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SHORT COMMUNICATION

Efficacy of Medication Directed by Home-Monitoring Cardiac Resynchronization Therapy in Chronic Heart Failure Patients

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PATIENTS with chronic heart failure (CHF) have a high incidence of atrial/ventricular arrhythmias which seriously affect life span and quality of life. Cardiac resynchronization therapy (CRT) can improve cardiac function and reverse myocardial remodeling, therefore improving the quality of life and reducing mortality. CRT with Home-Monitoring (HM) can be used to monitor cardiac arrhythmias and other heart physiological indexes such as intrathoracic impedance and hemodynamics. Through wireless satellites, the data from the patients are sent to a monitor center for analysis. Doctors can identify emergent information and make a rapid diagnosis based on the information stored in the monitor center. CRT with HM has been verified as a valid method to optimize drug treatment according to individual parameters.

PATIENTS AND METHODS

Patient selection

We reviewed 39 patients who had received CRT-pacemaker/defibrillator (P/D) treatment due to CHF from August 2008 to October 2012 in our department, in which 19 cases had CRT-P/D with HM function (Biotronik, Germany) and 20 had ordinary CRT-P/D (Medtronic, St. Jude, USA). The patients were selected in accordance with the CRT-P/D implantation

indications: (1) having ischemic or non-ischemic CHF; (2) after drug treatment, cardiac function was New York Heart Association (NYHA) class III–IV, QRS duration ≥ 120 ms, echocardiographic signs of inter- or intraventricular dyssynchrony, and left ventricular ejection fraction (LVEF) $\leq 35\%$.

HM technology

The HM system transmits data on a daily basis at fixed time intervals, or immediately upon the occurrence of a clinically relevant event. A cell-phone-like device was assigned to each patient, which sent encrypted data automatically *via* mobile phone lines to Biotronik HM Service Center. An automated analysis of HM messages is performed in the Center to recognize events and promptly send event notifications to the attending physicians *via* e-mail, text messages, or fax.

Follow-up

All the patients conducted individual pacemaker parameters optimization under ultrasound guidance within 1 week after the operation. The non-HM group were scheduled for follow-up visits 3 and 6 months after the operation. The program-control information, clinical signs, symptoms, and adjustment of clinical drug use were recorded. Clinical drug adjustments in the HM group were performed according to the monitor statistics and early-warning, as well as prompt examination results in hospital.

Observation indexes

LVEF before and 6 months after the operation, vital signs,

NYHA cardiac function class, program-control information, atrial/ventricular arrhythmic events, biventricular pacing percentage, and mean heart rate at rest and under activity were recorded. Low biventricular pacing was defined as a biventricular pacing percentage <85%.

Statistical analysis

Statistical analysis was performed using SPSS 13.0 software package. Quantitative data are presented as means $\pm$ SD and compared using Student's *t* test. Qualitative data are presented as frequencies and compared using the Pearson's chi-square test or Fisher's exact test. $P < 0.05$ was considered statistically significant.

RESULTS

Patient baseline information

The two groups were comparable in gender and age, NYHA class, and LVEF. Dilated cardiomyopathy was the most common cause of HF in both groups. Premature ventricular contractions and non-sustained ventricular tachycardia were frequent in both groups. All the patients were implanted with CRT-P/D for prevention of sudden death and were on optimal medication for heart failure.

Clinical information

Within the first 3 postoperative months, the HM group recorded 40 events, with 2 cases (10.5%) of paroxysmal AF, 10 (52.6%) of non-sustained ventricular tachycardia, 17 (89.5%) of frequent premature ventricular contractions, 12 (63.2%) of low biventricular pacing, and 10 (52.6%) of mean heart rate > 80 bpm at rest. Ventricular arrhythmias were basically consistent with baseline data. Nineteen patients were scheduled to follow-up (5.05 ± 0.97 times/6 months) for relevant examinations, therapeutic

schedule change, and dosage adjustment. Three patients had pacemaker parameters reset. After 3 months and 6 months, cardiac function in one patient showed no improvement, and drug therapy was optimized on the basis of cardiac physiological parameters provided by the monitor. None of the patients were recalled to hospital.

In the non-HM group 3 months after the operation, paroxysmal AF was found in 2 cases (10%), frequent premature ventricular contractions in 18 (90%), low biventricular pacing in 10 (50%), mean heart rate >80 bpm at rest in 13 (65%), drug dose change in 18 (90%), and re-hospitalization in 3 (15%).

Arrhythmias and cardiac function

Six months after drug treatment, biventricular pacing rate was over 95% in all the patients in the HM group. The frequency of AF onset decreased. The improvement rate of frequent premature ventricular contractions was 88.2% and that of non-sustained ventricular tachycardia was 80%. Mean heart rate at rest was 62.68 ± 1.70 bpm. In the non-HM group, the improvement rate of low biventricular pacing was 50%. AF onset frequency decreased. Frequent premature ventricular contractions were reduced by 55.6% and the average heart rate at rest was 67.30 ± 3.29 bpm. LVEF in the 6th postoperative month was significantly higher in the HM group than in the non-HM group ($40.42\% \pm 3.73\%$ vs. $35.85\% \pm 5.71\%$, $P < 0.01$).

DISCUSSION

The results of this study indicate that the CRT-P/D with HM function could detect arrhythmia events immediately, and guide the clinical medication adjustment timely, which can significantly improve cardiac function in patients with CHF and atrial/ventricular arrhythmia.