Efficacy Analysis of Arrhythmia in Coronary Heart Disease and Application Value of Pet

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Abstract
Coronary artery is the only blood vessel supplying the heart. Its shape is coronal, so it is called coronary artery. This blood vessel also has the same sclerosis as the whole body blood vessel, showing atherosclerotic changes, resulting in the supply of heart blood circulation disorders, causing myocardial ischemia, hypoxia, that is coronary heart disease. Arrhythmia belongs to the common clinical symptoms of patients with coronary heart disease. Generally, the symptoms of arrhythmia in mild coronary heart disease patients are not obvious concave. With the development of the disease, palpitation, dizziness, hypotension and other symptoms gradually appear. Shock or even sudden death occurs in severe patients, which seriously affects the quality of life and safety of patients. The application of cardiac PET in the evaluation of patients with coronary artery disease (CAD) has aroused more and more interest. Existing evidence shows that myocardial perfusion PET provides an accurate means for the diagnosis of obstructive coronary heart disease, especially in obesity and drug stress patients, its diagnostic effect is better than SPECT. The ability of left ventricular function from rest to peak was recorded. Quantitative myocardial perfusion (mL/min/g tissue as a unit) provides additional advantages for evaluating multi-vessel CAD. There is growing and consistent evidence that gated myocardial perfusion PET also provides clinically useful risk stratification. The purpose of this study is to evaluate the non-invasive myocardial perfusion and coronary stenosis using PET/CT simultaneously, and to evaluate the diagnostic efficacy of adenosine stress perfusion imaging combined with color Doppler ultrasound in coronary heart disease.

Key words: Coronary Heart Disease, Arrhythmia, Heart Pet, Cardiovascular Disease

Análisis de la Eficacia de la Arritmia en la Enfermedad Coronaria y Valor de Aplicación de la Mascota

Resumen
La arteria coronaria es el único vaso sanguíneo que abastece al corazón. Su forma es coronal, por lo que se llama arteria coronaria. Este vaso sanguíneo también tiene la misma esclerosis que el vaso sanguíneo de todo el cuerpo, mostrando cambios ateroscleróticos, lo que resulta en el suministro de trastornos de la circulación sanguínea del corazón, causando isquemia de miocardio, hipoxia, que es una enfermedad coronaria. La arritmia pertenece a los síntomas clínicos comunes de los pacientes con cardiopatía coronaria. En general, los síntomas de arritmia en pacientes con cardiopatía coronaria leve no son obvios cóncavos. Con el desarrollo de la enfermedad, aparecen gradualmente palpitaciones, mareos, hipotensión y otros síntomas. La conmoción o incluso la muerte súbita se produce en pacientes graves, lo que afecta gravemente la calidad de vida y la seguridad de los pacientes. La aplicación de la PET cardíaca en la evaluación de pacientes con enfermedad arterial coronaria (EAC) ha despertado cada vez más interés. La evidencia existente muestra que la PET con perfusión miocárdica proporciona un medio preciso para el diagnóstico de la enfermedad coronaria obstructiva, especialmente en pacientes con obesidad y estrés por drogas, su efecto diagnóstico es mejor que la SPECT. Se registró la capacidad de la función ventricular izquierda desde el reposo hasta el pico. La perfusión miocárdica cuantitativa (ml / min / g de tejido como una unidad) proporciona ventajas adicionales para evaluar el CAD mult.tarvario. Existe una evidencia creciente y constante de que la PET con perfusión miocárdica cerrada también proporciona una estratificación de riesgo clínicamente útil. El propósito de este estudio es evaluar la perfusión miocárdica no invasiva y la estenosis coronaria utilizando PET / TC simultáneamente, y evaluar la eficacia diagnóstica de la perfusión de adenosina combinada con la ecografía Doppler color en la enfermedad coronaria.
1. Introduction

