



APPLICATION OF ABNORMAL ECG EARLY WARNING DATABASE OF CARDIAC REMOTE MONITORING SYSTEM

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ABSTRACT

Objective: To study application value of abnormal ECG early warning database of cardiac remote monitoring system. **Methods:**In the respect of clinical application,6575 users wear iHolter, using CM1, CM5 dual channel recording and the mode of automatically and quietly warning.We analyzed automatic alarm of ECG data. At the same time,the application of abnormal ECG early warning database in scientific research, teaching and other aspects was discussed. **Results:** In 6006 users for diagnosis of diseases, we found ECG abnormalities in 5882 cases, including episodic atrial premature beats, frequent atrial premature beats, occasional ventricular premature contractions, frequent ventricular premature contractions, paroxysmal atrial tachycardia, paroxysmal atrial flutter, paroxysmal atrial fibrillation, paroxysmal ventricular tachycardia, intermittent preexcitation syndrome, asymptomatic myocardial ischemia, in which 23 cases were found nothing in multiple routine ECG. By the automatic alarm recording, we found paroxysmal ventricular tachycardia in 162 cases, frequent ventricular premature contraction in 51 cases, obvious ST-T changes in 883 cases, fast ventricular rate of atrial fibrillation in 25 cases, paroxysmal supraventricular tachycardia in 129 cases, sinus arrest (maximum 6.03s) in 38 cases, and we all timely called the patients themselves or their family members. In 438 cases of operation care patients, we immediately proposed to suspend operation in 7 cases of apparent ST-T changes, 6 cases of frequent ventricular premature contraction and 6 cases of rapid ventricular rate with atrial fibrillation after receiving the automatic alarm ECG. In 131 cases of pacemaker patients, automatic alarm electrocardiogram showed paroxysmal atrial tachycardia in 7 cases, atrial premature beats in 27 cases, ventricular premature contractions in 12 cases, ST-T changes in 11 cases. **Conclusion:** Abnormal ECG early warning database of cardiac remote monitoring system had a high application value in clinical, scientific research, teaching, and other areas.

Keywords: *Cardiac Remote Monitoring System, Abnormal Electrocardiogram, Intensive Holter, Database, Application.*

1. INTRODUCTION

Cardiac remote monitoring system consists of cardiac remote monitoring center in hospital and the cardiac remote monitoring apparatus iHolter which users wear portable. It has the function of continuous ECG abnormality detection early warning with 24 hours, GPRS (General Packet Radio Service) wireless two-way data transmission, fixed telephone digital transmission and USB playback[1]. Abnormal

ECG early warning database of cardiac remote monitoring system is constructed based on cardiac remote monitoring system. It was organized by C language after collecting and analyzing a wide range of typical cases, referring the views of domestic well-known experts in the field of ECG[2]. Now its application value in clinical, research and teaching aspects is as follows.

2. CLINICAL APPLICATION

2.1 Clinical Data

Until June 2011, 6575 patients were monitored, who were all from Qilu Hospital of Shandong University. There were 3435 males, accounting for 52.24% of the total monitoring patients, and 3140 females, accounting for 47.76% of the total number. The maximum age of the patients was 87 years old and the minimum age was 13. The average age was 56.31 ± 14.76 . There were 2335 cases with coronary heart disease accounting for about 35.51% of the total number; The number of patients with arrhythmia was 2053 accounting for about 31.22% of the total number; The number of patients with hypertension was 1167 accounting for about 17.75% of the total number; The number of patients with pacemaker was 131 accounting for about 1.99% of the total number and the other patients were 889 accounting for about 13.52%.

2.2 Methods

All users wore cardiac remote monitoring apparatus iHolter, using CM1, CM5 dual channel recording and the mode of automatically and quietly warning. Electrode location: green electrode (CM1) is pasted on the right edge of the fourth intercostal space; red electrode (CM5) is pasted on the left anterior axillary line of the fifth intercostals; Brown electrode is pasted on below the 1/3 part of left clavicle; black electrode (unrelated electrode) is pasted on the right chest.

