CRP, NT-proBNP, CK-MB, cTnT level and clinical significance in patients with acute myocardial infarction before and after PCI

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ABSTRACT

Objective: To analyze CRP, NT-proBNP, CK-MB, cTnT level changes and clinical significance in patients with acute myocardial infarction before and after percutaneous coronary intervention (PCI).

Methods: A total of 122 cases with acute myocardial infarction (study group) who were admitted in our hospital from January 2012 to December 2014 were selected and retrospectively analyzed. Meanwhile 122 cases with healthy physical examination in our hospital were selected as control group. Patients in study group were performed with PCI, and conventional elbow vein blood was collected for CRP, NT-proBNP, CK-MB, cTnT level determination within 24 h before and after PCI, and then CRP, NT-proBNP, CK-MB, cTnT level changes before and after PCI were analyzed.

Results: CRP, NT-proBNP, CK-MB, cTnT levels of patients in study group were significantly higher than that in control group (P<0.05). NT-proBNP, cTnT, CRP, CK-MB levels of patients in study group were significantly reduced after PCI (P<0.05). cTnT and NT-proBNP levels of patients in study group presented proportional relations after PCI. NT-proBNP level had a certain relations with myocardial ischemia. There were significant difference in total time and total times of unstable angina pectoris, diabetes, bifurcation lesion, multi-vessel lesions and balloon dilatation between cTnT drop group&cTnT unchanged group and NT-proBNP drop group&NT-proBNP unchanged group after PCI (P<0.05). Stent length difference was statistical significant only in cTnT drop group&cTnT unchanged group and NT-proBNP drop group&NT-proBNP unchanged group. Logistic analysis found that total time and total times of unstable angina pectoris, diabetes, bifurcation lesion, multi-vessel lesions and balloon dilatation were the relevant factors affecting postoperative cTnT and NT-proBNP level changes for patients with acute myocardial infarction, and stent length was the relevant factor affecting cTnT level changes. There was significant difference in heart adverse event occurrence rate in cTnT drop group and NT-proBNP drop group or between cTnT unchanged group and NT-proBNP unchanged group (P<0.05).

Conclusions: CRP, NT-proBNP, CK-MB, cTnT levels of patients with acute myocardial infarction are significantly higher than that of healthy people, and cTnT and NT-proBNP levels are valuable in prediction of heart adverse event occurrence rate after PCI.

1. Introduction

Compared with conventional drug therapy, it takes shorter time for percutaneous coronary intervention (PCI) to dredge infarction related artery and PCI could effectively improve myocardial perfusion, relieve myocardial infarction area, increase postoperative prognosis of acute myocardial infarction patients, bring timely and effective treatment to patients, and then reduce the death rate and postoperative heart adverse event occurrence rate[1]. In addition, PCI has followed advantages like easy operation, slight injury and good prognosis, which is widely applied to clinic treatment[2]. In this paper, we mainly discussed the relationship between CRP, NT-proBNP, CK-MB, cTnT level determination of acute myocardial infarction patients before and after PCI, related reports were as followed.

2. Materials and methods

2.1. Clinical data

A total of 122 cases with acute myocardial infarction (study group) who were admitted in our hospital from January 2012 to December
2014 were selected and retrospectively analyzed. Meanwhile 122 cases with healthy physical examination in our hospital were selected as control group. Study group: male (68 cases), female (54 cases), age (55-77 years old), average age (63.5±1.8) years old. Control group: male (65 cases), female (57 cases), age (54-73 years old), average age (64.2±2.0) years old. People in both group were informed of this study and were willing to follow-up investigation. Clinical data inputting for both group was conducted and medical history( hypertension, hyperglycemia, hyperlipidemia, family diabetic history, family cardiovascular history)was recorded. Physical examination was performed on objectives. Patients in study group were in accordance with the diagnostic criteria of diagnosis and treatment guideline of acute myocardial infarction established by Chinese Society of Cardiology of Chinese Medical Association[3]. Patients who met the following conditions could be conducted with PCI treatment[4]: (1) Left ventricular ejection fraction<50% for successive two times or above by echocardiography determination. (2)Patients were confirmed with acute myocardial infarction and internal diameter stenosis of at least one piece of blood vessel 50% after angiography. Cases with acute myocardial infarction were divided into cTnT drop group (71 cases) & NT-proBNP unchanged group (51 cases) and NT-proBNP drop group (68 cases)& NT-proBNP unchanged group (54 cases) after PCI according to cTnT and NT-proBNP level changes.

