False Patterns of Right Ventricular Hypertrophy in Children

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It has been stated that the electrophysiologic diagnosis of right ventricular hypertrophy is very difficult during the first weeks of life. Evidently, there are occasions in which the electrocardiograms and vectorcardiograms can show the characteristic signs of right ventricular enlargement without high voltage. However, voltage criteria, although helpful in the majority of cases, are not absolute, because minor degrees of hypertrophy can produce QRS complexes of normal height.

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The vectocardiogram presented in Fig. 1 taken with the Frank system of electrode placement, shows a horizontal figure “8” loop, which is considered abnormal for the age of the child (48 days). Previous studies on children of normal age and weight for the average local Cuban population with this method have revealed that counterclockwise rotation in that plane appeared by the 36th post-natal day. In addition, the T loop in the horizontal plane is directed to the left and anteriorly, about +80°, whereas at this age it should point posteriorly. Finally, the frontal plane reveals a clockwise rotation of the QRS loop with
the major part being located to the right of point 0; and the sagittal plane also shows a clockwise rotation of the QRS loop. No pathologic slowing is seen in any of the three planes. The final impression of this case was that in spite of voltage being normal, the diagnosis of right ventricular hypertrophy could be made, based on the vectorcardiographic findings. The precordial leads (upper row) taken at the same time as the vectocardiogram, show an Rs complex with positive T waves in the right precordial leads, findings which have been considered abnormal for this age. In this tracing, it can be observed that the Q-T interval measures 0.44 sec. according to Bazzet’s formula and is within normal limits for the age, as stated by Ziegler.

The recordings presented above were obtained from a 48-day-old premature malnourished child (weight: 6 pounds) admitted because of acute diarrhea and dehydration, without evidence of cardiopulmonary disease. Serum electrolytes revealed only metabolic acidosis. The precordial electrocardiogram taken one week later after correction of acidosis (bottom strip) shows that T waves now become inverted in right chest leads as expected in normal infants. Note that the duration of the Q-T interval has remained practically unchanged (0.43 sec.).

This case is an example of the difficulties encountered when trying to make the diagnosis of right ventricular hypertrophy in small, malnourished infants. In 1953, Elek and co-workers using the cubic system of vectorcardiography, reported that in underdeveloped children the patterns of right ventricular enlargement could persist beyond the period considered typical for children of normal body build. Doll, Wachtelet et al. and Castellanos Jr. et al. later corroborated the assumptions of Elek. Furthermore, the latter authors using the method introduced by Frank, emphasized that positive T waves in the right precordial leads of these children was not an unmistakable sign of right ventricular hypertrophy, for such abnormalities could be induced by various metabolic disturbances. In their cases, hyperkalemia did not produce these changes because they were seen in patients with hypokalemia. Interestingly, positive T waves in lead VI were not seen in older children with similar clinical findings. This leads to the assumption that age is of paramount importance in the genesis of the abnormalities described above.

It is concluded that in malnourished infants a single electrocardiogram or vectorcardiogram is not enough for a definite diagnosis of right ventricular hypertrophy.

HYPERTROPHIC SUBAORTIC STENOSIS

Three cases of hypertrophic subaortic stenosis are presented by Bolteau and Allenstein. A diamond-shaped holosystolic murmur was present at the fifth left intercostal space, inside the cardiac apex; the aortic second sound was well heard. The murmur was less intense at the base and not transmitted well into the neck. There was synchronism of the rapid upstroke time and slope of the simultaneously recorded left ventricular and central aortic pressure curves. Also present was a parallelism of the radial artery upstroke time with that of the central aortic pressure curve. A prolonged ejection time was seen and a large secondary systolic wave, representing the subaortic muscular obstruction, was noted. They believe that the unusual central and peripheral arterial pulse contour in hypertrophic subaortic stenosis represents, by itself, a diagnostic feature of this disease if not complicated by other anomalies.

Angiocardiography showed a cone formation and marked diminution of the outflow tract lumen during systole, about 3 cm. below the valve, and normal contour of the valvular cusps. Of special interest is that two of the three patients had subacute bacterial endocarditis, responding to penicillin therapy.