Application of Blood Flow Velocity Study based on Electromagnetic Flowmeter in the Treatment of Cerebral Infarction

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Abstract: Epidemiological studies on people infected with novel coronavirus have found that patients with underlying diseases, especially cardiovascular diseases, account for the first place in mortality. The treatment effect of cardiovascular diseases is proportional to time, and the more timely the discovery and treatment, the higher the success rate of cure. Because of the special requirements for medical procedures during the COVID-19, the monitoring before the onset of the disease is particularly important. This study aims to conduct long-term monitoring of blood flow velocity and predict the condition of cardiovascular disease based on the monitoring results, which is of great significance for effective treatment time and provides strong reference for improving the medical level of cardiovascular disease in the future.

1 INTRODUCTION

Cardiovascular disease is one of the leading causes of death in China. According to statistics, there are 290 million people affected by cardiovascular disease in China (Stevens, 2016), more than cancer. According to statistical analysis, the highest mortality rate of cardiovascular disease in more than 200 diseases in nearly 200 countries around the world is myocardial infarction (Eisen A- Le May MR). Acute myocardial infarction (AMI) is myocardial necrosis caused by acute and persistent ischemia and hypoxia of coronary artery, which is an important manifestation of coronary heart disease. Chest pain is the most common symptom of cardiovascular disease (CVD). Consultations for myocardial infarction in the emergency department account for 10 % of the emergency department (Berger PB - Mc Namara RL), and acute ST-segment elevation myocardial infarction (STEMI) patients are more significant in myocardial infarction. Long term monitoring of blood flow velocity and analysis of monitoring results can provide useful references for the prevention and control of ischemic stroke. The model studied in this article is not only simple, but also has strong operability characteristics, and has the value of promoting to society.

The chest pain center was first established in the United States, founded by the St. ANGLE Hospital in Baltimore, and then appeared in France, Britain, Canada, Germany and other developed countries. It was not until 2011 that China established the first batch of chest pain centers recognized by the SCPC. The purpose of establishing a chest pain center is to ' send patients with acute chest pain to hospitals with treatment capacity and receive the best treatment in the shortest possible time '. The outbreak of coronavirus disease 2019 (COVID-19) has brought severe challenges to the diagnosis and treatment of STEMI patients undergoing emergency PCI in chest pain center. On the one hand, COVID-19 poses a great threat to medical staff. On the other hand, the screening and infection control procedures required to reduce the nosocomial transmission of COVID-19 may seriously delay the PCI time and have a negative impact on the prognosis of patients.

2 DATA AND OBJECTS OF PAPER

2.1 Research Object

The data of Shanghai Chest Pain Center from 2019 to 2021 were collected. In order to more clearly

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analyze the results according to the outbreak of the epidemic, grouped by time. Patients from January 2019 to December 2019 were divided into pre-epidemic group A (n = 222), and patients from January 2020 to December 2021 were divided into epidemic group B (n = 190). The pre-epidemic group was again divided into group A1 (self-admission group, n = 131) and group A2 (120 admission, n = 91). The epidemic group was divided into group B1 (self-admission group, n = 112) and group B2 (120 admission, n = 78).

Compared with before the epidemic, patients need to complete the examination of the new coronavirus before treatment and carry out shunt treatment according to the examination results, as shown in Fig.1.

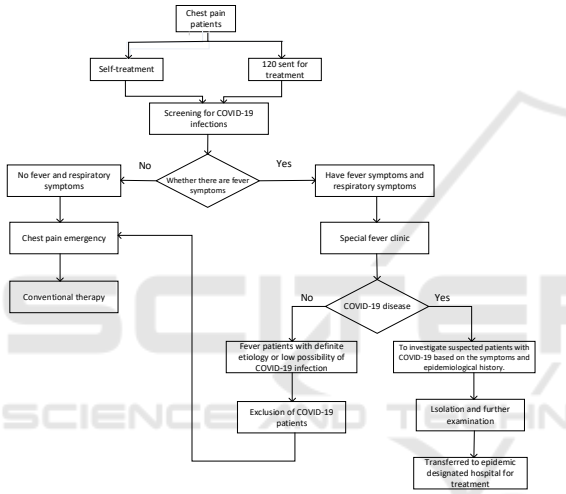

Figure 1: Flow chart of triage treatment.

2.2 Analysis of the Influence of Blood Flow Velocity

Because the data sources are extensive and diverse, two variables related to coronary heart disease, cerebral infarction and cerebral blood flow velocity are extracted from the preprocessed database. The multivariate features were extracted and represented as binary vectors to compare the effects of novel coronavirus infection on blood flow velocity in patients with coronary heart disease and cerebral infarction.

