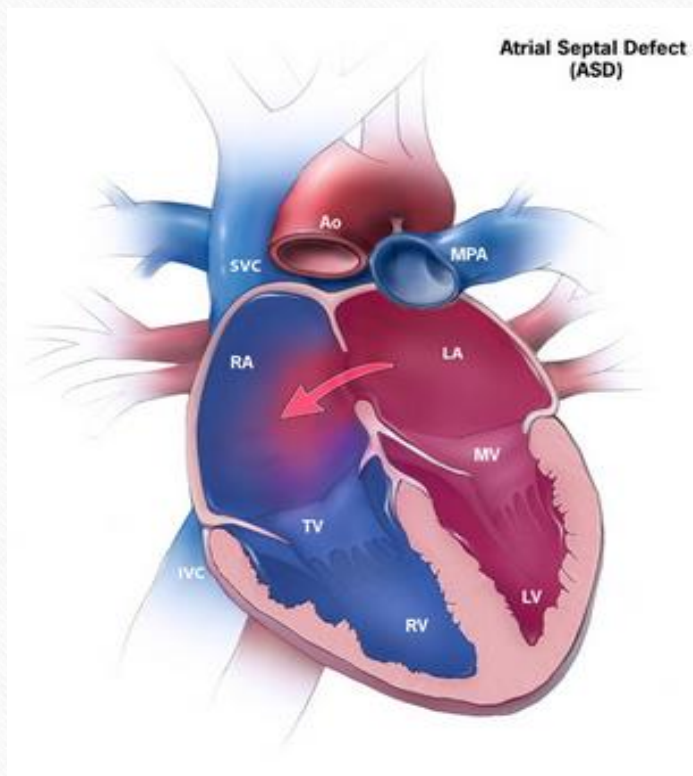


ECG IN CONGENITAL HEART DISEASES

Dr TRẦN CÔNG BẢO PHỤNG, CHILDREN HOSPITAL N1

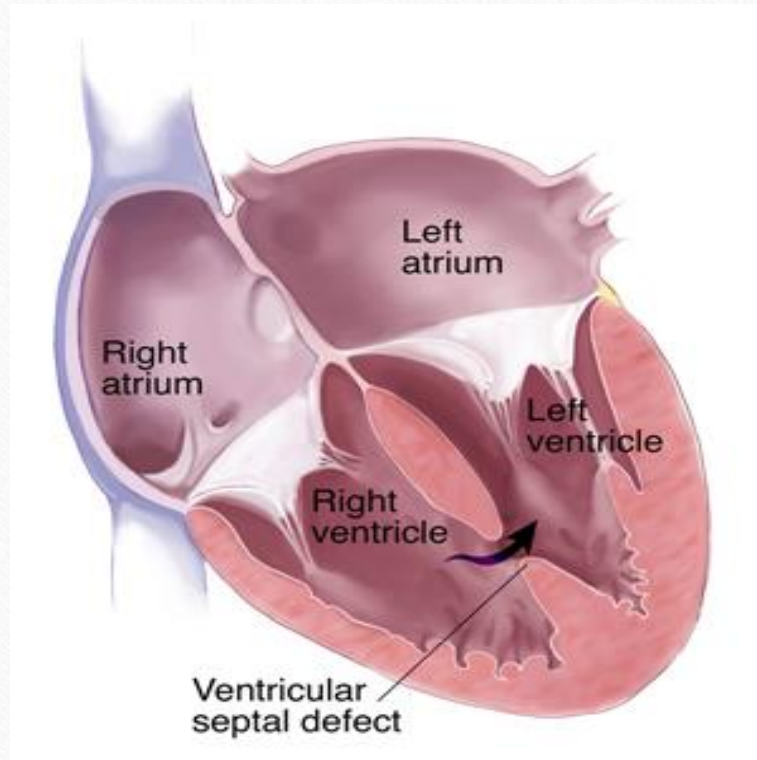
-
- ECG IN COMMON CONGENITAL HEART DISEASES
 - ARRYTHMIAS AFTER OPEN HEART SURGERIES

ASD



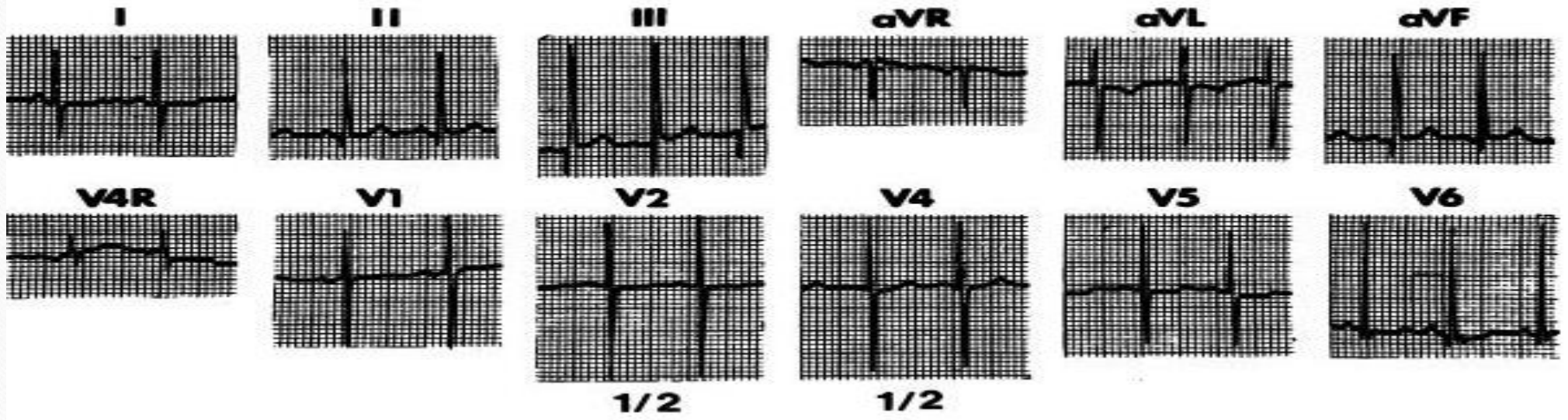
- ✓ Small ASD: normal ECG
- ✓ Large ASD : RAD, RAH, RVH±RBBB or 1st degree AV block

VSD



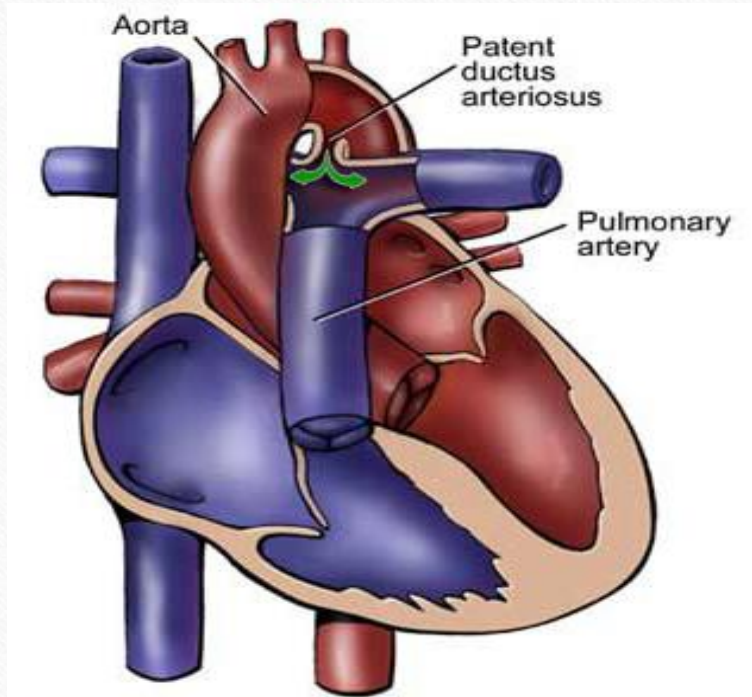
- ✓ Small VSD, ECG is normal.
- ✓ Moderate VSD: LVH and occasional left LAH.
- ✓ Large defect: BVH with or without LAH.
- ✓ If pulmonary vascular obstructive disease develops, the ECG shows RVH only.

