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Changes in myocardial oxidative metabolism after biventricular pacing as evaluated by [^{11}C]acetate positron emission tomography

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A 70-year-old woman with dilated cardiomyopathy and recurrent severe heart failure was admitted for biventricular pacing (BVP), which was recently reported to have clinical efficacy for severe heart failure with intraventricular conduction delay. An electrocardiogram showed complete left bundle branch block, and the QRS interval was markedly prolonged at 195 msec. Echocardiogram showed marked dilatation, diffuse hypokinesis and dyssynchrony of the left ventricle, and grade III mitral valve regurgitation. The patient underwent implantation of an atriobiventricular pacemaker and three pacing leads transvenously. The QRS interval shortened to 165 msec immediately after the BVP therapy, and improvements in echocardiographic parameters were seen at 5 months after BVP therapy. Myocardial oxidative metabolism was assessed by the monoexponential clearance rate of [^{11}C]acetate (Kmono) as measured by positron emission tomography (PET), and myocardial efficiency was assessed by the work metabolic index (WMI) at 1 and 5 months after the BVP therapy. The PET images obtained 5 months after BVP therapy showed a decrease in the clearance of [^{11}C]acetate compared with that obtained 1 month after BVP therapy. The Kmono of the whole left ventricle decreased from 0.051 at 1 month to 0.038 min^{-1} at 5 months after BVP therapy, and that of the septum, anterior wall, lateral wall and posterior wall also decreased. The WMI increased from 4.2×10^6 to 6.8×10^6 mmHg·ml/m^2. These results suggest that BVP improved left ventricular function without increasing myocardial oxidative metabolism, resulting in improved myocardial efficiency, and that BVP may improve the long-term prognosis of heart failure patients with ventricular dyssynchrony. [^{11}C]acetate PET is a useful method of evaluating global and regional myocardial oxidative metabolism in patients who have undergone BVP therapy.

Key words: [^{11}C]acetate, positron emission tomography, myocardial oxidative metabolism, biventricular pacing