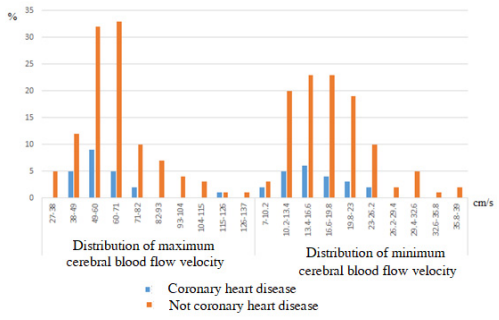

Figure 2: Characteristics of cerebral blood flow velocity in patients with coronary heart disease.

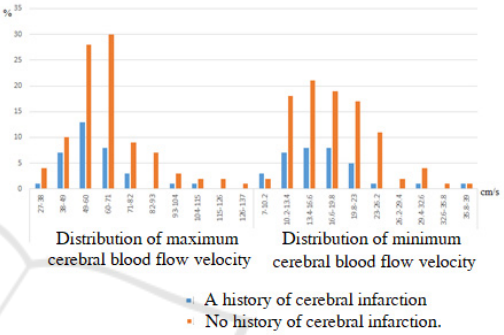

Figure 3: Effect of coronary heart disease on cerebral blood flow velocity.

According to Figures 2 and 3, A history of coronary heart disease and cerebral infarction has a more significant impact on minimum blood flow velocity.

The minimum blood flow velocity of patients with a history of coronary heart disease and cerebral infarction is higher than that of normal individuals.

3 COMPARISON OF TREATMENT-RELATED TIME NODES

3.1 Research Method

The measurement data of normal distribution were expressed as (x ± s), and the comparison between groups was performed by independent sample t test. The measurement data is expressed as [M (Q1-Q3)] and is a non normal distribution. The study used Mann Whitney rank sum test for inter group comparison. Where [n (%)] represents counting data. Comparison between groups using χ 2 Inspection.

3.2 Data Statistics

Table 1: Hospitalization days and cost table before and after the epidemic.

item	Before the epidemic	After the epidemic	
hospital days（d）	7.96±2.12	8.57±2.58	Self-treatment
Hospitalization expenses (ten thousand yuan)	5.96±0.57	6.37±1.27	
Drug proportion (%)	4.88	7.53	
hospital days（d）	8.34±2.46	8.76±1.98	120 sent for treatment
Hospitalization expenses (ten thousand yuan)	6.07±0.34	6.77±1.08	
Drug proportion (%)	5.88	6.93	

The treatment time is very valuable for patients with chest pain. Here, the time required for medical contact to complete the first electrocardiogram, detection of troponin, entry of a guide wire, catheter room activation test (x ± s, min) after self-service and 120 admissions were compared and analyzed.

Table 2: Time node analysis.

item	Before the epidemic	After the epidemic	*p*	
Medical contact to complete the first electrocardiogram	5.8±0. 43	9.6±0.63	0.009	Self-treatment
Detection of troponin	8.6±0.41	20±0.54	0. 016	
Introduction A guide wire	82.5±12.84	85.7±14.34	0.023	
cardiac catheterization laboratory activations	21.2±8.52	26.3±9.75	0.043	
Medical contact to complete the first electrocardiogram	5.2±2.59	8.7±4.06	0.020	120 sent for treatment
Detection of troponin	7.9±0.89	21±19.64	0.045	
Introduction A guide wire	89.2±12.39	105.2±30.04	0.039	
cardiac catheterization laboratory activations	26.8±11.29	27.5±13.65	0.047	

By comparing the test time shown in Table1 and 2, it can be seen that the novel coronavirus epidemic has indeed prolonged the time of diagnosis and treatment. The reasons for the analysis are as follows:

(1) In order to avoid nosocomial infection, the time of shunt treatment increased, as shown in Fig.4.

(2) Some patients, usually do not pay attention to their chronic underlying diseases, until the symptoms of life crisis to the hospital, resulting in increased hospital staff.

(3) Some doctors can 't work because of the epidemic.

4 CONCLUSION

In this paper, during the COVID-19 pandemic, the number of severe cases of chest pain has been on the rise, and the number of deaths has gradually increased. The main reason is that severe cases of COVID-19 have severe respiratory distress syndrome, or even respiratory failure. According to research data, it can be inferred that

(1) Patients with a history of coronary heart disease and cerebral infarction have significantly different blood flow velocities compared to healthy individuals. The development of stroke can be indirectly obtained based on changes in blood flow velocity;

(2) The minimum blood flow velocity of patients with coronary heart disease and cerebral infarction is usually lower than that of non diseased patients, so special attention should be paid to changes in the minimum blood flow velocity during monitoring. It is worth noting that if the patient takes anticoagulant drugs, the monitoring results may be affected.

On the basis of analyzing the blood flow rate, the patient 's medical time before and after the epidemic was analyzed. The hospitalization time, cost and time node were compared. The results showed that the chest pain examination time during the epidemic was longer than that before the epidemic. Effective monitoring of blood flow velocity in patients with chronic underlying diseases is of great significance to avoid severe chest pain and even death.

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