CASE REPORTS

TORSADES DE POINTES IN PATIENTS WITH ELECTRICAL ALTERNANS OF T-U WAVE WITHOUT CHANGE IN QRS COMPLEX

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A case with alternans of repolarization wave without changes in QRS complex and torsades de pointes after recovering from cardiac surgery was described.

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Alternans of repolarization wave without change in QRS complexes is fairly rare. We report on a patient who had showed transient alternans of repolarization wave and torsades de pointes after recovering from cardiac surgery.

Fig.1. M-mode echocardiogram recorded on June 2nd, 1990 shows marked left atrial and right ventricular enlargement. Echoes from the vegetation on the aortic and the mitral valves are also shown.

Key words:
Electrical alternans of T-U wave
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CASE REPORT

A 39-year-old man who had been in good health was referred to our hospital on June 2nd, 1990, because of fever and dyspnea on exertion which had lasted about a month. The patient stated that he had never experienced cardiac murmurs until this year.

The physical examination on admission revealed jugular venous dilatation at 30 degrees. Crackles were heard over both lung fields. The apex beat was palpable at 5th intercostal space, 2 finger breadths outside of the left midclavicular line. A diastolic blowing murmur (2/6) was audible at 3rd intercostal space left to the sternum, and a grade 3/6 holosystolic murmur and an S3 was audible at the apex. The liver was palpable 2 fingers breadth below the costal margin. There was +++ peripheral edema. Neurological examination was negative.

Laboratory data showed a white-cell count of 10,200, red-cell count $2.33 \times 10^{10}$, hemoglobin 7.0 g/dl, serum ASAT 19 IU, ALAT 34 IU, alkaline phosphatase 221 IU, Na 136 mEq/L, K 3.3 mEq/L, Cl 101 mEq/L, Ca 4.0 mEq/L, inorganic P 3.3 mg/dl. Erythrocyte sedimentation rate was 15 mm/hr and the CRP was 7.54. Urine showed +++ test for blood. Electrocardiogram showed a sinus rhythm with a heart rate of 100 beats/min with QTc of 0.43. Two dimensional echocardiogram revealed vegetations on both the aortic and mitral leaflets, and perforation of the three aortic cusps and the anterior mitral leaflets. An M-mode echocardiogram showed marked dilatation of the left atrium and the left ventricle (Fig. 1). The diagnosis of aortic and mitral regurgitation with severe congestive heart failure due to perforation of the valve leaflets by infective endocarditis was made. Because the patient's course was guarded despite drug therapy, mitral and aortic valve replacement was performed.
to sinus tachycardia formed an atypical kind of double tachycardia. Repolarization waves alternated beat by beat and they were especially well noted in leads I, aVR, and V_{4-6}. Repolarization waves were positively double peaked in leads V_{1-3}. In lead V_{4}, large repolarization waves showed negative double peaks in which the latter peak might be giant negative U waves. QTc of the smaller repolarization waves was 0.52 and that of giant negative T-U waves was markedly prolonged to 0.64. The amplitude of QRS complexes showed respiratory changes in which there was no relation between the QRS amplitude and the T-U complex. Torsades de pointes (Fig. 5) developed and terminated spontaneously in about 15 sec. These bouts occurred several times. Intravenous lidocaine was not effective for the termination of these bouts but mexiletine was effective. After that the patient's hospital course was uneventful. Laboratory data on June 12th revealed serum Na 129 mEq/L, K 4.5 mEq/L, Cl 89 mEq/L, Ca 4.4 mEq/L, Mg 1.4 mEq/L, urea nitrogen 16.4 mg/dl, creatinine 0.7 mg/dl. Electrocardiogram on June 16th (Fig. 6) showed a sinus rhythm at a rate of 75/min with QTc of 0.62. Leads V_{5} and V_{6} showed prominent negative U waves which decreased their amplitude in time. The patient enjoyed normal daily life thereafter. An electrocardiogram on September 10th showed a sinus rhythm at a rate of 86/min with QTc of 0.45. Distinct negative U waves were shown only in lead V_{3}.

**DISCUSSION**

Alternans of the repolarization wave involving T, U, or T-U waves have been reported to be fairly rare. It is usually recorded only transiently in critical conditions in the course of organic heart disease with great vulnerability for ventricular excitability. Associated factors reported so far are decreased serum ions such as calcium, magnesium, potassium, sodium or a combination of these ions. However, there is a paper claiming that emotional or physical stress can induce alternans of T waves in patients with long Q-T syndrome. The present case showed hypocalcemia (4.1 mEq/L), hypo-

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Fig.4. Electrocardiogram recorded on June 12th, 1990, shows a sinus tachycardia and A-V junctional tachycardia forming a double tachycardia in addition to that electrical alternans of repolarization wave. Although slight variation of QRS complexes due to respiration are noted in leads V₄₋₆, there is no relationship between the features of repolarization waves and and QRS complexes.

About one third of the reported patients developed multiple ventricular premature beats or ventricular fibrillation. To our knowledge, only one paper demonstrated hypocalcemic torsades de pointes with rate-dependent QT prolongation, although the tracing did not show the real electrical alternans. The pathogenetic conditions inducing torsades de pointes reported so far are almost the same as those which induce repolarization alternans. Therefore, ven-
tricular fibrillation in patients with alternans of repolarization waves might be similar to the torsades de pointes seen in our patient.

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