RESEARCH ARTICLE

Effects of nursing methods for emergency PCI and non-emergency PCI on the treatment of patients with acute myocardial infarction

Wenli Guo,[1] Yue Su,[2] Lixia Chen,[3] Peiyu Wang,[4] Yan Zhou,[5] Yongzheng Li,[6] Qi Liu,[7] Hongmei Guo[8]

Abstract

Objective: To study the effect of emergency nursing methods on the treatment of acute myocardial infarction (AMI).

Methods: A total of 100 patients with AMI were divided into emergency percutaneous coronary intervention (PCI) group (group A, 50 cases) and non-emergency PCI control group (group B, 50 cases). The clinical outcome, average left ventricular ejection fraction (LVEF), angina pectoris, heart failure, and reperfusion arrhythmia after myocardial infarction were compared between the two groups.

Results: The average hospitalization days of emergency PCI group were less than those of the control group, and the incidence of angina pectoris and heart failure after myocardial infarction was lower than that of the control group. The average LVEF of emergency PCI group was higher than that of the control group.

Conclusion: This shows that emergency nursing of AMI can quickly and efficiently dredge the infarcted artery, reduce the occurrence of cardiovascular events after AMI and the average hospitalization days of patients, improve the left ventricular function and prevent heart failure. This method is a very effective treatment for improving the prognosis in patients with AMI.

Keywords: Emergency nursing, PCI, AMI, cardiovascular event, Infarct-related artery. (JPMA 70:31[Special Issue]; 2020)

Introduction

With the economic development of China, as well as the changes in lifestyles and the population aging problem, both the incidence and death rate of coronary heart disease continue to increase, which have become one of the most important public health issues. More than 500,000 of new myocardial infarction patients are diagnosed annually in China; currently, the cases of myocardial infarction patients have reached 2 million.[1] Of all the myocardial infarction sub-types, the ST-segment elevated myocardial infarction (STEMI) has a high incidence and death rate worldwide, whose effective prevention and treatment have been under the spotlight. The occurrence of AMI is sudden and its death rate at the acute stage is high. Based on the lesions of coronary artery, the coronary blood supply of STEMI patients would be reduced sharply or even interrupted; the corresponding myocardium would be necrosed due to the serious and long-lasting acute ischaemia; the myocardial fibers would be dissolved into muscle-soluble foci and gradually formed into granulation tissue. The electrocardiogram (ECG) indicates elevation of ST-segment in which patients would show the symptoms of chest tightness and chest pain, as well as the condition of cardiac functions of being damaged or more seriously leading to death.[2,3] Of all the STEMI patients in Beijing, the in-hospital mortality rate for those patients who did not receive the percutaneous coronary intervention (PCI) was 12.7%, while for the patients who received PCI was only 1.8%.[4] In the early stage of STEMI, the emergency PCI treatment could rapidly open the infarct-related artery (IRA), restore the effective reperfusion of myocardium, improve the cardiac function, inhibit the left ventricular remodeling, relieve the symptom of chest pain, and significantly reduce the mortality rate of patients.[5] Especially, with the continuous development of intervention techniques and equipment, the preoperative and postoperative antiplatelet therapies were improved and the thrombus suction catheters were applied.[6] Emergency PCI was of great importance to the emergency treatment of acute myocardial infarction, whose effect would be more significant for patients with cardiogenic shock. For patients with acute myocardial infarction, time is extremely essential, in which the sooner the myocardium was reperfused, the better the therapeutic effect was as the reperfusion therapy could re-open the early occluded coronary artery. Once the myocardium was perfused, the myocardium on the verge of necrosis was saved, or the range of necrosis was narrowed. With the improved prognosis, myocardial reperfusion was a positive treatment.[7-9] Due to the timely re-opening of the IRA, patients would keep higher LVEF and improve the left ventricular function, which helps to reduce the occurrence rate of angina pectoris and heart

[1,3,4,6,7]Department of Emergency, [2,5]Department of Operation Room, [8]Department of Anus & Intestine, Hiser Hospital, Shibei District, Qingdao, Shandong, China.

Correspondence: Hongmei Guo. Email: guohongmei_qd266@yeah.net

failure after myocardial infarction, as well as the rate of cardiogenic death in patients with acute myocardial infarction.[10-12] Therefore, it indicates that PCI is considered as an approach of emergency care to improve the quality of life, in which it could restore the coronary recanalization in a short period of time, reduce the mortality rate and the re-infarction rate, as well as reduce myocardial ischaemic cases and time span of hospital stays. The objective of this study was to explore the effect of emergency nursing methods on the treatment of AMI.

