BASIC TOOLS IN ROUTINE EVALUATION OF CARDIAC PATIENTS

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1. History Taking
2. Physical Examination
3. ECG
4. Chest RÖ
5. Echocardiography
6. Catheterization
ECG: Routine Interpretation

The following sequence is one of many approaches that can be used in routine interpretation of an ECG.

- Rhythm (sinus or nonsinus) by considering the P axis
- Heart rate (atrial and ventricular rates, if different)
- The QRS axis, the T axis, and the QRS-T angle
- Intervals: PR, QRS, and QT
- The P wave amplitude and duration
- The QRS amplitude and R/S ratio; also abnormal Q waves
- ST-segment and T-wave abnormalities
Figure 3-3 Comparison of P axis in sinus rhythm (A) and low atrial rhythm (B). In sinus rhythm, the P waves are upright in leads I and aVF. In low atrial rhythm, the P wave is inverted in lead aVF.
Figure 3-4 ECG paper. Time is measured on the horizontal axis. Each 1 mm = 0.04 second, and each 5 mm (a large division) = 0.20 second; 30 mm (or six large divisions) = 1.2 second or 1/50 minute. Every 7.5 cm marked on the top margin of the paper = 3.0 second or 1/20 minute. (From Park MK, Guntheroth WG: How to Read Pediatric ECGs, 3rd ed. St. Louis, Mosby, 1992.)
Figure 3-8 Hexaxial (A) and horizontal (B) reference systems. (From Park MK, Guntheroth WG: How to Read Pediatric ECGs, 3rd ed. St. Louis, Mosby, 1992.)

Figure 3-9 An easy way to memorize the hexaxial reference system. (From Park MK, Guntheroth WG: How to Read Pediatric ECGs, 3rd ed. St. Louis, Mosby, 1992.)
Figure 3-12 Diagram illustrating important intervals (or durations) and segments of an ECG cycle.
Figure 3-10 Locating quadrants of mean QRS axis from leads I and aVF. (From Park MK, Guntheroth WG: How to Read Pediatric ECGs, 3rd ed. St. Louis, Mosby, 1992.)

<table>
<thead>
<tr>
<th></th>
<th>Lead I</th>
<th>Lead aVF</th>
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<tr>
<td>$0^\circ - +90^\circ$</td>
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<td><img src="image2" alt="Graph" /></td>
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<tr>
<td>$0^\circ - -90^\circ$</td>
<td><img src="image3" alt="Graph" /></td>
<td><img src="image4" alt="Graph" /></td>
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<tr>
<td>$+90^\circ - \pm 180^\circ$</td>
<td><img src="image5" alt="Graph" /></td>
<td><img src="image6" alt="Graph" /></td>
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<tr>
<td>$-90^\circ - \pm 180^\circ$</td>
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CONDUCTION SYSTEM OF THE HEART

Sinoatrial (SA) node

Right atrium

Right ventricle

Purkinje fibers

Left atrium

Atrioventricular (AV) node

Left ventricle

Atrioventricular bundle (bundle of His)

Normal EKG
ATRIAL DEPOLARIZATION

Electrical Impulse moves from Sinoatrial Node to Atrioventricular Node
AV NODE DEPOLARIZATION

Electrical Impulse moves from Atrioventricular Node through Atrioventricular Bundle