2.2. Instruments

Instrument: 725-87C-MULTI ultra low temperature refrigerator produced by America ThermoICE; LDZ5-2 low speed autobalancing centrifuge produced by Beijing Medical Centrifuge Factory; SHWH-IS electric heating thermostatic water tank produced by Beijing Medical Equipment Factory; BeckmanLE-25 fully automatic serum analyzer produced by America BECMAN; E230 electrochemistry luminescence immunity analyzer produced by America Roche Group; BACKMAN Access fully automatic micro particle chemical luminescence immunity analyzer produced by America BECMAN.

2.3. PCI therapeutic method

Patients in study group were conducted with PCI and GE Advantx LCA+Digital subtraction angiography was adopted. The contrast media-Ultravist370 used in the PCI was produced by Schering Pharmaceutical Ltd. Patients in study group were given clopidogrel hydrogen sulfate tablet (300 mg) and aspirin (300 mg) treatment before conventional operation in oral administration. In addition, patients in study group were given daily clopidogrel hydrogen sulfate tablet (75 mg) and aspirin (300 mg) treatment for maintenance treatment. Meanwhile, patients in study group were given β receptor blockers and statins treatment[5]. The right radial artery was selected as puncture path and seldinger puncture method was adopted for PCI. 6F arterial sheath was imbedded and heparin (3000 U), nitroglycerin (200 μg) were adopted conventionally, with intravenous injection. Then digital subtraction angiography was performed. Heparin (300 U) was adopted every 1 hour during operation. After operation, subcutaneous injection of low molecular heparin was performed, with twice one day, continuous injection for 3 days. Judkins F6, F7 or Amplatz guiding catheters were selected according to the practical situations of patients[6]. Multiple body position scanning(right head position, right front inclined head position, left front inclined head position, right foot position, right front inclined foot position, left front inclined foot position) was performed during the process of angiography in PCI to increase the observation of lesion locations. After balloon predilation was performed, stent was implanted. Balloon or stent size was defined by the actual situations of patients. Balloon catheter was selected based on the blood vessel diameter proportion (1:1:1) of pre target position of balloon, while stent was selected based on the proportion (1:1) of stent and blood vessel[7]. Stent implantation criteria were as follows[8]: (1) Coronary artery was on the verge of occlusion or chronic complete occlusion lesions. (2) Angiectasis was not very obvious due to vascular springback contraction after balloon dilatation, and vessel lumen stenosis>50%. (3) Blood vessel diameter<3 mm. (4) Coronary artery ostium or bifurcation lesions. (5) Blood vessel dissection was formed.

2.4. Observation indexes

PCI success criteria were as follows[9]: Stent was fully in adherence to walls after implantation and expansion and lesion coronary artery residual stenosis<5%, forward blood flow level was TIMI3, and syndromes didn't occur during the operation.

2.5. Statistical analysis

SPSS16.0 statistical software was adopted for statistical analysis, measurement data were expressed as mean±SD. t test was used for analyze enumeration data. P<0.05 indicated the significant difference.

3. Results

3.1. CRP, NT-proBNP, CK-MB, cTnT levels

CRP, NT-proBNP, CK-MB, cTnT levels of patients in study group before treatment were significantly higher than that (P<0.05), as was shown in Table 1.

Table 1

<table>
<thead>
<tr>
<th>Groups</th>
<th>CRP (mg/L)</th>
<th>NT-proBNP (pg/mL)</th>
<th>CK-MB (ng/mL)</th>
<th>cTnT (ng/mL)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Study group</td>
<td>11.5±4.8</td>
<td>241.3±144.6</td>
<td>289.3±78.4</td>
<td>0.66±0.54</td>
</tr>
<tr>
<td>Control group</td>
<td>1.1±0.8</td>
<td>30.4±7.9</td>
<td>30.5±14.8</td>
<td>0.02±0.01</td>
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<table>
<thead>
<tr>
<th>t value</th>
<th>5.362</th>
<th>6.352</th>
<th>6.524</th>
<th>5.142</th>
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<tbody>
<tr>
<td>P value</td>
<td>&lt;0.05</td>
<td>&lt;0.05</td>
<td>&lt;0.05</td>
<td>&lt;0.05</td>
</tr>
</tbody>
</table>

3.2. CRP, NT-proBNP, CK-MB, cTnT level difference before and after treatment in study group

NT-proBNP, cTnT, CRP, CK-MB levels of patients in study group were significantly reduced after treatment (P<0.05), as was shown in Table 2.
3.3. Relationship between cTnT and NT–proBNP levels and myocardial necrosis

cTnT and NT–proBNP levels of patients in study group presented proportional relations after PCI treatment. It was assumed that NT-proBNP level had a certain relations with myocardial ischemia. cTnT, NT-proBNP levels of patients were significantly reduced after PCI treatment (P<0.05).

