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Clinical values of electrocardiogram (ECG) in diagnosing cardiac autonomic dysfunction.

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Abstract

This study aims to analyse the clinical efficacies of electrocardiogram (ECG) in diagnosing cardiac autonomic dysfunction (CAD) and to explore the clinical values of this method. A total of 82 CAD patients clinically diagnosed and confirmed were selected for the traditional Chinese medical treatment and psychological intervention. After three courses of treatment, their ECG were monitored, and the diagnostic results before and after the treatment were then compared. Before the treatment, the abnormality rate of the patients ECG diagnosis was 100%; while after the treatment, the rate was reduced to 10.98% (9/82). The intragroup comparison showed that the post-treatment abnormal ECG rate was significantly reduced and exhibited statistically significant difference with that before the treatment (P<0.05). Meanwhile, after the treatment, such clinical symptoms as palpitation, shortness of breath, or precordialgia were significantly improved, and the symptoms in 73 patients totally disappeared. The application of ECG in the clinical diagnosis of CAD was non-invasive and simple, and had high detection rate and accuracy; therefore, it had high clinical values and was suitable for wide promotion.

Keywords: Electrocardiogram, Clinical diagnosis, Cardiac autonomic dysfunction, Clinical value.

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Introduction

Cardiac autonomic dysfunction (CAD) is the syndromes of cardiovascular dysfunction caused by the cardiac autonomic function disorders [1,2], though it does not belong to cardiac organic disease, its incidence has been significantly increased in recent years, and the incidence focuses in young adults at the age of 20 ~ 40 years old; the incidence in female is slightly higher than that in male. Because the clinical manifestations of CAD were palpitation, shortness of breath, and precordialgia [3], which were very similar to those of organic cardiac diseases, not only the difficulties of clinical diagnosis were increases, but also the patients would have more psychological burdens because of the doubts about the disease, and these were not conducive to the treatment of CAD [4]. Dynamic electrocardiogram (ECG) could diagnose CAD accurately and simply [4]. In order to accurately diagnose CAD and perform the symptomatic treatment as early as possible, we sampled 82 CAD patients to analyse the diagnostic values of their ECG results, and the study was reported below.

Materials and Methods

General information

A total of 82 CAD patients clinically diagnosed and confirmed in our hospital from January 2013 to January 2015 were selected. All the 82 patients met the following inclusion criteria: 1). had different degrees of palpitation, shortness of breath, and precordialgia, and these symptoms lasted for >150 days [2]; 2). Between 20 and 40 years old; 3). ECG results revealed abnormalities of ST wave band, T wave, and heart rate variability. Meanwhile, through blood routine, urine routine, and hepatonephric function examinations, patients with heart diseases, myocarditis, and diabetes were excluded [3]. Among the 82 qualified patients selected, 35 were males and 47 were females, with the average age as (32.6 ± 3.2) years (Table 1). This study was conducted in accordance with the declaration of Helsinki. This study was conducted with approval from the Ethics Committee of Henan Provincial People's Hospital. Written informed consent was obtained from all participants.

Table 1. *General information of patients and some results in this study.*

S.No.	Gender	Age	Type of abnormality in this monitoring	Symptoms disappeared completely
1	male	33	Supraventricular extrasystole and emergency ventricular extrasystole	Yes
2	male	37	Supraventricular extrasystole and emergency ventricular extrasystole	Yes
3	male	32	Complex heart rhythm abnormality	Yes