VSD



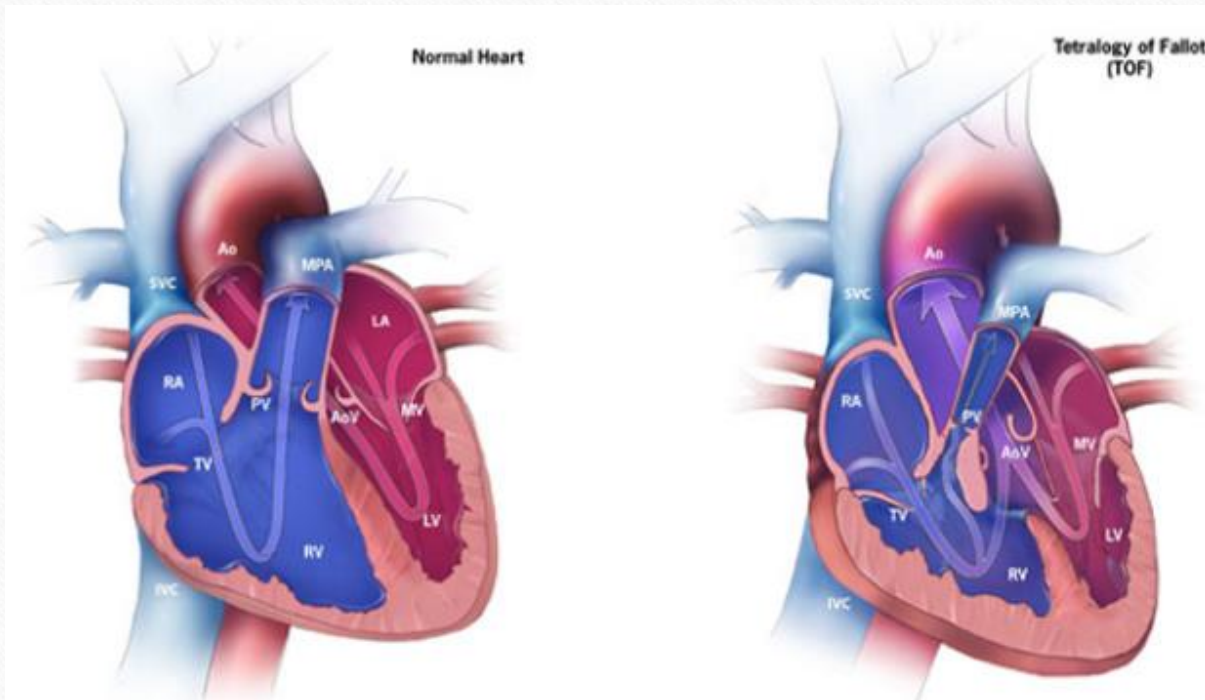
Large vsd / 3 months baby: LVH, RVH

PDA



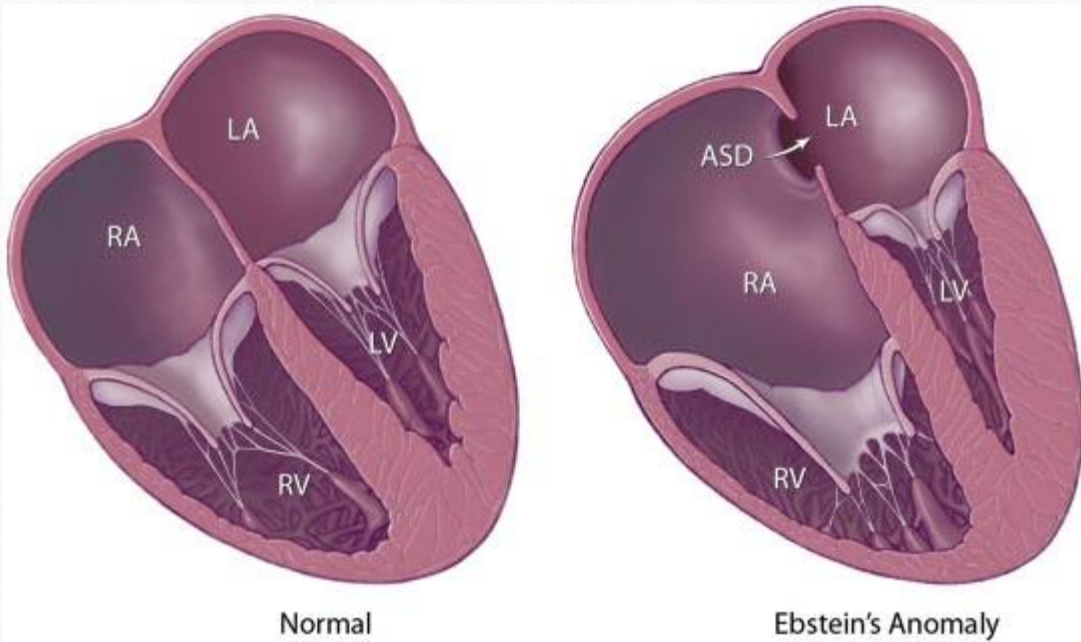
- ✓ Similar to those in VSD.
- ✓ A normal ECG or LVH with small to moderate PDA.
- ✓ BVH with large PDA.
- ✓ If pulmonary vascular obstructive disease develops, RVH is present.

TOF



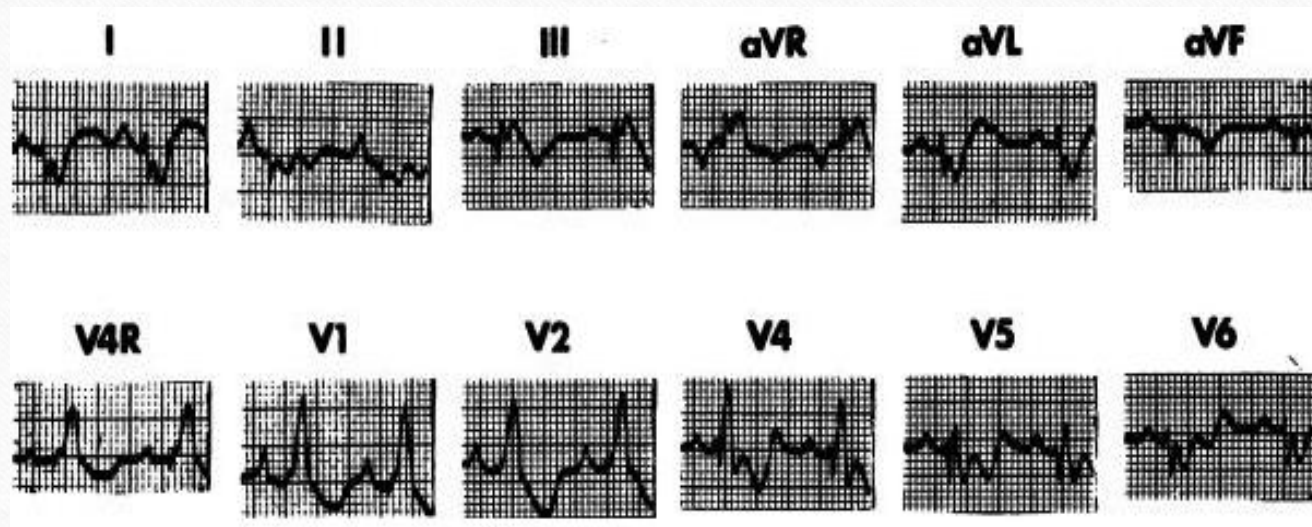
1. Right axis deviation (RAD) (+120 to +150 degrees).
2. RVH. LVH in the acyanotic form. RAH is occasionally present.

