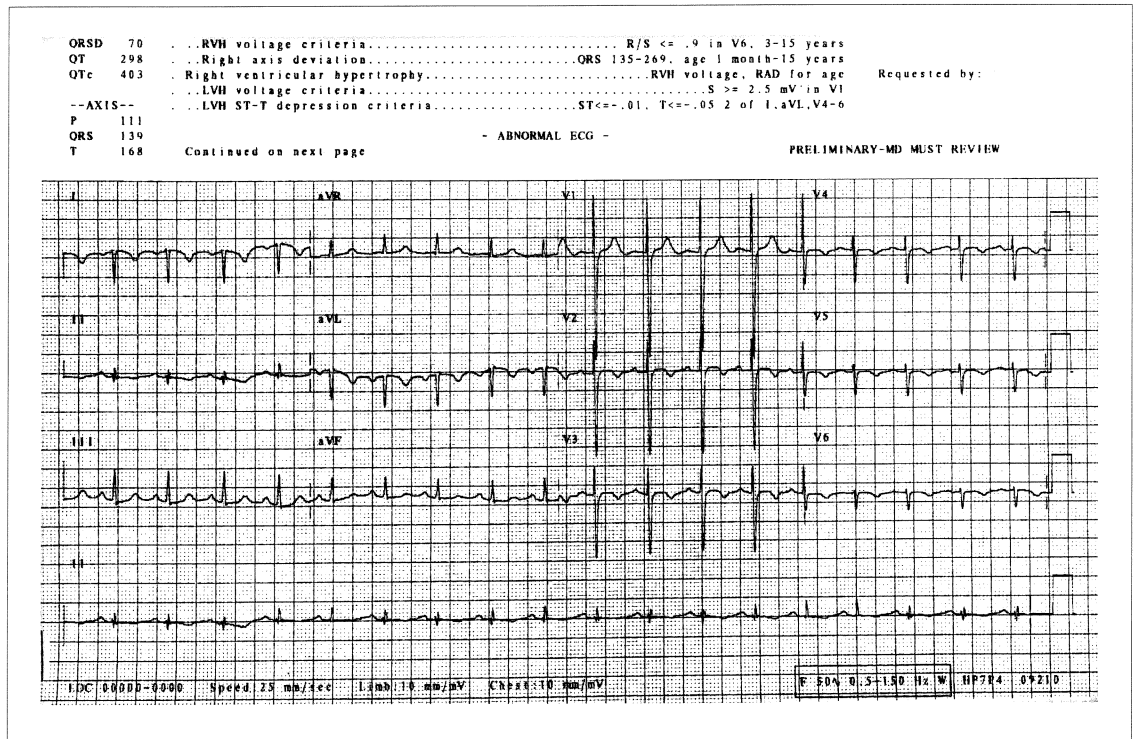


Electrocardiographic Case – The Position of the Heart on ECG

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This is an ECG of an 8-year-old school boy who is clinically well. No murmur was evident on auscultation. What condition does he have?

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Answer : Dextrocardia (mirror-image).

DISCUSSION

This patient has dextrocardia with situs inversus. The heart is "flipped over" as it would be in a mirror-image. The cardiac apex now points rightward with the morphologic right atrium and ventricle being on the left, and the left atrium and ventricle on the right. In short, there is a reversal of the right-to-left relationship while the anterior-posterior relations of the two ventricles remain normal⁽¹⁾. Situs inversus refers to the reversal in the position of the abdominal organs. The liver, instead of being right-sided, is now left-sided, and the stomach and spleen are more rightward. The incidence of dextrocardia and situs inversus has been variously estimated, with the most common approximate being 1 in 8,000 from mass radiographic screening in adults⁽²⁾.

The two most pertinent features in an ECG of a dextrocardia are the p-wave axis and the morphology of the QRS waves of the praecordial leads. The p-wave signifies atrial depolarisation, and the p-axis gives an indication of the site of the cardiac pacemaker. A simplified method of determining the p-wave axis is to look at the p waves in leads I and aVF. The net amplitude (positive or negative) of the p wave is taken from each lead. A perpendicular is drawn from these two points, and a line constructed to meet at the point of intersection. The angle created by this line is the p-wave axis.

In a person with levocardia, activation of the heart begins in the right atrium from the sino-atrial (SA) node and progresses leftward and downward. The usual p-wave axis is therefore in the second quadrant, usually about 60°. This situation is reversed in mirror-image dextrocardia as the SA node is now situated leftward with the p-wave axis shifting to the third quadrant⁽³⁾. In the ECG shown, the p-wave axis is about +120°.

In a normal ECG, there is a gradual increase in the amplitude of the R wave over the mid and left praecordial leads. This trend is reversed in dextrocardia⁽⁴⁾ so that the QRS amplitudes of the right leads are prominent and they diminish in size over the left praecordial leads. Reverse placement (mirror-image) of the ECG praecordial leads on the right chest at corresponding sites corrects this trend.

Kartegener's syndrome, or the "immotile cilia syndrome", is a known association. However, as in this case, most people with dextrocardia and situs inversus are well and have structurally normal hearts.

REFERENCES

1. Park MK, Guntheroth WG. How to read pediatric ECGs (Chapter 8, p133). Mosby Year Book. Third edition 1992.
2. Garson A, Bricker JT, McNamara DG. The science and practice of pediatric cardiology (Chapter 75, p1282). Lea and Febiger 1990.
3. Fyler DC. Nadas' Pediatric cardiology (Chapter 12). Hanley & Belfus 1992.
4. Emmanouilides GC, Allen HD, Riemenschneider TA, Gutgesell HP. Moss and Adams Heart Disease in Infants, Children, and Adolescents (Chapter 80). 5th edition. Williams & Wilkins 1995.