Patients and Methods

The general clinical data of 200 patients with ages between 38 and 72 years and a mean age of 58.5± 9.1 years with AMI treated at Hiser Hospital, were analyzed. All of the patients had no previous history of heart failure. In accordance with the therapeutic plans, the patients were divided into the emergency PCI treatment group (group A, n=100) and the non-emergency PCI treatment group (group B, n=100). All patients were followed up by outpatient reviews and telephone calls after the treatment for a period of 12 months. Informed consent was signed by all patients or their families and this study was approved by the Ethics Committee of Hiser Hosp.

Sample size calculation: According to 10 pre-test results, patients underwent emergency PCI and non-emergency PCI, respectively. The difference in average LVEF between the two groups was 5.20. According to the results of the document13 which was 55.65±11.87, the overall standard deviation was selected as 11.87. The estimation equation for the sample size of the measurement data in both groups was as follows:

$$n_1 = n_2 = 2[(z_\alpha + z_\beta)^2 \sigma^2 / \delta^2]$$

Where $\alpha = 0.05$, $\beta = 0.1$, $z_\alpha = 1.6449$, $z_\beta = 1.2816$, $\sigma = 11.87$, and $\delta = 5.20$. After calculations, n_1, and n_2, were 89. Since about 10% of the estimated cases needed to be excluded, 100 cases were sampled in each group.

Inclusion criteria: Symptoms of chest pain $\leq$ 12 hours, ischaemic chest pain $\geq$ 30 minutes, which could not be relieved through rest or nitroglycerin (both orally and intravenously); ECG indication of ST segments elevation of $\geq$ 0.2mV in at least two adjacent chest leads, or elevation of $\geq$ 0.1mV in ST segment of limb lead, or presence of left bundle branch block (LBBB) noted for the first time and the myocardial enzymes level more than twice of the normal value.

Exclusion criteria: patients who had previous history of myocardial infarction, left main coronary artery disease, chronic total occlusion, multiple total occlusion, severe coronary distortion and calcification, severe liver and kidney dysfunction, malignant tumour, open IRA, narrowed non-IRA during emergency surgery; patients who died during hospitalization or emergency surgeries; patients with incomplete general clinical data and observation indicators; and patients who were lost to follow up.

On being diagnosed as acute myocardial infarction; the patient was immediately given 300mg of enteric-coated aspirin tablets and 300mg of clopidogrel hydrogen sulfate tablets. In accordance with the necessity of applying emergency PCI treatments, the patients were included in group A or group B, respectively.

After urgent preoperative preparations, the femoral artery of the patient was punctured by the Seldinger method, and the 6F or 7F lower arterial sheath was placed. During surgery, heparinization (100 units/kg) was applied to establish an intravenous line for temporary cardiac pacing. The Judkins method[14] was applied to perform the coronary angiography. PTCA and coronary stenting were applied to IRA. The coronary stent should completely cover the relevant vascular lesions with appropriate pressure release (8-16atm). The indications of successful PCI treatment were: IRA stenosis residual <20% and the result of Thrombolysis in Myocardial Infarction (TIMI) grade flow was TIMI 3. The TIMI 2 or TIMI 3 indicated revascularization of blood vessels. The artery sheath was removed 6 hours after the surgery. The patient was subcutaneously injected with 40mg/12 hours of low molecular weight heparin for 5-7 days. After the surgery, all patients were given oral clopidogrel sulfate tablets 75mg/day for a period of 12 to 18 months. Besides, all patients were given oral aspirin enteric-coated tablets 100mg/day for a long-term period. The success criteria of PCI surgery was based on the following criteria: the lumen diameter after PCI increased by $\geq$50% as compared with the preoperative diameter; the residual stenosis of target vessels was $\leq$20%; the vascular blood flow of the offender was TIMI 3; no serious complications occurred during hospitalization; the symptoms of myocardial ischaemia and/or signs were relieved.