EBSTEIN



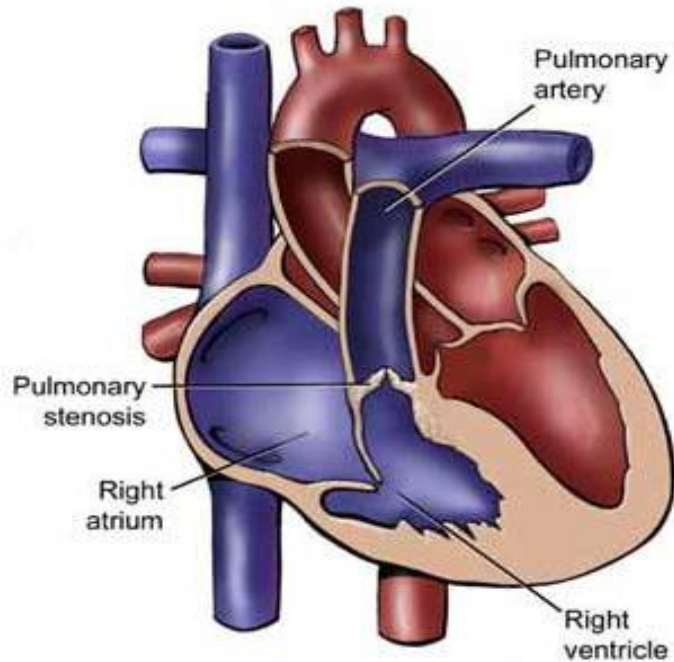
1. RBBB and RAH
2. First-degree AV block in 40% of patients. A WPW pattern in 15% to 20% of patients with occasional episodes of SVT.

EBSTEIN



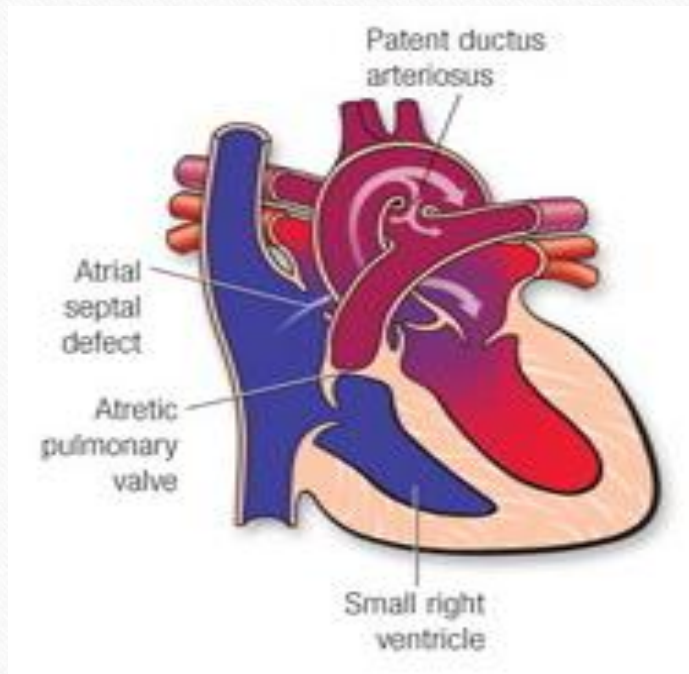
Tracing from a 5-year-old child with Ebstein's anomaly. The tracing shows right atrial hypertrophy, right bundle branch block, and first-degree atrioventricular block

PS



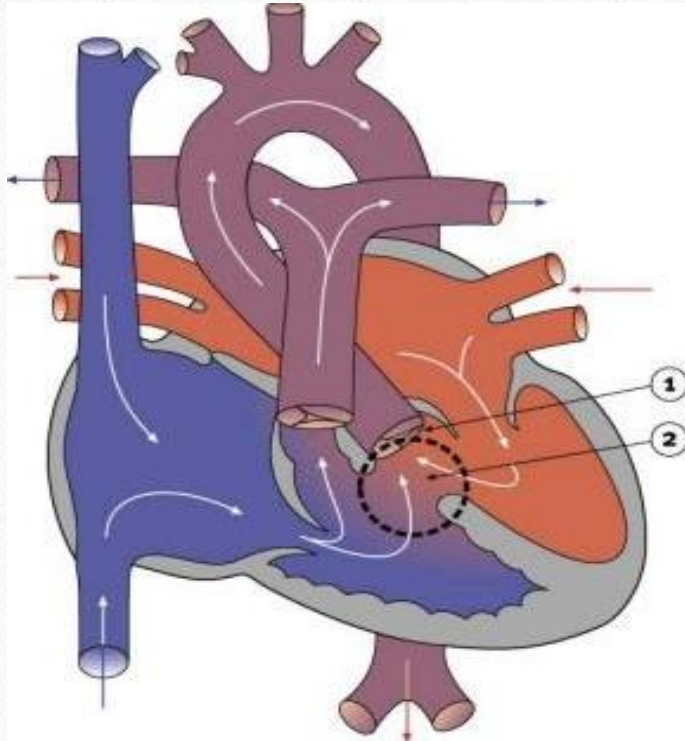
- ✓ Mild: normal ECG.
- ✓ Moderate PS: Right axis deviation (RAD) and RVH. The degree of RVH on the ECG correlates with the severity of PS.
- ✓ Neonates with critical PS may show LVH because of a hypoplastic RV and relatively large LV

PAIVS



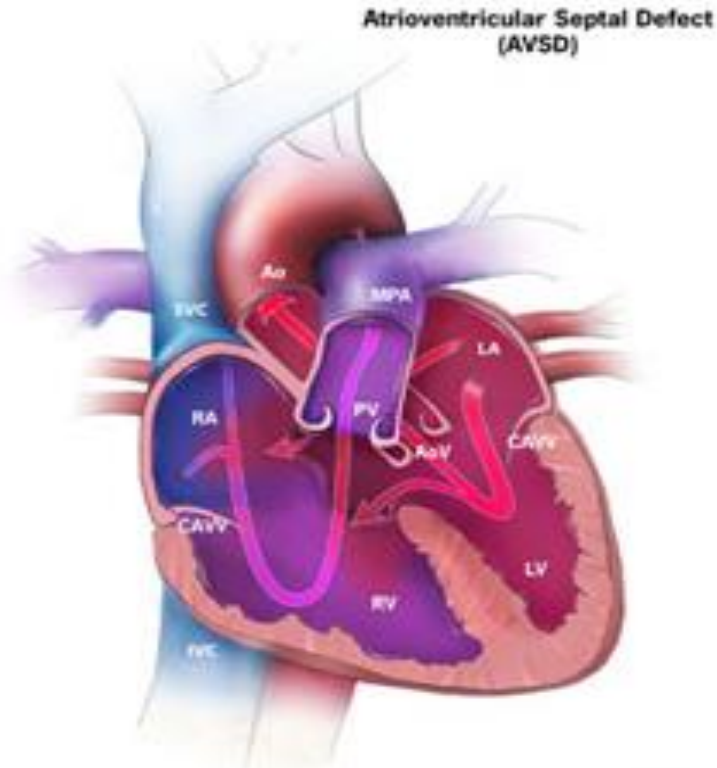
- ✓ The QRS axis is normal (i.e., +60 to +140 degrees), in contrast to the superiorly oriented QRS axis seen in tricuspid atresia.
- ✓ LVH. Occasionally, RVH is seen in infants with a relatively large RV cavity. RAH

