Wide QRS Waveform Thought to Be Caused by Hypoglycemia

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Introduction: Electrolyte abnormalities are known to cause wide QRS waveforms and ventricular arrhythmias (VAs). However, hypoglycemia is not thought to induce VAs. We report a case with hypertrophic cardiomyopathy, a wide QRS waveform, and VAs that improved by correcting hypoglycemia.

Methods: N/A

Result: An 86-year-old woman with hypertrophic cardiomyopathy and chronic kidney disease had been treated for chronic heart failure. She was referred to our hospital for dyspnea caused by acute exacerbation of her chronic heart failure. On admission, her electrocardiogram showed a heart rate of 84 bpm with a QRS waveform (140 msec). She was administered diuretics intravenously, but she was unable to urinate. Her consciousness and respiratory condition gradually had become worse. Her blood tests revealed hypoglycemia (29 mg/dL) and hyperkalemia (6.6 mmol/L). The monitored electrocardiogram exhibited a heart rate of 90 bpm with a wide QRS waveform (200 msec). After a blood sugar correction, the QRS width improved rapidly to 130 msec. As the QRS width improved rapidly to a narrow QRS due to the blood glucose correction, hypoglycemia was suspected as the cause of the wide QRS waveform.

We examined the relationship between the hypoglycemia and VAs. We performed a perfusion of a porcine myocardial section and examinations were performed using three different conditions of the perfusion solution. The first solution had a control glucose level (100 mg/dL) and control potassium level (4.0 mmol/L). The second solution had a low glucose level (30 mg/dL) and control potassium level. The third solution had a low glucose level and high potassium level (8.0 mmol/L). We analyzed the inducibility of the VAs with programmed electrical stimulation. Under the condition of a low glucose level and control potassium level, the VAs were likely to be induced and sustained. On the other hand, under the condition of a control glucose level and high potassium level, the VAs were likely to be decreased.

Conclusion: Clinically, as the QRS width improved rapidly to a narrow QRS due to a corrected blood glucose level, hypoglycemia was suspected as the cause of the wide QRS waveform. Further, experimentally, it was suggested that there is a relationship between hypoglycemia and VAs. Therefore, it
is suggested that hypoglycemia should be suspected as a possible cause of a wide QRS waveform.