3.5. Relevant factors affecting cTnT and NT–proBNP levels

There were significant difference in total time and total times of unstable angina pectoris, diabetes, bifurcation lesion, multi-vessel lesions and balloon dilatation between cTnT drop group & cTnT unchanged group and NT–proBNP drop group & NT–proBNP unchanged group after PCI (P<0.05). There was significant difference in stent length only in cTnT drop group & cTnT unchanged group (P<0.05), while difference was not statistical significant in NT–proBNP drop group & NT–proBNP unchanged group, as shown in Table 3. Logistic analysis found that total time and total times of unstable angina pectoris, diabetes, bifurcation lesion, multi-vessel lesions and balloon dilatation were the relevant factors affecting postoperative cTnT and NT–proBNP level changes for patients with acute myocardial infarction, and stent length were the relevant factors affecting cTnT level changes.

3.5. Heart adverse event occurrence rate of patients in study group

There was significant difference in heart adverse event occurrence rate between cTnT drop group & cTnT unchanged group and NT-proBNP drop group & NT-proBNP unchanged group (P<0.05), as was shown in Table 4.

4. Discussion

Acute myocardial infarction is a kind of common clinical diseases, which mainly occurs among old people. Along with the increasing trend of aging of population and living standard in our country, occurrence rate of this disease also present an increasing trend in the clinic. Acute myocardial infarction has higher death rate and disability rate, especially higher among patient with coronary heart disease, which is the key factor affecting the life safety of patients[10]. Meanwhile, atherosclerosis of coronary artery of acute myocardial infarction patients result in the higher occurrence rate in thrombus, which lead to the appearance of heart adverse time and was an important factor resulting in myocardial necrosis of patients. Therefore, strengthening the clinical treatment, diagnosis and prevention of acute myocardial infarction patients are important in our country’s clinical care[11]. In recent years, along with the continuous development of the studies and clinical treatment of acute myocardial infarction, especially the application of interventional therapy, new therapeutic schedules for acute myocardial infarction treatment appear. PCI is increasingly applied to clinic, which is considered as a kind of method of effectively relieving myocardial necrosis of patients and improving coronary artery perfusion[12].

Cardiac markers play an important role in multiple clinical relevant factors, like diagnosis, clinical treatment, disease control and prognosis for myocardial infarction patients. Along with the continuous development of science and technology and the increasing deep studies for myocardial infarction in recent years, among the clinical diagnosis for ischemic heart disease, serum specificity biomarkers are considered as its judgment standard. However, among present clinical studies, there are no specific cardiac markers which could meet the diagnostic criteria for acute myocardial infarction patients. Cardiac markers for acute myocardial infarction diagnosis need higher sensitivity and specificity. Therefore, multiple markers for combined detection are used for

<table>
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<tr>
<th>Groups</th>
<th>CRP (mg/L)</th>
<th>NT-proBNP (pg/mL)</th>
<th>CK-MB (ng/mL)</th>
<th>cTnT (ng/mL)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Before treatment</td>
<td>11.5±4.8</td>
<td>241.3±114.6</td>
<td>289.3±78.4</td>
<td>0.66±0.54</td>
</tr>
<tr>
<td>After treatment</td>
<td>8.6±3.5</td>
<td>194.5±75.4</td>
<td>224.4±54.2</td>
<td>0.32±0.34</td>
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<tr>
<td>t value</td>
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<td>5.369</td>
<td>5.412</td>
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<tr>
<td>P value</td>
<td>&lt;0.05</td>
<td>&lt;0.05</td>
<td>&lt;0.05</td>
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*Note, compared with drop group, *P<0.05.