DORV



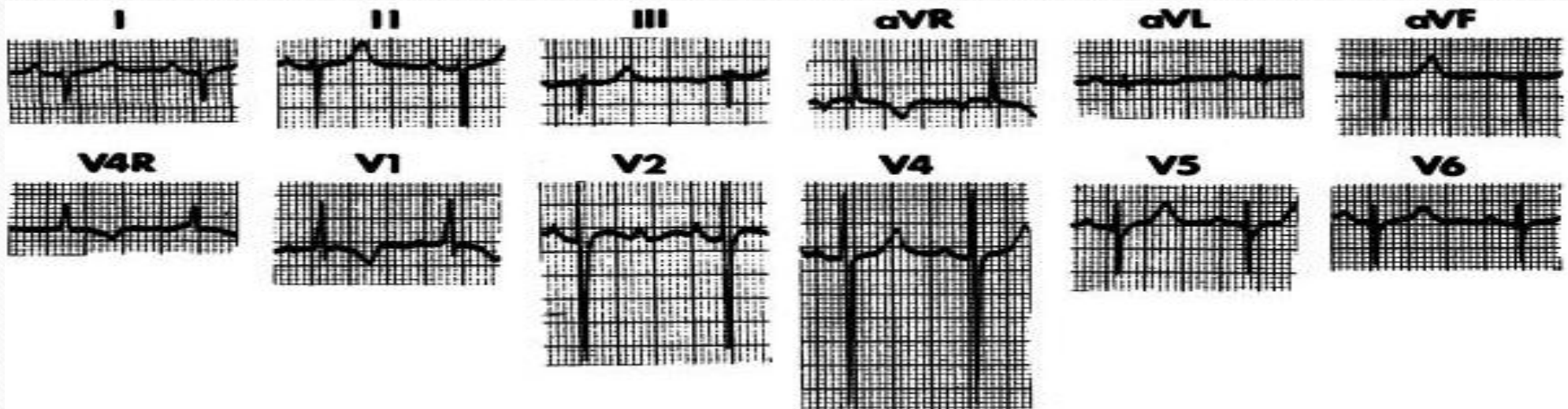
- ✓ Subaortic VSD without PS: resembles ECDc. Superior QRS axis. RVH or BVH, LAH. 1st degree AV block.
- ✓ Subaortic VSD with pulmonary stenosis (Fallot type): RAD, RAH, RVH, or RBBB. 1st degree AV block
- ✓ Subpulmonary VSD (Taussig-Bing syndrome): RAD, RAH, and RVH. LVH: during infancy

AVSD



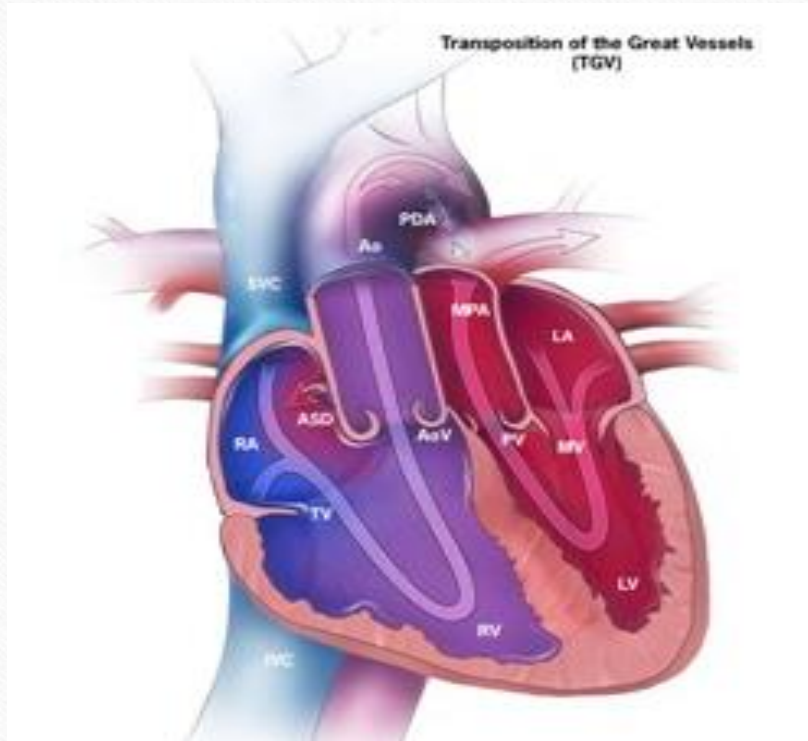
- ✓ “Superior” QRS axis with the QRS axis between -40 and -150 degrees is characteristic of the defect .
- ✓ Most of the patients have a prolonged PR interval (first-degree AV block).
- ✓ RVH or RBBB is present in all cases, and many patients have LVH.

AVSD



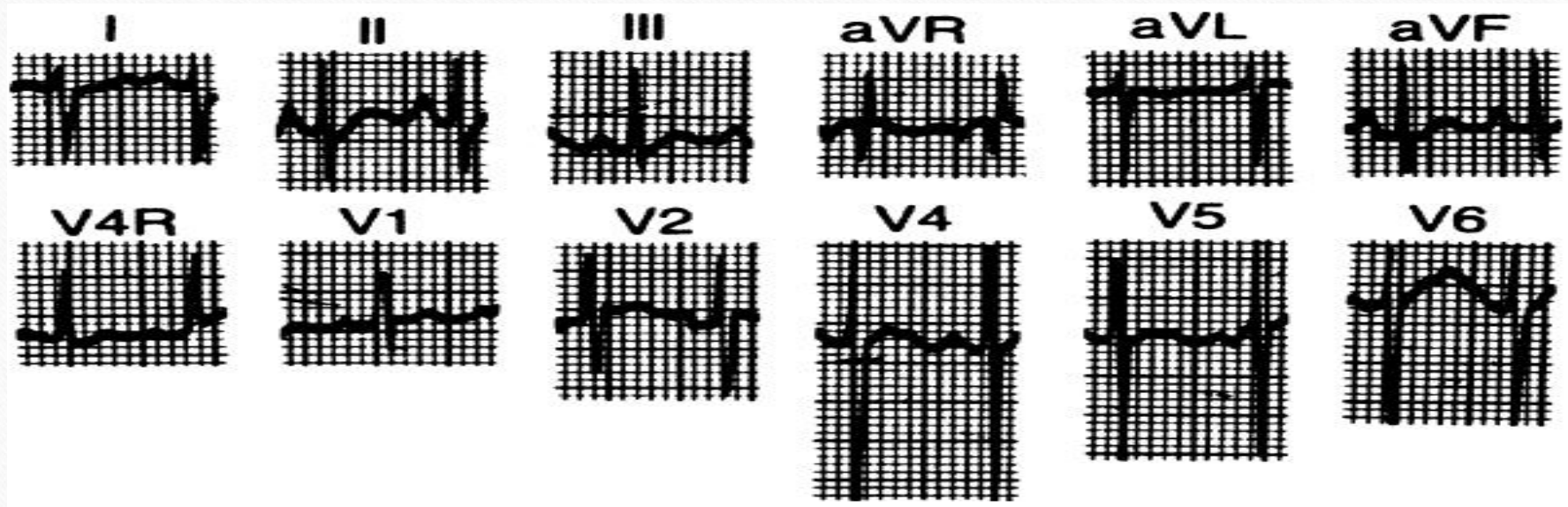
Tracing from a 5-year-old boy with Down syndrome and complete atrioventricular canal. Note the “superior” QRS axis (-110 degrees) and right ventricular hypertrophy

TGA



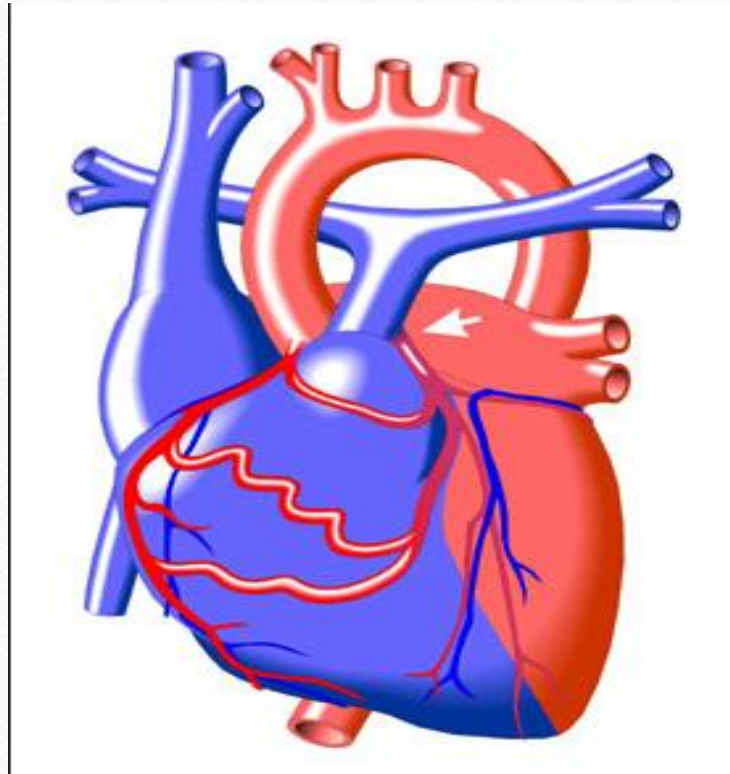
- ✓ Rightward QRS axis (+90 to +200 degrees).
- ✓ RVH is usually present after the first few days of life.
- ✓ Biventricular hypertrophy (BVH) with large VSD, PDA, or PAH.
- ✓ Occasionally RAH.