4	male	36	Multiple ventricular extrasystole	Yes
5	male	29	Multiple ventricular extrasystole	Yes
6	male	29	Supraventricular extrasystole and emergency ventricular extrasystole	Yes
7	male	36	Supraventricular extrasystole and emergency ventricular extrasystole	Yes
8	male	33	Supraventricular extrasystole and emergency ventricular extrasystole	Yes
9	male	32	Complex heart rhythm abnormality	No
10	male	36	Supraventricular extrasystole and emergency ventricular extrasystole	Yes
11	male	26	Multiple ventricular extrasystole	Yes
12	male	29	Multiple ventricular extrasystole	Yes
13	male	35	Supraventricular extrasystole and emergency ventricular extrasystole	Yes
14	male	36	Multiple ventricular extrasystole	Yes
15	male	35	Supraventricular extrasystole and emergency ventricular extrasystole	Yes
16	male	34	Multiple ventricular extrasystole	No
17	male	35	Supraventricular extrasystole and emergency ventricular extrasystole	Yes
18	male	32	Multiple ventricular extrasystole	Yes
19	male	29	Multiple ventricular extrasystole	Yes
20	male	28	Supraventricular extrasystole and emergency ventricular extrasystole	Yes
21	male	28	Multiple ventricular extrasystole	No
22	male	37	Complex heart rhythm abnormality	Yes
23	male	30	Supraventricular extrasystole and emergency ventricular extrasystole	Yes
24	male	35	Atrioventricular conduction disorder	Yes
25	male	36	Supraventricular extrasystole and emergency ventricular extrasystole	Yes
26	male	30	Supraventricular extrasystole andemergency ventricular extrasystole	Yes
27	male	32	Supraventricular extrasystole and emergency ventricular extrasystole	Yes
28	male	33	Multiple ventricular extrasystole	Yes
29	male	28	Supraventricularextrasystole and emergency ventricular extrasystole	Yes
30	male	32	Multiple ventricular extrasystole	Yes
31	male	30	Supraventricular extrasystole and emergency ventricular extrasystole	Yes
32	male	28	Multiple ventricular extrasystole	Yes
33	male	38	Supraventricular extrasystole and emergency ventricular extrasystole	Yes
34	male	36	Supraventricular extrasystole and emergency ventricular extrasystole	Yes
35	male	36	Complex heart rhythm abnormality	Yes
36	female	36	Supraventricular extrasystole and emergency ventricular extrasystole	Yes
37	female	28	Supraventricular extrasystole and emergency ventricular extrasystole	No
38	female	29	Multiple ventricular extrasystole	Yes
39	female	36	Supraventricular extrasystole and emergency ventricular extrasystole	Yes
40	female	32	Multiple ventricular extrasystole	Yes
41	female	37	Normal	Yes
42	female	32	Supraventricular extrasystole and emergency ventricular extrasystole	Yes
43	female	28	Atrioventricular conduction disorder	Yes
44	female	29	Multiple ventricular extrasystole	Yes
45	female	28	Atrioventricular conduction disorder	Yes
46	female	36	Supraventricular extrasystole and emergency ventricular extrasystole	Yes
47	female	33	Supraventricular extrasystole and emergency ventricular extrasystole	Yes
48	female	29	Supraventricular extrasystole and emergency ventricular extrasystole	Yes
49	female	35	Complex heart rhythm abnormality	Yes
50	female	32	Normal	Yes
51	female	29	Supraventricular extrasystole and emergency ventricular extrasystole	Yes
52	female	29	Supraventricular extrasystole and emergency ventricular extrasystole	Yes
53	female	35	Multiple ventricular extrasystole	Yes
54	female	35	Multiple ventricular extrasystole	Yes
55	female	37	Supraventricular extrasystole and emergency ventricular extrasystole	Yes
56	female	38	Multiple ventricular extrasystole	Yes
57	female	36	Supraventricular extrasystole and emergency ventricular extrasystole	Yes
58	female	30	Multiple ventricular extrasystole	Yes
59	female	32	Multiple ventricular extrasystole	No
60	female	36	Multiple ventricular extrasystole	Yes
61	female	35	Supraventricular extrasystole and emergency ventricular extrasystole	No
62	female	30	Supraventricular extrasystole and emergency ventricular extrasystole	Yes
63	female	31	Complex heart rhythm abnormality	Yes
64	female	32	Multiple ventricular extrasystole	Yes
65	female	32	Complex heart rhythm abnormality	Yes
66	female	28	Atrioventricular conduction disorder	Yes
67	female	35	Multiple ventricular extrasystole	Yes
68	female	32	Normal	Yes