If the occurrence of AMI was within 12 hours, and the patients had no absolute thrombolytic contraindication, whose age was $\leq$70 years, the intravenous thrombolytic therapy was given (8 cases), 1.5 million units of urokinase were added into 100mL of physiological saline and were infused intravenously within 30 minutes; then, the ECG and myocardial enzymes were dynamically observed to determine whether the coronary artery was recanalized. After the thrombolytic therapy, the patients were given aspirin enteric-coated tablets 300mg/day for 3

consecutive days; then, the dosage was changed into 100mg/day for long-term use. If the occurrence of AMI exceeded 12 hours, the patients received regular conservative treatment (79 cases). All patients who met the clinical diagnostic criteria for AMI were admitted to the coronary care unit (CCU), where they were given oxygen and ECG monitoring on a regular basis; the patients without contraindications were given subcutaneous injection of LMWH, oral aspirin enteric-coated tablets, oral clopidogrel hydrogen sulfate tablets, oral nitrate drugs, oral ACEI, oral beta receptor blockers, and oral statins drugs.

The status of age and gender, the incidence of coronary heart disease including hypertension, diabetes mellitus type 2, and hyperlipidaemia, as well as the general clinical data including Killip cardiac function classification and the myocardial infarction sites of the patients in group A and B were compared.[15]

Criteria of TIMI grade flow: TIMI 0 flow (no perfusion) refers to the absence of any antegrade flow beyond a coronary occlusion; TIMI 1 flow (penetration without perfusion) is the faint antegrade coronary flow beyond the occlusion, with incomplete filling of the distal coronary bed; TIMI 2 flow (partial reperfusion) is the delayed or sluggish antegrade flow with complete filling of the distal territory; TIMI 3 is normal flow which fills the distal coronary bed completely.

Criteria of Killip cardiac function classification: Killip class I includes individuals with no clinical signs of heart failure; Killip class II includes individuals with rales or crackles in the lungs, an S3, and elevated jugular venous pressure; Killip class III describes individuals with frank acute pulmonary oedema; Killip class IV describes individuals in cardiogenic shock or hypotension (measured as systolic blood pressure lower than 90 mmHg), and evidence of peripheral vasoconstriction (oliguria, cyanosis or sweating). Patients belonging to Killip class II and above are classified as patients with heart failure.

The average hospital stay and the occurrence rate of cardiovascular events: Post-infarction angina (PIA) refers to angina pectoris that occurred within 30 days of acute myocardial infarction; reperfusion arrhythmias (RA) refers to the occurrence of arrhythmia during the recovery process of blood perfusion in the local or total ischaemia of myocardium; average LVEF refers to the LVEF measured through echocardiography that performed one month after the occurrence of AMI, which is evaluating the function of left ventricular and the difference of cardiogenic death.

For Heart failure occurring after myocardial infarction (≥NYHA III), the criteria of The New York Heart Association (NYHA) Functional Classification was used.[16] This is described as follows: NYHA class I indicates no limitation of physical activity where ordinary physical activity does not cause the undue fatigue, palpitation, dyspnoea (shortness of breath); NYHA class II indicates a slight limitation of physical activity and comfortable at rest where ordinary physical activity results in fatigue, palpitation, dyspnoea (shortness of breath); NYHA class III indicates the marked limitation of physical activity and comfortable at rest where less than ordinary activity causes fatigue, palpitation, or dyspnoea; NYHA class IV indicates unable to carry on any physical activity without discomfort and having symptoms of heart failure at rest where the discomfort increases if any physical activity is undertaken.

All the collected data were processed using the SPSS 17.0 statistics software package. The measurement data were submitted to the normality test. Test results indicated that the measurement data were in a normal distribution ($P>0.05$). The measurement data were expressed in the form of $x\pm s$, the comparisons between mean numbers were tested by t, and the count data were tested by $\times 2$. The test level was $a=0.05$, $P<0.05$ indicates statistical significance.

Results

The comparisons between age and gender composition, dangerous factors of coronary heart disease, Killip cardiac function classification, and infarction sites of patients in the two groups are shown in Figure-1. In terms of the comparisons between general clinical data, all the P values were >0.05, which indicating no statistical significance.

Comparisons between clinical outcomes of patients in the two groups

The average hospital stay of the patients of the two groups were 11.35±1.796 days (group A) and 14.17±2.342 days (group B), respectively. The shorter average hospital stays of the patients of group A (with emergency PCI treatment) than that of group B (with non-emergency PCI treatment) indicates the statistical significance of the difference ($P<0.05$) as shown in Figure-2.