TGA



ECG tracing from a 6-day-old male infant with complete transposition of the great arteries. The QRS axis is +140 degrees. Note the deep S waves in V5 and V6 and an upright T wave in V1.

ALCAPA



Anterolateral myocardial infarction pattern: abnormally deep and wide Q waves, inverted T waves, and an ST-segment shift in leads I and aVL and the precordial leads

Congenital heart abnormalities: time of onset and typical ECG findings

CHD	Onset	RVH	LVH	RAE	LAE	RAD	LAD	RBBB
PDA	2 nd -3 rd wk		+ (older child)					
ASD	Variable	+		+		+		+
VSD	2 nd -12 th wk	+	+				+	+
CoA	1 st wk	+	+			+		
		(newborn)	(older)			(newborn)		
ToF	1 st -12 th wk	+				+		+
								(after repair)
TGA	1 st wk	+				+	+	
Truncus arteriosus	Variable, infancy	+	+					
Tricuspid atresia	1 st -4 th wk		+	+			+	
PA	Variable		+					
HLHS	1 st wk	+						
AS	Variable		+					
PS	1 st -4 th wk	+		+		+		
AVC	2 nd -3 rd wk	+	+	+	+		+	+
HCM	Variable, adulthood		+		+			

Early postoperative arrhythmias

Hemodynamically significant arrhythmias are frequent in the early days after pediatric cardiac surgery, affecting perhaps 15–20% of cases overall

- Sinus tachycardia
- Junctional ectopic tachycardia
- Atrial tachycardia and atrial flutter
- Sinus bradycardia
- Ventricular premature beats
- ventricular tachycardia
- Ventricular fibrillation
- Postoperative complete AV block



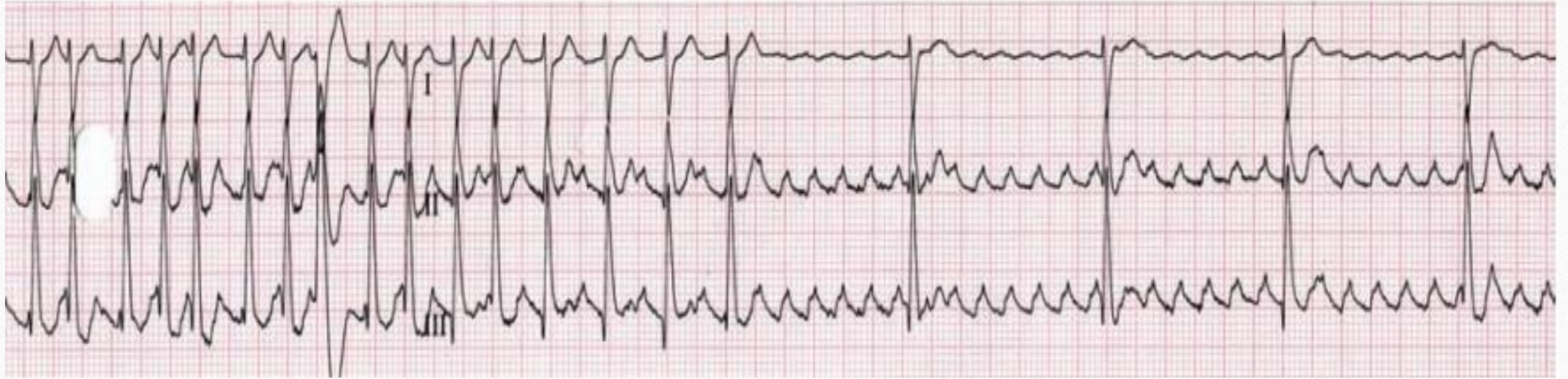
Sinus tachycardia



Junctional ectopic tachycardia



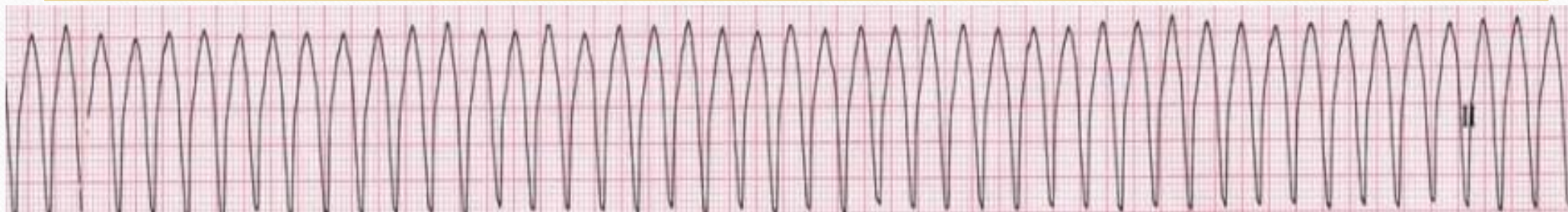
Adenosin reveal JET



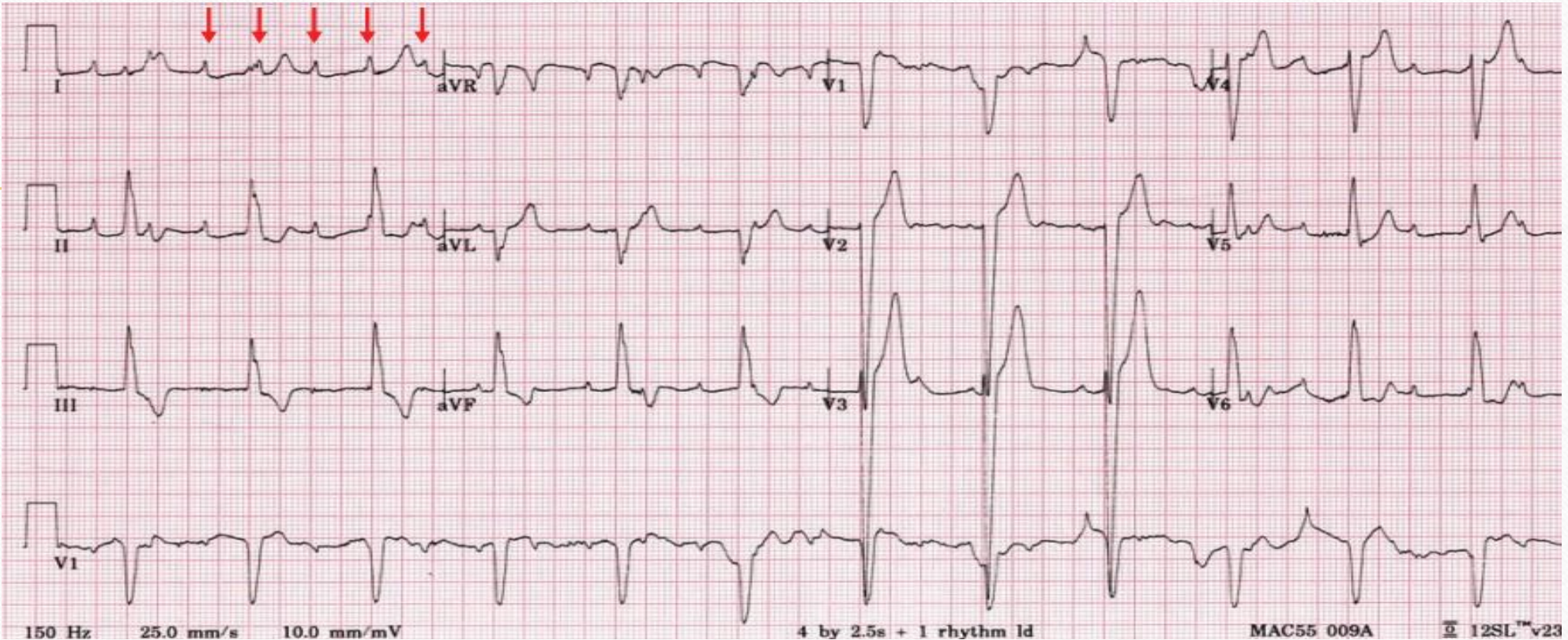
3 years old boy after double switch for L TGA: atrial flutter