69	female	26	Supraventricular extrasystole and emergency ventricular extrasystole	Yes
70	female	36	Supraventricular extrasystole and emergency ventricular extrasystole	Yes
71	female	32	Multiple ventricular extrasystole	No
72	female	34	Multiple ventricular extrasystole	No
73	female	37	Supraventricular extrasystole and emergency ventricular extrasystole	Yes
74	female	33	Supraventricular extrasystole and emergency ventricular extrasystole	Yes
75	female	28	Normal	Yes
76	female	35	Multiple ventricular extrasystole	Yes
77	female	33	Multiple ventricular extrasystole	Yes
78	female	35	Supraventricular extrasystole and emergency ventricular extrasystole	Yes
79	female	36	Supraventricular extrasystole and emergency ventricular extrasystole	No
80	female	30	Atrioventricular conduction disorder	Yes
81	female	32	Supraventricular extrasystole and emergency ventricular extrasystole	Yes
82	female	31	Normal	Yes

ECG diagnosis

All the patients were performed 24 h dynamic ECG monitoring twice after admission (model: MSLVE02, manufacturer: Guangzhou Yilujiuge Co., China), and were recorded the detailed monitoring results.

Treatment methods

The main treatment was psychotherapy, aiming to eliminate the patient's fear and pressure. Meanwhile, necessary medical treatment was supplemented according to the principles of reinforcing Heart and tranquilization; the traditional Chinese medicine Ganmai dazao decoction was used for the treatment, with 10 days as a course for three courses [5].

Dynamic ECG monitoring

At the end of the three treatment courses, dynamic ECG monitoring was performed three times, and the duration should be >20 h; the ECG monitoring results were recorded.

Observation indexes

The abnormal indexes before the treatment and at the end of the 3rd ECG monitoring were observed to compare the abnormality rates. Meanwhile, the changes of clinical symptoms before and after the treatment were observed and compared.

Statistical analysis

SPASS 17.0 software was used for the data analysis; the counting data were expressed as% and performed the χ^2 test; the measurement data were expressed as mean ± standard deviation ($\bar{x} \pm s$) and performed the t-test, with $P<0.05$ considered as statistically significant difference.

Results

Results of 24h dynamic ECG monitoring

There were 77 cases of cardiac index abnormality in this monitoring, including 32 males and 45 females; there was no statistically significant difference in the detection rate between the genders ($P>0.05$). Among these cases, 38 cases were supraventricular extrasystole and emergency ventricular extra systole, accounting for 49.35%; 27 cases were multiple ventricular extra systole, accounting for 35.06%; seven cases were complex heart rhythm abnormality, accounting for 9.09%; five cases were atrioventricular conduction disorder, accounting for 6.49% (Table 1, Figure 1).

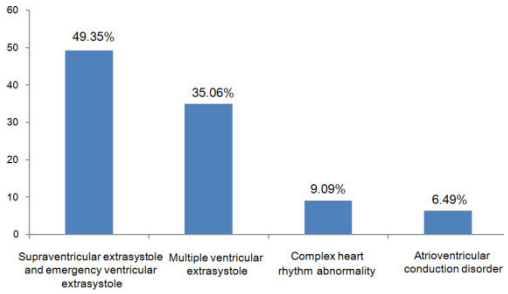

Figure 1. *Results of 24th dynamic ECG monitoring.*

Abnormality rate of ECG

Before the treatment, all the 82 patients exhibited ECG abnormality, with the abnormality rate as 100%. After the treatment, only nine patients showed abnormal ECG, with the abnormality rate as 10.98%. The intragroup comparison showed that the post-treatment abnormal ECG rate was significantly reduced and exhibited statistically significant difference with that before the treatment ($\chi^2=12.6968$, $P=0.0004<0.05$) (Table 2).

Table 2. *Abnormality rate of ECG between before the treatment and after the treatment.*

	Before the treatment	After the treatment	Statistical result
The normality rate	0% (n=0)	89.02% (n=73)	χ2=12.6968, P=0.0004
The abnormality rate	100% (n=82)	10.98% (n=9)	

Changes of clinical symptoms

After the treatment, such clinical symptoms as palpitation, shortness of breath, and precordialgia in this study were significantly improved. Of these, the symptoms in 73 patients disappeared completely, and the clinical improvement rate was 89.02% (Table 1, Figure 2).