2.3 Results

In 6006 users for diagnosis of diseases, we found ECG abnormalities in 5882 cases, including episodic atrial premature beats, frequent atrial premature beats, occasional ventricular premature

contractions, frequent ventricular premature contractions, paroxysmal atrial tachycardia, paroxysmal atrial flutter, paroxysmal atrial fibrillation, paroxysmal ventricular tachycardia, intermittent preexcitation syndrome, asymptomatic myocardial ischemia, in which 23 cases were found nothing in multiple routine ECG. By the automatic alarm recording, we found paroxysmal ventricular tachycardia in 162 cases, frequent ventricular premature contraction in 51 cases, obvious ST-T changes in 883 cases, fast ventricular rate of atrial fibrillation in 25 cases, paroxysmal supraventricular tachycardia in 129 cases, sinus arrest (maximum 6.03s) in 38 cases, and we all timely called the patients themselves or their family members.

In 438 cases of operation care patients, we proposed to suspend operation immediately in 7 cases of apparent ST-T changes, 6 cases of frequent ventricular premature contraction and 6 cases of rapid ventricular rate with atrial fibrillation after receiving the automatic alarm ECG.

In 131 cases of pacemaker patients, automatic alarm electrocardiogram showed paroxysmal atrial tachycardia in 7 cases, atrial premature beats in 27 cases, ventricular premature contractions in 12 cases, ST-T changes in 11 cases.

2.4 Typical Cases

Shan XX, male, 70 years old. Brief disease history: He fell ill with coronary heart disease, hypertension, type II diabetes mellitus for 10 years. Diagnosis: 1 coronary heart disease; 2 hypertension; 3 sick sinus syndrome; 4 type II diabetes mellitus. Electrocardiographic characteristics: 1 sinus rhythm; 2 I°II AVB; 3 high voltage of left ventricular 4. ST-T change (Figure 1).

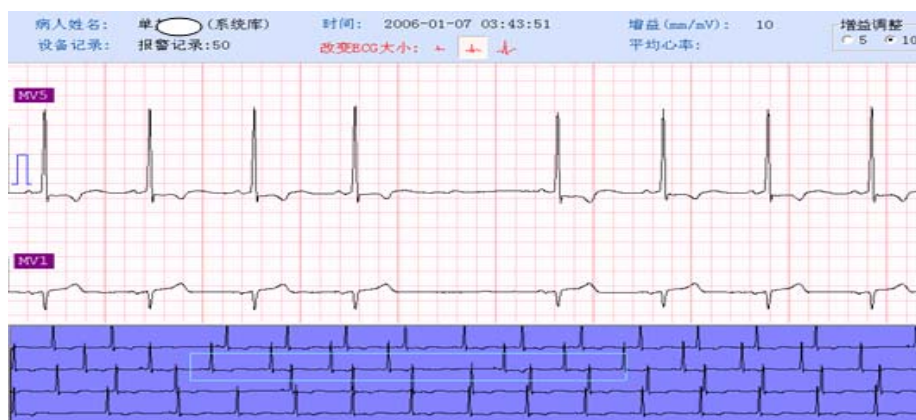


Figure 1

Hou XX, male, 72 years old. Brief disease history: He fell ill with repeated chest pain, feeling

suffocated for 2 years, and become heavier for a half moon. Diagnosis: 1 coronary heart disease, old

myocardial infarction, acute coronary syndrome; 2 hypertension. Electrocardiographic characteristics: 1 sinus rhythm; 2 node escape rhythm; 3 ST-T change; 4 V1 presents QS shape; 5 I°, high degree AVB (Figure 2).