Neonate after TAPVC repair: PAC recovered with oral propranolol



Ventricular tachycardia in 5 year old girl after RVO conduit replacement



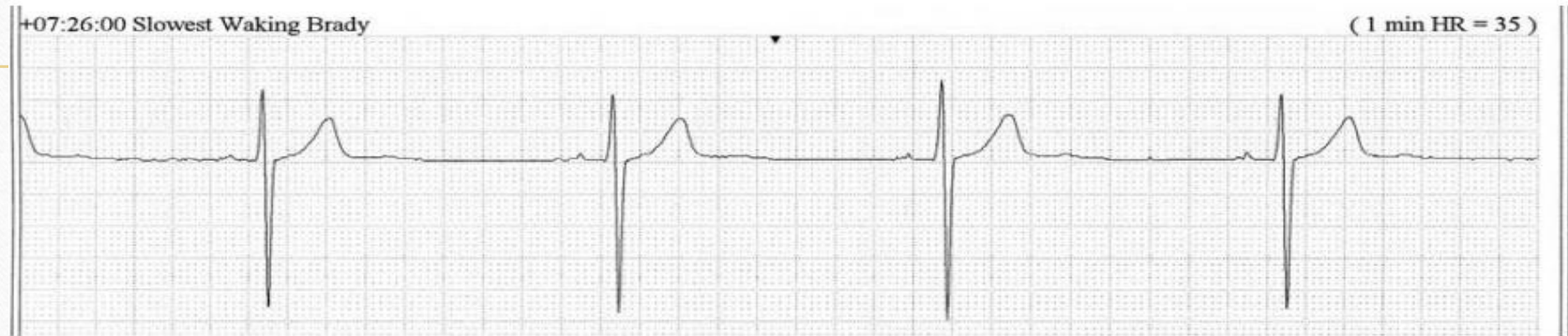
Complete AV block in 18 months old girl after resection of severe fibromuscular subaortic stenosis

Late postoperative arrhythmias

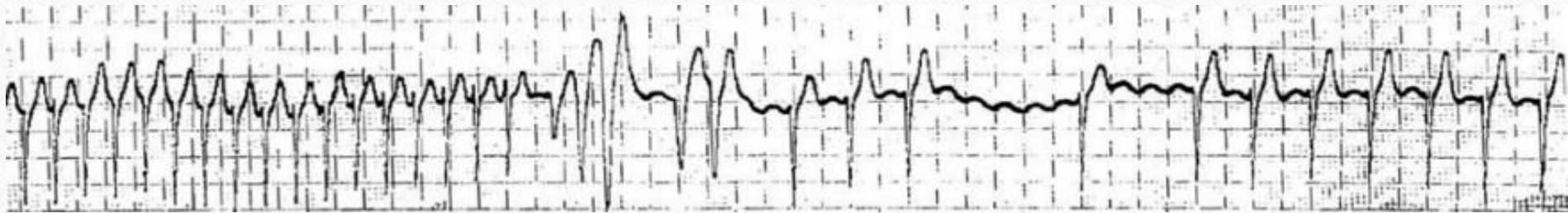
The main arrhythmias of concern are incisional atrial tachycardia (atrial flutter), sinoatrial disease, and ventricular tachycardia

- Arrhythmias after the Senning and Mustard operations
- Arrhythmias after repair of a tetralogy of Fallot
- Arrhythmias after the Fontan operation