<table>
<thead>
<tr>
<th>Indexes</th>
<th>cTnT</th>
<th>NT-proBNP</th>
</tr>
</thead>
<tbody>
<tr>
<td>Bifurcation lesion</td>
<td>24</td>
<td>45a</td>
</tr>
<tr>
<td>Balloon dilatation Total time (s)</td>
<td>70.4±12.3</td>
<td>142.4±23.4a</td>
</tr>
<tr>
<td>Balloon dilatation Total times</td>
<td>1.2±0.4</td>
<td>1.9±0.5a</td>
</tr>
<tr>
<td>Multi-vessel lesions</td>
<td>12</td>
<td>43a</td>
</tr>
<tr>
<td>Stent length</td>
<td>12.5±5.3</td>
<td>18.4±6.2a</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Heart adverse event</th>
<th>cTnT</th>
<th>NT-proBNP</th>
</tr>
</thead>
<tbody>
<tr>
<td>Angina</td>
<td>7</td>
<td>15</td>
</tr>
<tr>
<td>Cardiac failure</td>
<td>6</td>
<td>14</td>
</tr>
<tr>
<td>Occurrence rate (%)</td>
<td>10.7</td>
<td>23.8</td>
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</table>
myocardial infarction diagnosis in the clinic frequently to prevent from lower sensitivity or specificity of single serum indicator for myocardial necrosis. And this detection method has higher clinical application effect in the diagnosis of early myocardial infarction patients. Therefore, combined detection of new type sensitivity and higher specificity of serum and cardiac markers have important significance in clinical diagnosis and treatment of acute myocardial infarction[13].

Related records indicate that cTnT was a kind of recent discovered serum detection indicator, which has higher sensitivity and specificity for myocardial damage judgment[14]. Compared with other cardiac markers, cTnT has higher specificity and also has higher sensitivity in the diagnosis of tiny myocardial necrosis. CK-MB is considered as golden stand for myocardial infarction diagnosis in the past clinical biochemical indicators of myocardial necrosis diagnosis. However, along with the development of continuous studies on myocardial infarction, the specificity and sensitivity of CK-MB is lower than that of cTnT. However cTnT diagnosis is not perfect, cTnT detection of early myocardial infarction patients shows negative, and only when myocardial infarction attack occurred, cTnT detection could play its effect. cTnT level changes have a certain relations with myocardial ischemia and anoxia, that is to say, when patients suffered from septic opyemia, atrial fibrillation and cardiac failure, pericarditis, myocarditis or acute pulmonary embolism, cTnT level of patients would rise accordingly; in addition cTnT level of patients would also rise due to others factors; NT-proBNP, as an important indicator for clinical cardiac failure judgment, is also an important indicator reflecting prognosis of patients. And related reports indicate that NT-proBNP could be considered as an important indicator of clinical acute myocardial infarction diagnosis, and it could also reflect the prognosis of patients after PCI interventional treatment[15].

In this study, 122 cases with acute myocardial infarction and 122 cases of healthy people were selected. CRP, NT-proBNP, CK-MB, cTnT levels between study group and control group before PCI treatment were compared. CRP, NT-proBNP, CK-MB, cTnT levels of patients in study group were significantly higher than that in control group (P<0.05). NT-proBNP, cTnT, CRP, CK-MB levels of patients in study group were significantly reduced after PCI (P<0.05). cTnT and NT-proBNP levels of patients in study group presented proportional relations after PCI, NT-proBNP level had a certain relations with myocardial ischemia. There were significant difference in total time and total times of unstable angina pectoris, diabetes, bifurcation lesion, multi-vessel lesions and balloon dilatation between cTnT drop group&cTnT unchanged group and NT-proBNP drop group&NT-proBNP unchanged group after PCI (P<0.05). Stent length difference was statistical significant only in cTnT drop group&cTnT unchanged group (P<0.05), while difference was not statistical significant in NT-proBNP drop group&NT-proBNP unchanged group. Logistic analysis found that total time and total times of unstable angina pectoris, diabetes, bifurcation lesion, multi-vessel lesions and balloon dilatation were the relevant factors affecting postoperative cTnT and NT-proBNP level changes for patients with acute myocardial infarction, and stent length was the relevant factor affecting cTnT level changes. There was significant difference in heart adverse event occurrence rate in cTnT drop group and NT-proBNP drop group or between cTnT unchanged group and NT-proBNP unchanged group (P<0.05). It can be concluded that CRP, NT-proBNP, CK-MB, cTnT level changes are valuable in prognosis of acute myocardial infarction.

References