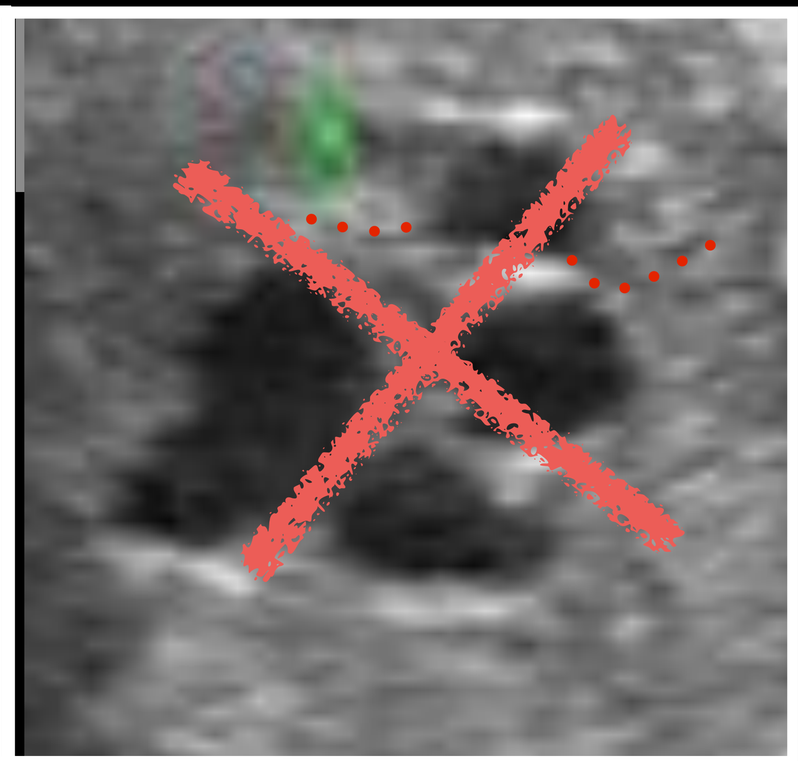
TGA-VSD-PS

TGA-VSD-Coa

Complex forms: associated anomalies

TGA

Summary



Traps

Neonatal tolerance

prognosis

Remaining issues