Arrhythmias after the Senning and Mustard operations



Sinus bradycardia



Atrial flutter

Arrhythmias after the Senning and Mustard operations

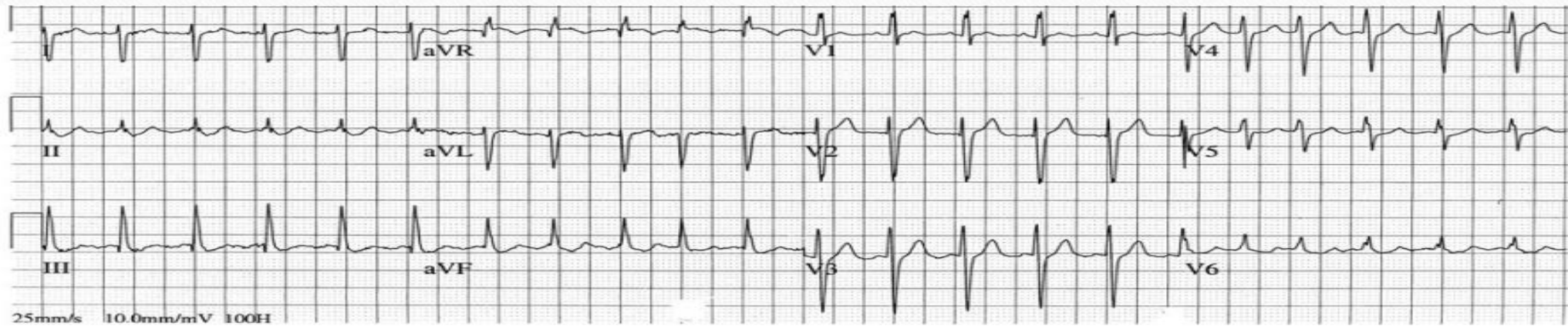


Figure 32.5



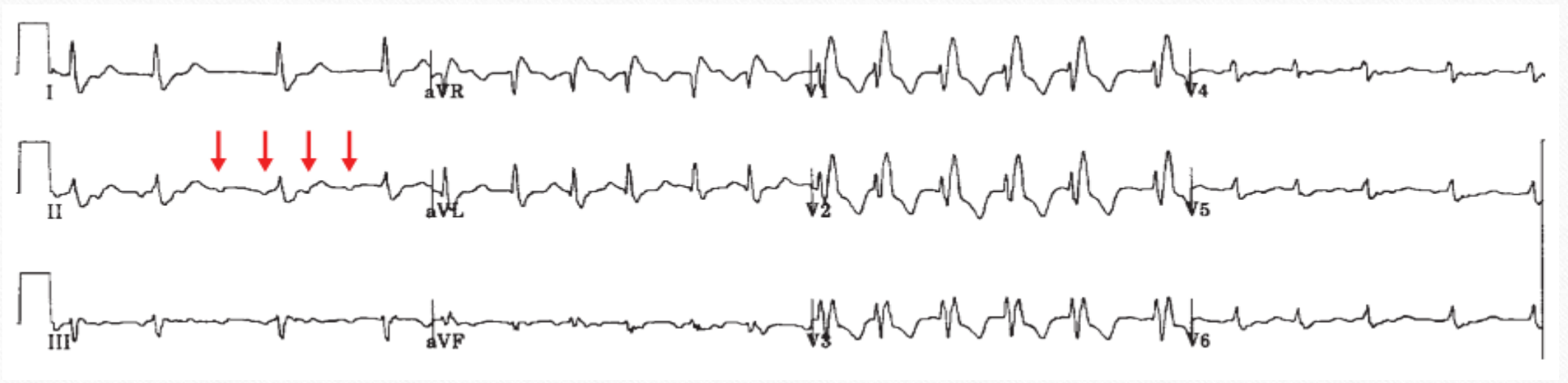
Figure 32.6

Atrial flutter

Arrhythmias after repair of TOF

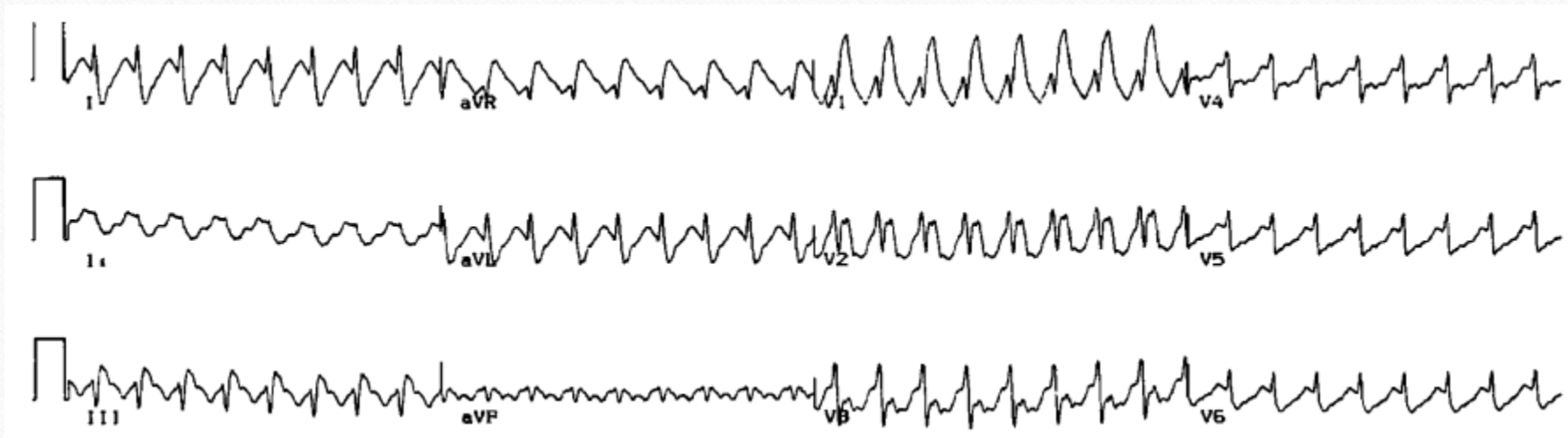
- Significant arrhythmias are uncommon in the early years after repair of a tetralogy of Fallot but they become increasingly prevalent late on.
- Often related to significant haemodynamic abnormalities, such as PR, impaired RV function, and TR.
- The most common arrhythmias are AT (flutter or fibrillation) and VT.
- RBBB → an atrial arrhythmia. LBBB → ventricular tachycardia