Comparisons between the occurrences of post-myocardial infarction angina pectoris, reperfusion arrhythmia, post-infarction heart failure, and cardiogenic death between the two on groups showed, the frequency rates of heart failure after myocardial infarction and angina pectoris after myocardial infarction of group A was

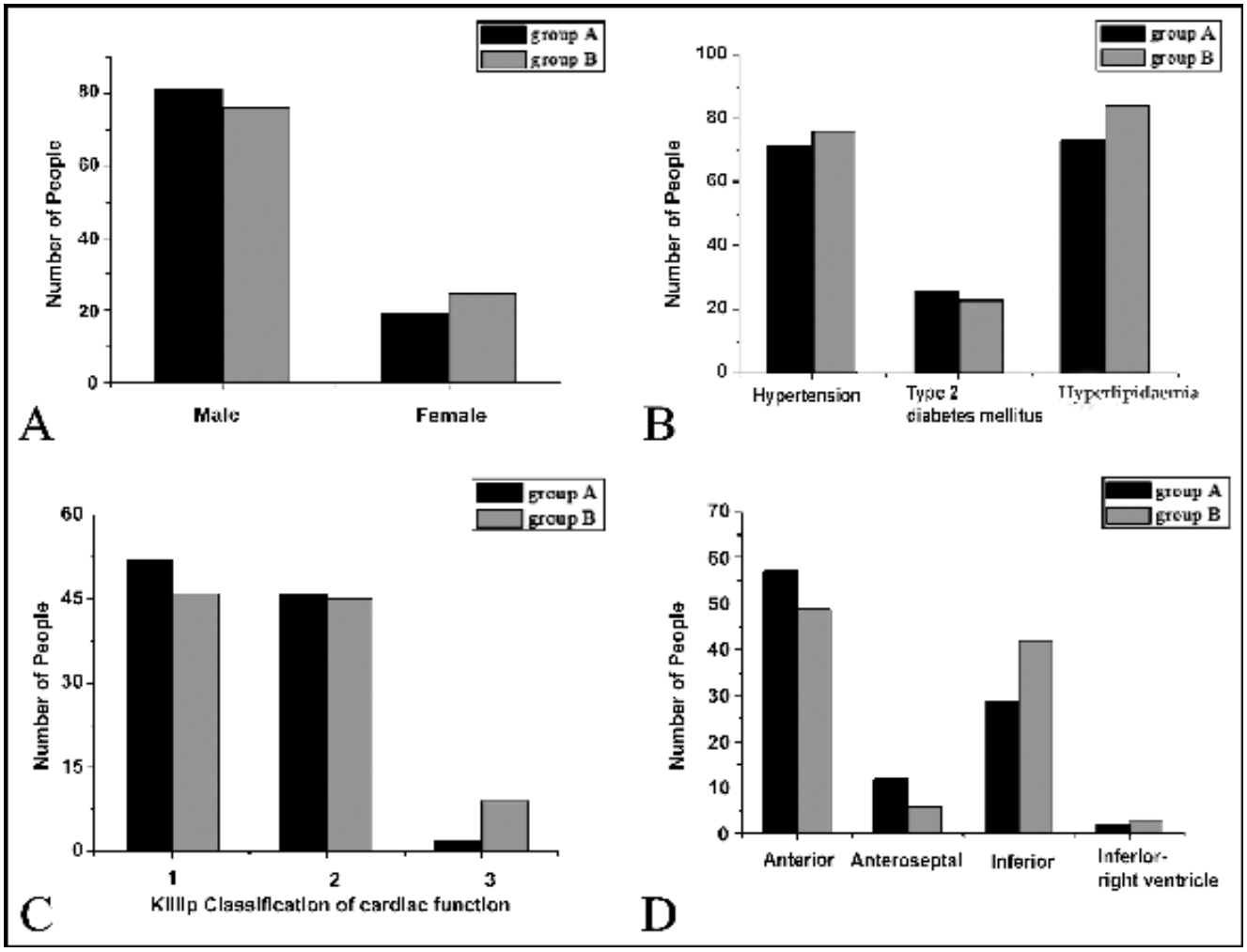

Figure-1: The comparisons of general clinical materials between the patients in the two groups (A: the comparison of gender composition; B: the comparison of dangerous factors of the incidence of coronary heart disease;C: the comparison of Killip cardiac function classification; D: the comparison of infarction sites).