At present, the incidence of cardiovascular diseases (CVD) in China is increasing continuously [1], and the age of onset is also ahead of schedule. CVD accounted for 41% of all causes of death, ranking first among all causes of death. The survey shows that the prevalence of CVD in China is 1.78% in males and 1.10% in females, and the prevalence increases with age [2-5]. At present, there are about 230 million CVD patients in China, and 20 of every 100 adults suffer from CVD. Every year, there are about 3.5 million deaths and 9590 deaths per day. It is estimated that there are 6 deaths per minute, of which the prevalence of coronary heart disease is the highest. Coronary heart disease (CHD) is a heart disease caused by coronary artery atherosclerosis which narrows or obstructs the vascular lumen [6], or by myocardial ischemia, hypoxia or necrosis caused by functional changes of coronary artery (spasm). It is divided into acute coronary syndrome (ACS) and chronic coronary artery disease (CAD) or chronic ischemic syndrome (chr). Onic ischemic syndrome (CIS) is divided into two categories [7]. The former includes unstable angina (UA), non-ST-segment elevation myocardial infarction (NSTEMI) and ST-segment elevation myocardial infarction (STEMI) [8-11]; the latter includes coronary sudden death; the latter includes stable angina pectoris (SAP), ischemia, Cardiomyopathy and occult or asymptomatic coronary heart disease. The main causes of death of coronary heart disease are sudden death and heart failure [12], both of which are closely related to arrhythmia. In coronary heart disease, myocardial remodeling caused by long-term myocardial ischemia leads to the increase of ectopic pacing points in the cardiac cavity. The changes of myocardial cell potential at ectopic pacing points can easily induce various arrhythmias. At the same time, myocardial ischemia and hypoxia affect the normal function of myocardial cell membranes. The increase of excitability and abnormal conduction of myocardial cells can further decrease the cardiac function of patients, and arrhythmias a result, It is easy to induce sudden death [12].

Diagnosis of coronary artery disease by CTA is a hotspot in recent imaging medicine [13-15]. In the case that CT images can satisfy the evaluation of coronary artery lumen, the accuracy of spiral CT over 16-slice is higher than 50%. It is helpful to avoid invasive catheterization in patients with normal coronary artery or without interventional treatment. Most experimental studies show that CTA can be used to diagnose coronary artery stenosis with clinical significance. The negative predictive value of diagnosing coronary artery disease is high, which is close to [16]. It basically meets the need of screening interventional therapy for coronary heart disease. In addition, coronary CTA can visually display or measure the value of cT to evaluate the nature of spot rapidity. After coronary CTA imaging, coronary stenosis can be diagnosed by calcification integral test software, which has a good correlation with routine angiography. However, this method also has its own drawbacks [17]: because the image obtained by the adjacent R-R interval of heart rate fluctuation is not absolutely equal in length, it is difficult to estimate the severity of coronary artery calcification (the more serious the calcification is, the more difficult it is to evaluate the degree of stenosis). Coronary artery calcification exists in some branches of coronary artery. Because of the influence of artifacts [18], multi-slice CT does not. It can clearly show the inner cavity of the coronary artery, which is the cause of most false-negative and all false-positive results in the study. Moreover, 16-slice CT requires strict cooperation with patients. Patients need to hold their breath during image acquisition, so as to avoid the inconsistency of the position of coronary artery caused by exercise in the data acquisition process [19].

PET/CT cardiac scan imaging can be divided into two parts [20-23]: anatomical imaging of coronary artery and functional imaging of myocardium. Therefore, in order to better complete the PET/CT cardiac examination, it is necessary to have at least 8 or more layers of CT in the PET/CT system, preferably more than 16 layers. The key to the success of CTA coronary angiography lies in the change of heart rate during examination. Excessive fluctuation of heart rate will lead to the decrease of time resolution [25], but slightly produce stepped artifacts, which will directly lead to the failure of examination. There is still considerable room for the development of multi-slice spiral CT in the field of coronary artery imaging, especially the development of hardware technology deserves attention [26]. For example, to further improve the rotational speed of CT scaffolds, improve the time resolution of cardiac CT scans, improve the quality of coronary artery CT images [27], increase the number of detectors, improve the CT scan coverage in unit time, so as to complete the whole cardiac scan in as few cardiac cycles as possible. In software technology, especially in the post-processing software of coronary CT images, more attention is paid to the humanization of the software use process to improve the efficiency of image post-processing. The development of these technologies will help to promote the clinical application of multi-slice spiral CT coronary angiography [28-30]. There are essential differences between PET/CT and pure PET cardiac examination because PET/CT can simultaneously obtain myocardial and coronary artery anatomical images and blood perfusion images, and contribute to screening interventional surgery. Anatomical image of coronary artery and myocardial perfusion image. Recent research focuses on the fusion of CTA and perfusion information on three-dimensional images [31]. More qualitative and quantitative information,
including the location of coronary stenosis, plaque composition and regional wall motion, can be added to provide more accurate diagnostic information [32]. A large number of research data confirm that the prognosis of patients with coronary heart disease is closely related to the extent and extent of myocardial perfusion abnormality under load condition [33]. PET/CT will reduce unnecessary diagnostic coronary angiography and provide assistance in screening interventional therapy for patients with coronary heart disease. PET/CT, L, myocardial perfusion imaging and coronary CTA can be used as safe, reliable and non-invasive methods for screening coronary heart disease. But there are some limitations in the application of these two methods alone. Therefore, the combination of the two is the best choice for PET/CT cardiac examination [34], which will become the development trend of PET/CT cardiac examination. Practice has proved that the fused image can be recognized by most clinicians, which obviously improves the confidence of clinicians. Thus, it can play a good role in better guiding the formulation of reasonable and effective treatment plan. Metabolic imaging and perfusion imaging of some positron radiopharmaceuticals are the gold standard for judging myocardial viability [35].