ELECTROCARDIOGRAM
HIS-PURKINJE OR VENTRICULAR DEPOLARIZATION

Electrical Impulse moves from Atrioventricular Bundle Branches to Purkinje Fibers
Figure 4-1 Diagram showing how to measure the cardiothoracic (CT) ratio from the posteroanterior view of a chest x-ray film. The CT ratio is obtained by dividing the largest horizontal diameter of the heart \((A + B)\) by the longest internal diameter of the chest \((C)\).
Figure 4-2 Posteroanterior and lateral projections of normal cardiac silhouette. Note that in the lateral projection, the right ventricle (RV) is contiguous with the lower third of the sternum and that the left ventricle (LV) normally crosses the posterior margin of the inferior vena cava (IVC) above the diaphragm. AO, aorta; LA, left atrium; LAA, left atrial appendage; LPA, left pulmonary artery; PA, pulmonary artery; RA, right atrium; RPA, right pulmonary artery; SVC, superior vena cava.
Figure 4-3 Abnormal cardiac silhouettes. A, “Boot-shaped” heart seen in cyanotic tetralogy of Fallot or tricuspid atresia. B, “Egg-shaped” heart seen in transposition of the great arteries. C, “Snowman” sign seen in total anomalous pulmonary venous return (supracardiac type).
Figure 6-2 Diagram of important two-dimensional echo views obtained from the parasternal transducer position. Parasternal long-axis view (A) is shown. Parasternal short-axis views can be obtained at various levels: semilunar valve and great artery level (B, C), mitral valve level (D), and papillary muscle level (E). AO, aorta; LA, left atrium; LCA, left coronary artery; LPA, left pulmonary artery; LV, left ventricle; MPA, main pulmonary artery; MV, mitral valve; PA, pulmonary artery; PM, papillary muscle; PV, pulmonary valve; RA, right atrium; RCA, right coronary artery; RPA, right pulmonary artery; RV, right ventricle; RVOT, right ventricular outflow tract.
Figure 6-3 Diagram of two-dimensional echo views obtained with the transducer at the apical position. Both the apex-down and apex-up images are shown. A, Apical four-chamber view. B, Apical four-chamber view with left ventricular outflow tract (apical “five-chamber” view). C, Apical long-axis view. AO, aorta; LA, left atrium; LV, left ventricle; RA, right atrium; RV, right ventricle.
Figure 6-4 Diagram of two-dimensional echo views obtained with the transducer at the subcostal position. Both the apex-down and apex-up images are shown. A, Subcostal four-chamber view. B, View showing the left ventricular outflow tract and the proximal aorta (subcostal “five-chamber” view). C, View that shows the right ventricular outflow tract (RVOT) and the proximal main pulmonary artery (PA). D, Subcostal short-axis view. AO, aorta; LA, left atrium; LV, left ventricle; RA, right atrium; RV, right ventricle.
Figure 6-5 Diagram of suprasternal notch two-dimensional echo views. A, Long-axis view. B, Short-axis view. AO, aorta; Asc Ao, ascending aorta; Desc Ao, descending aorta; Inn A, innominate artery; LA, left atrium; LCA, left carotid artery; LSA, left subclavian artery; MPA, main pulmonary artery; PA, pulmonary artery; RPA, right pulmonary artery; SVC, superior vena cava.
Figure 5-1 Flow diagram of acyanotic congenital heart defects. AR, aortic regurgitation; AS, aortic stenosis; ASD, atrial septal defect; COA, coarctation of the aorta; CVH, combined ventricular hypertrophy; ECD, endocardial cushion defect; EFE, endocardial fibroelastosis; L-R, left-to-right; LVH, left ventricular hypertrophy; MR, mitral regurgitation; MS, mitral stenosis; PAPVR, partial anomalous pulmonary venous return; PBF, pulmonary blood flow; PDA, patent ductus arteriosus; PS, pulmonary stenosis; PVOD, pulmonary vascular obstructive disease (or Eisenmenger's syndrome); RBBB, right bundle branch block; RVH, right ventricular hypertrophy; VSD, ventricular septal defect.
Figure 5-2 Flow diagram of cyanotic congenital heart defects. CVH, combined ventricular hypertrophy; HLHS, hypoplastic left heart syndrome; L-R, left-to-right; LVH, left ventricular hypertrophy; PA, pulmonary artery; PBF, pulmonary blood flow; PS, pulmonary stenosis; PVOD, pulmonary vascular obstructive disease (or Eisenmenger's syndrome); RBBB, right bundle branch block; RV, right ventricle; RVH, right ventricular hypertrophy; TAPVR, total anomalous pulmonary venous return; TGA, transposition of the great arteries; TOF, tetralogy of Fallot; VSD, ventricular septal defect.
Cardiac Catheterization and Angiocardiography

Figure 7-1 Pressure and oxygen saturation values in normal children. AO, aorta; LA, left atrium; LV, left ventricle; M, mean pressure; PA, pulmonary artery; PV, pulmonary vein; RA, right atrium; RV, right ventricle; VC, vena cava.
Figure 7-2 Angiocardiography and balloon valvuloplasty. A, Lateral view of right ventriculogram showing a thick, dome-shaped pulmonary valve and a marked poststenotic dilatation of the pulmonary artery. B, A maximally inflated sausage-shaped valvuloplasty balloon is seen, which suggests that the stenotic pulmonary valve has been widened. The balloon catheter was introduced over a guide wire, which was positioned in the left pulmonary artery.
Thank You