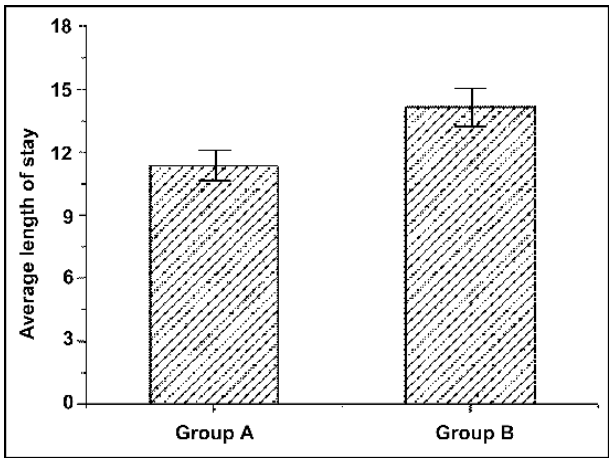

Figure-2: The comparison between average hospital stays of the patients in the two groups.

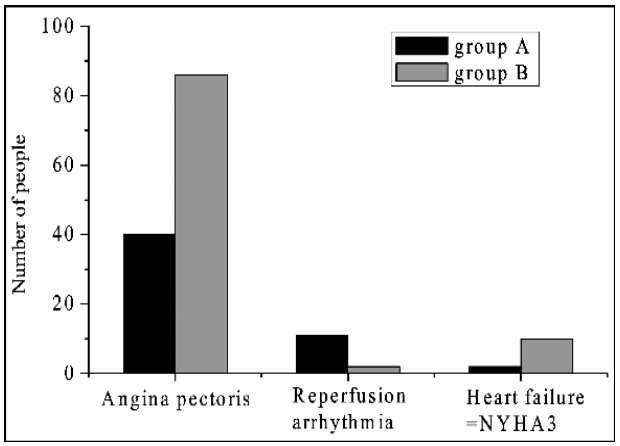

Figure-3: The comparisons between the occurrences of post-myocardial infarction angina pectoris, reperfusion arrhythmia, and post-infarction heart failure of patients in the two groups.

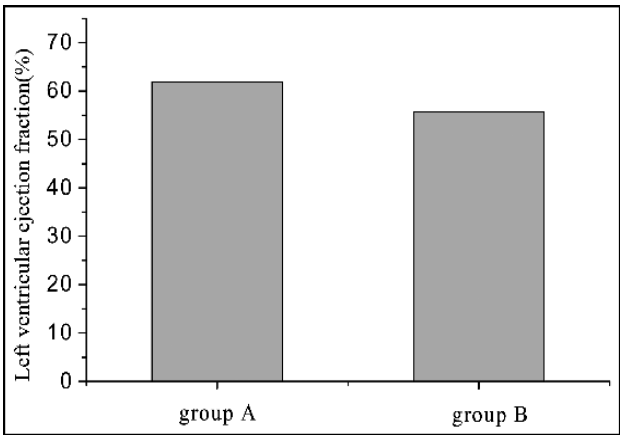

Figure-4: The comparison between the average left ventricular ejection fraction of the patients in the two groups.

lower than that of group B. This indicates the statistical significance of the difference (P<0.05). The frequency rate of reperfusion arrhythmia of group A was higher than that of group B, indicating the statistical significance of the difference (P<0.05). There were no deaths in group A and 6 deaths in group B. The difference was statistically significant (P<0.05), as shown in Figure-3.[17-20]

The emergency PCI could simultaneously treat the remaining stenosis in the infarction sites and immediately define the anatomy structure and the left ventricular function of the coronary artery. The average LVEF of group A was higher than that of group B, which indicates the statistical significance of the difference (P < 0.05) (Figure-4).[21-27]

Discussion

Acute myocardial infarction is a medical emergency. Missed diagnosis or delayed diagnosis may lead to poor prognosis or even death.[28] Each year, more than six million people are in the emergency rooms around the United States with symptoms of AMI. Of the 1 million AMI patients, 350,000 died in the acute phase.[29] Patients suspected of acute myocardial infarction with typical symptoms, including chest pain, should be assigned to the highest priority group, requiring immediate medical assistance or care within 10 minutes. Which will decrease the mortality of acute coronary syndrome. This achievement is based on the rapid identification of possible acute coronary syndromes, the acquisition of ECG diagnosis, and the rapid start of treatment, including aspirin, oxygen, thrombolytic agents and cardiac catheters. The American College of Cardiology / American Heart Association (ACC / AHA) practice guidelines emphasize the importance of rapid diagnosis and treatment.[30] However, these goals are not always achievable, and their failure leads to an increase in mortality. The purpose of this study was to determine the frequency of guidance related activities reported by emergency nurses in classifying patients with myocardial infarction.