Arrhythmias after repair of TOF



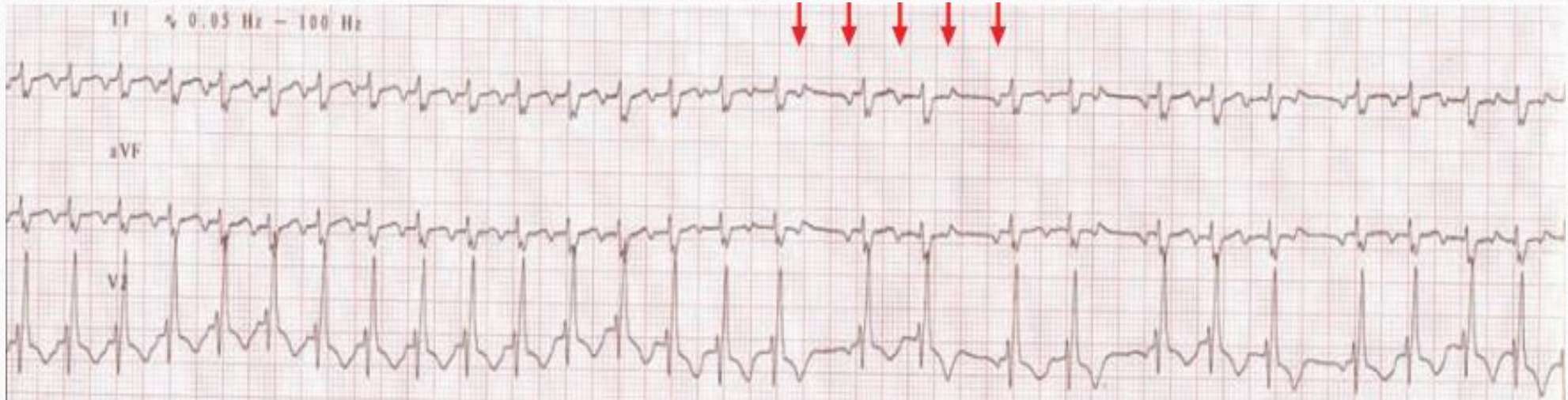
Atrial flutter

Arrhythmias after repair of TOF



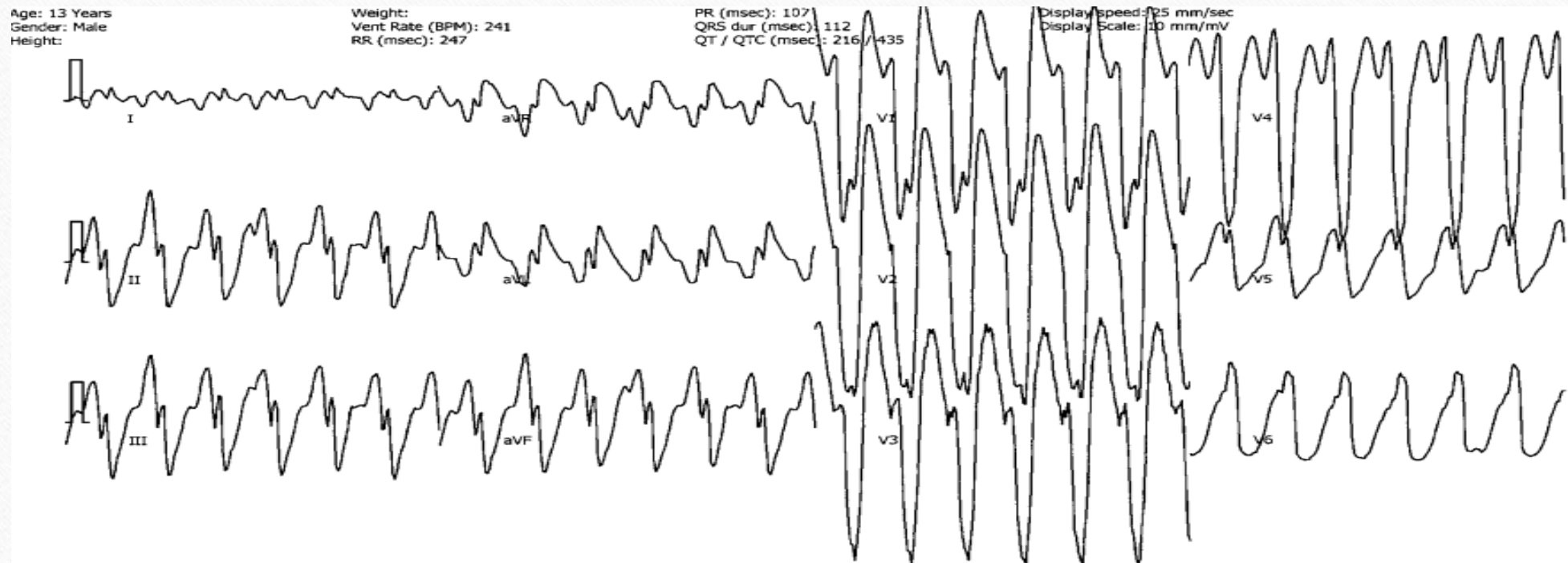
Atrial flutter

Arrhythmias after repair of TOF



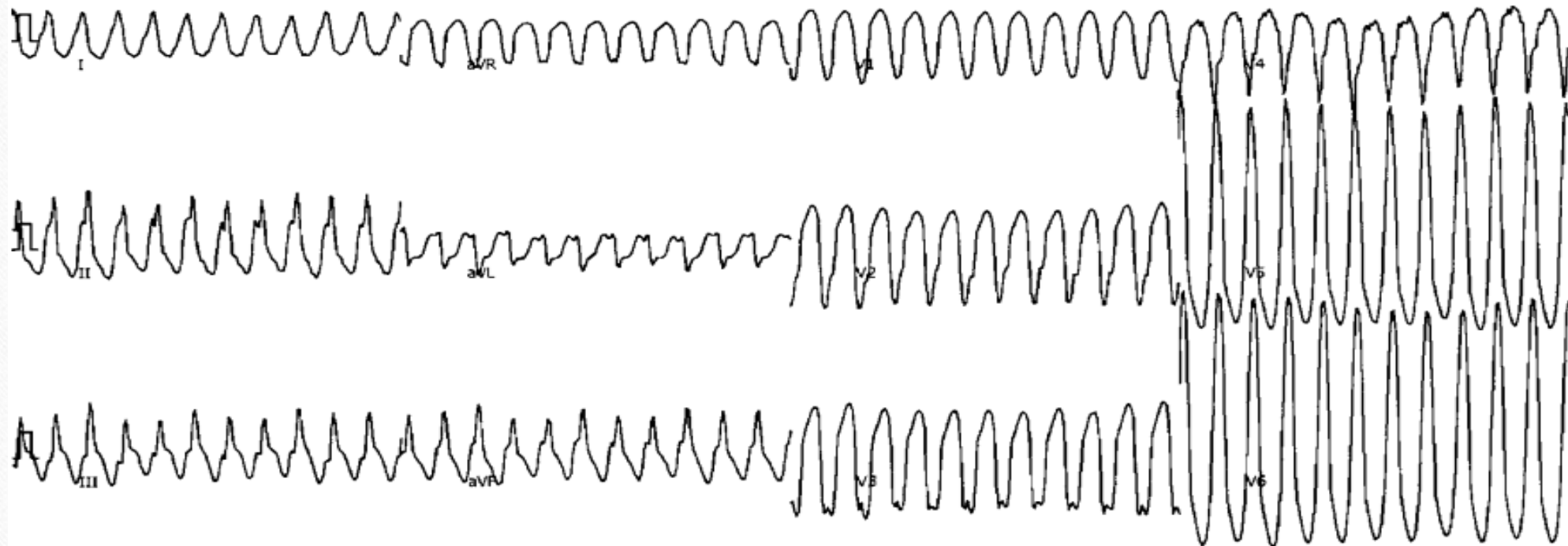
Atrial flutter

Arrhythmias after repair of TOF



Ventricular tachycardia

Arrhythmias after repair of TOF

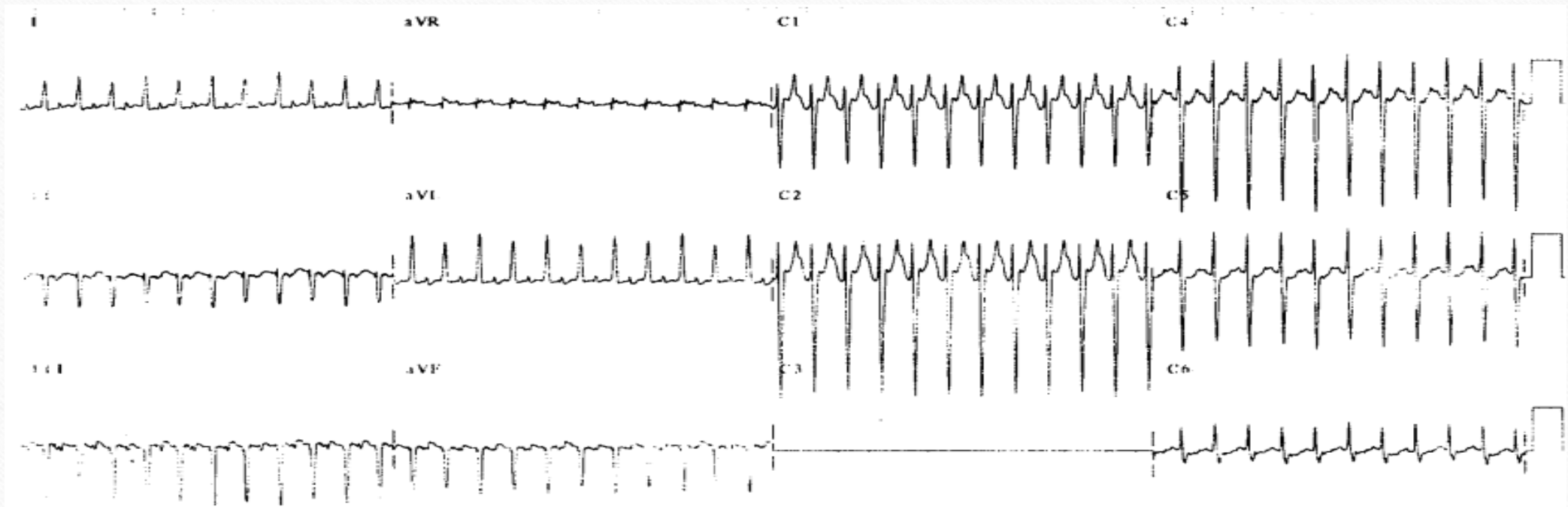


Ventricular tachycardia

Arrhythmias after the Fontan operation

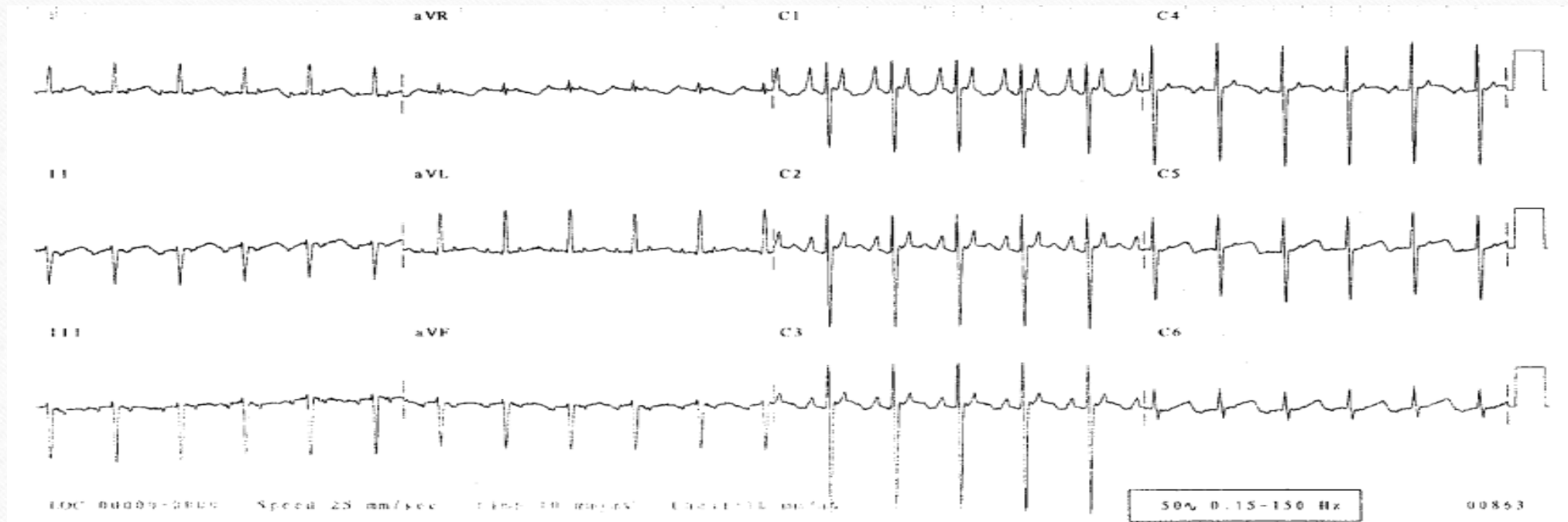
- Late arrhythmia is common involves loss of sinus rhythm with bradycardia or incisional atrial macro re-entry tachycardia, as atrial flutter.
- The substrate for tachycardia is provided by right atrial dilation and hypertrophy plus scarring from previous surgery.

Arrhythmias after the Fontan operation



7-year-old boy with SVT after Fontan operation: 1: 1 AV relationship

Arrhythmias after the Fontan operation



Few minutes later : 2: 1 AV conduction → atrial tachycardia, not accessory pathway

Thank you for your attention!

