

Radilologic Findings of Complete and Corrected Transpositions of the Great Arteries

울산의대

유 시 준

FINDINGS AT PLAIN RADIOGRAPHS

1. Complete transposition of the great arteries

- 1) Almost always levocardia when it is seen in situs solitus
- 2) Variable cardiomegaly
- 3) Egg-on-side appearance with narrow superior mediastinum; due to medial location of right ventricular outflow tract and parallel anteroposterior spatial relationship between ascending aorta and main pulmonary artery. Narrow superior mediastinum is also related to a deficiency of thymic tissue due to stress.
- 4) Variable pulmonary vascularity; depends on the presence and size of ventricular septal defect, the presence and severity of left ventricular outflow tract obstruction, and the patency and size of ductus arteriosus. In the newborns with uncomplicated complete transposition, the pulmonary vascularity is normal or only mildly increased. Markedly increased pulmonary vascularity and large heart size in the neonatal period suggest association with large ventricular septal defect and/or obstructive lesion of the aortic arch. Decreased pulmonary vascularity suggests significant left ventricular outflow tract obstruction. The pulmonary vascularity is often asymmetric with the right lung being more plethoric. It is considered to be related to the obtuse angle between the main and right pulmonary arteries.

5) Right aortic arch; A right aortic arch is more frequent in patients with ventricular septal defect (11%) than in patients with an intact ventricular septum (4%). It is particularly common when there is ventricular septal defect and pulmonary stenosis (16%).

2. Corrected transposition of the great arteries

- 1) Mismatched cardiac position, i. e., mesocardia or dextrocardia in situs solitus, and mesocardia or levocardia in situs inversus, strongly suggest atrioventricular discordance. However, levocardia in situs solitus does not exclude corrected transposition.
- 2) Variable cardiomegaly; depends not only on amount of left-to-right shunt but also on presence and severity of tricuspid valve regurgitation
- 3) Bulging contour of left upper and middle heart border in situs solitus; due to levoposed ascending aorta and supporting right ventricular outflow tract.
- 4) Variable pulmonary vascularity; depends on the presence and size of ventricular septal defect, the presence and severity of left ventricular outflow tract obstruction, and the presence and severity of tricuspid regurgitation.

FINDINGS AT ANGIOCARDIOGRAPHY

1. Complete transposition of the great arteries

- 1) Right and left ventriculography in long-axis oblique and elongated right anterior oblique projections

should be performed for the demonstration of the intracardiac anatomy, such as ventricular septal defect and left ventricular outflow tract obstruction. When there is a ventricular septal defect, the entire ventricular septum should be outlined for the exclusion of multiple defects. The left ventricular outflow tract obstruction may be due to a domed and thickened pulmonary valve, a subpulmonary fibrous diaphragm, posteriorly deviated outlet septum, an abnormally located mitral valve tension apparatus, an accessory atrioventricular valve tissue, or a reduplicated tricuspid valve tissue that is herniated into the left ventricle. The dynamic nature of the left ventricular outflow tract obstruction should also be evaluated.

2) Balloon occlusion aortography in laid back view (caudal angulation of frontal image intensifier with shallow left anterior oblique projection) is advantageous over conventional right and left anterior oblique aortography in defining the origins and epicardial distribution of the major coronary arteries. In laid back view, the base of the ventricles (the plane that passes through the four cardiac valves) together with the epicardial distribution of the coronary arteries is seen as if it were seen from the cardiac apex. The intramural course or the commissural origin of a coronary artery may be well demonstrated in this unique view. As the high take-off of a coronary artery from the ascending aorta cannot be defined in laid back view, it is necessary to obtain simultaneous lateral view.

2. Corrected transposition of the great arteries

1) Right and left ventriculography in frontal and lateral projection is preferred, as the ventricular septum is usually in a sagittal or horizontal plane. As the pulmonary valve is deeply wedged between the

atrioventricular valves in corrected transposition, it tends to override the ventricular septum when there is a ventricular septal defect below the pulmonary valve. This wedged position is also responsible for the left ventricular outflow tract which may be squeezed between the outlet septum and the ventricular free wall. Fibrous tissue tag from the atrioventricular valve or an accessory mitral valve may participate in the left ventricular outflow tract obstruction. However, it is not an easy task to clearly define the left ventricular outflow tract as it is often obscured by the overlapping left ventricular shoulder. Although the abnormalities of the atrioventricular valves, especially of the tricuspid valve, are frequent in corrected transposition, angiography is hardly better than echocardiography.

2) Ascending aortography is often necessary to define the integrity of the transverse aortic arch and isthmus and the origins and epicardial distribution of the coronary arteries.

ROLE OF MAGNETIC RESONANCE IMAGING

Magnetic resonance imaging is helpful in conditions where the ventricular spatial orientation is grossly distorted as in twisted atrioventricular connections (crisscross heart and superoinferior ventricles) or the spatial relationship between the associated ventricular septal defect and the great arterial valves are not clear in echocardiography and angiography. It is also helpful in defining the pathology of the left ventricular outflow tract in both complete and corrected transpositions. It is particularly useful in the evaluation of the distorted anatomy of the neo-aorta and neopulmonary artery after the arterial switch operation.