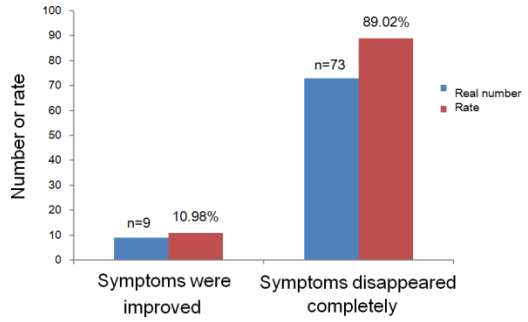

Figure 2. *Clinical symptoms changes.*

Discussion

The syndromes of cardiovascular dysfunction caused by the autonomic dysfunction while without heart organic disease are named CAD [6,7]. With the accelerated pace of life and the gradually increased pressure, the incidence of ACD is continuously increased and shows the trend towards younger adults; women between 20 and 40 years has become the high-risk population of CAD [8,9]. This study investigated the clinical values of ECG in diagnosing CAD, aiming to lay solid foundations for further clinical diagnostic work.

Because CAD belongs to a kind of psychological illness, so the focus of clinical treatment should be put onto caring the patient's psychological problems. But from the current status of the clinical treatments of CAD, it was usually treated as the diseases of the cardiovascular system, so many doctors just treated the clinical symptoms while did not care about the psychological status of the patients [10-12] or this issue had not caused sufficient attention, so it would easily lead to repeated medical treatment, which not only was a waste of medical resources but also would increase the economic and psychological pressure of the patients.

From the pathogenesis of CAD, fast pace of life, lack of sleep, or too much pressure were important factors towards the occurrence of CAD [13,14]. Under the joint effects of these factors, the body's sympathetic nerve and autonomic nerve might difficultly maintain the balance, so it would be easy to result in the dysfunction. Palpitation, shortness of breath, and precordialgia are the main clinical manifestations of CAD; meanwhile, patients might produce intense and other negative emotions because of pain, which virtually increased the psychological pressure of patients [15]. and would have some impacts on their normal work and lives.

Currently, there is still lack of unified and standard diagnostic criteria towards CAD, and what detection method should be used to confirm this issue is still a big controversy among medical fields. Based on this situation, we mainly used the symptom diagnosis and exclusion diagnosis to confirm the diagnosis. Dynamic ECG monitoring is simple and non-invasive, and could be easily accepted by patients; therefore, it could be used as the diagnostic evidence of CAD. In addition, other examination methods such as patient's medical history, enzymology, ultrasound, or x-rays could be combined for the comprehensive judgment and correct diagnosis, which could then eliminate patient's psychological fear of heart disease, improve the mental condition, facilitate physicians to achieve symptomatic treatment, and make the patient recovered as soon as possible [16,17].

Because ECG was the main signal detection way for heart diseases, which could quickly and accurately capture the instantaneous heart rate changes and waveform abnormalities [18,19], it could provide certain basis for the diagnose of CAD. This study investigated the clinical significance of ECG in diagnosing CAD.

The twice 24 h dynamic ECG monitoring towards the 82 patients revealed that a total of 77 patients exhibited abnormal heart rate indexes and waveforms, with a little higher abnormality rate as 93.9%. The abnormality rates in ST wave band or T wave were higher, and most of them appeared when the heart rate increased, so the frequency of the abnormality rate was positively correlated with the heart rate. Meanwhile, comparing the ECG monitoring results before and after the treatment revealed that the post-treatment abnormality rate was significantly reduced than that before the treatment, and the difference was statistically significant ($P<0.05$). In addition, after the treatment, such clinical symptoms as palpitation, shortness of breath, or precordialgia were significantly improved, and the symptoms in 73 patients totally disappeared; the clinical improvement rate was 89.02%. These results fully demonstrated that the clinical data of dynamic ECG could be used as the diagnostic evidence of CAD, consistent with Corazza et al. [20], indicating that ECG had high clinical values in diagnosing CAD. In summary, the application of ECG in clinically diagnosing CAD was non-invasive and simple, and had high detection rate and accuracy; therefore, it had high clinical values and was suitable for wide promotion.

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