Early infarct related artery patency is related to the improvement of prognosis in patients with myocardial infarction. Despite the progress of primary percutaneous coronary intervention, early infarct related artery patency is still associated with a high success rate of surgery and improved clinical care. Patients with AMI often have extremely unstable conditions in the acute stage in which they are prone to heart failure, arrhythmia, and cardiogenic shock with high mortality rates.[31] Minimizing the size of infarction and opening the infarct-related arteries in a short time with persistent and constant rates are the keys to improve the prognosis of patients with acute myocardial infarction. A large number of studies have shown that the emergency PCI has strong advantages in timely opening the infarct-related arteries in order to restore the myocardial blood supply, reduce the ischaemia and necrosis of myocardial tissues, diminish the complications, as well as improve the long-term prognosis.[32,33] The research by Desch et al. showed that the emergency PCI was more advantageous in the AMI treatment than other conservative treatments such as thrombolysis.[34]

In this study, the incidences of cardiovascular events were compared between the patients from the two groups (with emergency or non-emergency PCI). The results showed that the incidence rates of post-infarction angina pectoris, post-infarction heart failure, and cardiogenic death of group A were lower than those of group B. According to the researches of Dondo et al. and Sajjad et al., the incidence rates of a 30-day mortality, recurrent myocardial infarction, and angina pectoris decreased significantly for the patients with direct PCI as compared to conservatively treated patients with AMI, which was consistent with the results of this study.[35,36] Emergency PCI can quickly open the infarct-related arterial lumen to avoid the stimulation of platelet aggregation. Therefore, it can reduce the platelet aggregation and avoid the thrombosis and re-occlusion of infarct-related arteries, thereby improving the reserve capacity of coronary arteries and reducing the incidence rates of cardiovascular events. In this study, the incidence rate of reperfusion arrhythmias of group A was significantly higher than that of group B. This might be related to the immediate opening and higher opening rate of infarct-related arteries in emergency PCI. PCI nursing for patients

with acute myocardial infarction (AMI) can significantly reduce mortality and the risk of major cardiovascular adverse events. Similarly, studies have focused on analyzing key factors based on priority care for patients with acute myocardial infarction. Nursing classification is the first potential key step in the treatment of myocardial infarction. The study divided patients into two groups for statistical analysis: high priority (urgent and very urgent) and low priority (urgent, standard and non-urgent). Most patients with myocardial infarction are divided into low priority nursing. Because of the variability of symptoms or the professional qualification requirements of clinical data collection and interpretation, classification is difficult to achieve, which has a greater impact on the prognosis of patients.[37]

In summary, emergency nursing for the patients with AMI could quickly and efficiently clear the infarct-related arteries, as well as reduce the occurrence rate of cardiovascular events after myocardial infarction, improve the left heart functions of patients, prevent the heart failure, and reduce the average length of hospital stays. This is a very effective treatment for the patients with AMI as it brings good prognosis to the patients.

Conclusion

The paper has selected the general clinical data of 200 patients with AMI, including angina pectoris after myocardial infarction, the reperfusion arrhythmia, the post-infarction heart failure, the cardiogenic death, and the LVEF. All patients were divided into two groups according to the treatment methods, which were the emergency PCI treatment group (group A, 100 cases) and the non-emergency PCI treatment group (group B, 100 cases). A comparison of the general clinical data between the two groups showed no statistical difference indicating that both groups were comparable. By comparing the myocardial infarction, angina pectoris, heart failure after myocardial infarction, and cardiogenic death, it was discovered that the patients who received emergency PCI treatment had significantly fewer cardiovascular events after myocardial infarction than those non-emergency PCI treated patients. The re-opening of IRA could significantly improve the myocardial reperfusion and cardiac functions. If the IRA was opened within 1hour of the AMI incidence, the irreversible myocardial necrosis would be avoided, and the mortality risks would be minimized to the greatest extent. This indicated that the emergency treatment was urgent and critical to the AMI patients.

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