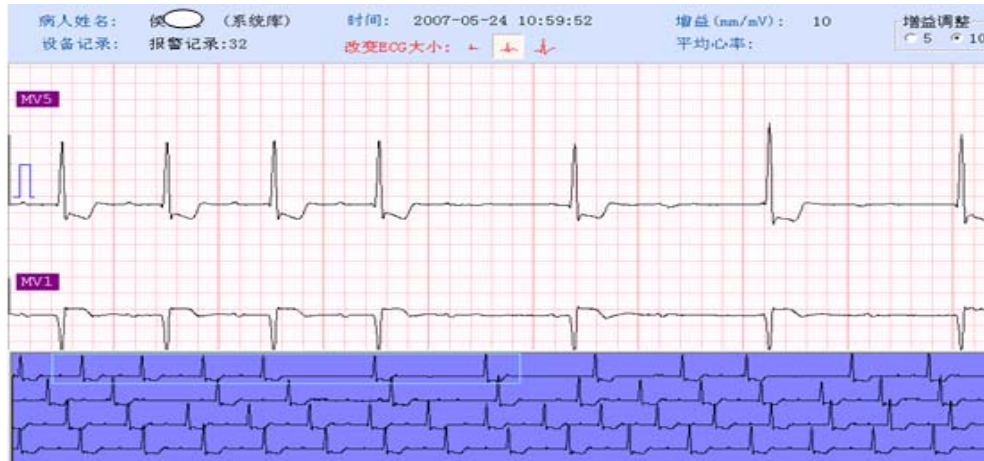


Figure 2

3. APPLICATION OF SCIENTIFIC RESEARCH

Abnormal ECG early warning database of cardiac remote monitoring system has filled the gaps in our country, reduced the gap of China and other countries. Its application in scientific aspect are as follows.

2.1 Until June, 2011, abnormal ECG early warning database of cardiac remote monitoring system has been stored with 6575 copies of ECG monitoring data. It is convenient for case management, these rich resources provide important basic data for our country to study the pathological changes of cardiovascular incidence, disability, acute death and find preventive measures.

2.2 Database objectively show various monitoring electrocardiogram of cardiovascular diseases, and it can assess potential diagnosis value to some cardiovascular acute events by monitoring the rhythm and morphological changes of electrocardiogram, At the same time ,it can correctly guide the prevention of acute event of cardiovascular diseases.

2.3 It can provide detailed data for the development of health policy. Its condition inquiries and other functions are advantageous to the quick summary of clinical data, and can be used for the evaluation of arrhythmia drug efficacy, pacemaker patients' quality of life improvement and the quality and effect of coronary artery stent operation.

I. Teaching application

3.1 Cardiac remote monitoring technology is an advanced application technology. In the implementation process of this research, many graduate students were related to the training so that they could use i-Holter skill fully and understand its general principle; practical experience. They understood that they should pay attention to some details problem in the process of giving patients wearing and monitoring.

3.2 This study combines database theory and clinical practice. It taught students some knowledge of database at the same time; it deepened their understanding of electrocardiogram principle.

3.3 It provided reference for the research direction of many graduate students, and some graduation theses were related to this research.

3.4 Some previous research results of this study have been involved in postgraduate teaching process as a horizons expanding content, and it received good response.

3.5 The content of this research can be edited into a practical book by database and clinical teaching experienced people as a computer professional and specialized clinical teaching tool, or as a reference book in related fields.

II. Discussion

Heart attack is accidental and unexpected, bringing great suffering and even death to the patient[3]. The automatic alarm function of i-Holter can find electrophysiological abnormalities in early time, such



as malignant arrhythmia or significant ST-T changes, so that we can take corresponding preventive measures or give a treatment that facilitate the timeliness to avoid disabling and fatal cardiovascular events.

4. CONCLUSION

Abnormal ECG early warning database of cardiac remote monitoring opens up a new research angle of view [5]. With "weibingxianfang, jibingfangbian, chaihoufangfu" as the core concept, we set up our telemedicine ECG monitoring database based on GPRS mobile communication network / WAN architecture form in the international from the source of cardiovascular disease. It can monitor dispersed big sample patients in society and provide effective early diagnosis methods for patients with cardiovascular disease [6]. It greatly shortens the definitive diagnosis and treatment time, and reduces the morbidity, mortality and disability of cardiovascular acute incidence to provide effective methods about building our prevention and control system of cardiovascular acute events. It shows good potential value, application prospect and important significance in its research and teaching applications.

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