From the point of view of modern medicine, the diagnosis of coronary heart disease includes not only the anatomical and morphological diagnosis, such as the condition of coronary stenosis, the location and degree of stenosis, whether collateral circulation exists or not, but also the pathophysiological changes of coronary artery, such as myocardial function, myocardial metabolism, the degree and extent of myocardial ischemia, so as to comprehensively analyze the condition, evaluate the prognosis and determine the treatment plan. Invasive angiography has been the gold standard for diagnosing coronary artery for more than 30 years. However, the shortcomings of traditional angiography are not only traumatic, but also inadequate information of coronary plaque and myocardial perfusion. It is difficult to detect the functional status of myocardial cells. If the non-invasive assessment of myocardial perfusion and coronary stenosis can be carried out at the same machine before coronary angioplasty, it will provide more comprehensive information for clinical diagnosis and treatment. A large number of research data confirm that adenosine-loaded myocardial perfusion imaging of PET also has good diagnostic effect u1J, PET, L, myocardial perfusion imaging can provide pathological and physiological information of narrow coronary artery and can judge the prognosis of patients. It is of great significance in risk stratification and treatment decision-making of coronary heart disease. Multi-slice spiral CT coronary angiography is one of the hotspots in cardiovascular imaging research in recent years. Especially 16-slice and 64-slice CT, which has been introduced in recent years, has further improved the time resolution and is close to isotropic imaging, making the non-invasive examination of coronary artery enter a new stage. It can not only display the stenosis of the lumen noninvasively, but also visually display or measure the CT value to evaluate the nature of macular rapidity. In addition, it can evaluate the coronary muscle bridge and coronary variation. The purpose of this study was to evaluate the diagnostic efficacy of PET adenosine stress myocardial perfusion imaging combined with 16-slice CT in coronary heart disease (CHD).

2. Proposed method

2.1. Common Examination of Coronary Heart Disease

1. Electrocardiogram

ECG is the most simple and commonly used method for the diagnosis of coronary heart disease. Especially when the patient's symptoms attack, it is the most important means of examination, and arrhythmia can be found. Most of them had no specificity when they did not attack. Abnormal S-T segment depression and transient S-T segment elevation were observed in patients with variant angina pectoris. Most of unstable angina pectoris have obvious S-T segment depression and T wave inversion. ECG manifestations of myocardial infarction: 1. Abnormal Q wave and S-T segment elevation in acute phase. (2) In subacute stage, only abnormal Q-wave and T-wave inversion (days to weeks after infarction) occurred. (3) Chronic or obsolete period (3-6 months) had only abnormal Q wave. If the elevation of S-T segment lasts for more than 6 months, ventricular aneurysm may occur. If T wave persistently inverted, it is called old myocardial infarction with coronary ischemia.

2. ECG load test

Including exercise load test and drug load test (such as dipyridamole, isoproterenol test, etc.). Myocardial ischemia can be induced by increasing the load of the heart through exercise or medication in patients with no symptoms or short symptoms in quiet state. The existence of myocardial ischemia can be confirmed by the changes of ST-T recorded by electrocardiogram. Exercise load test is the most commonly used, and the positive result is abnormal. However, patients suspected of myocardial infarction should be contraindicated.

3. Dynamic electrocardiogram

It is a method that can record and analyze the changes of ECG in active and quiet state continuously for a long time. This technology was first used by Holter in 1947 to monitor electrical activity, so it is also called Holter. This method can observe and record the changes of ECG in patients' daily life, such as ST-T changes caused by transient myocardial ischemia, Non-invasive, convenient, easy for patients to accept.
4. Radionuclide myocardial imaging

Angina pectoris can not be ruled out by medical history and electrocardiogram examination, and it can be done when some patients can not carry out exercise load test. Radionuclide myocardial imaging can show the ischemic area and determine the size and location of ischemia. Combined with exercise load test, the detection rate can be improved.

5. Echocardiography

Echocardiography can examine the shape, structure, wall motion and left ventricular function of the heart, which is one of the most commonly used methods at present. It has important diagnostic value for ventricular aneurysm, intracardiac thrombosis, cardiac rupture and papillary muscle function. However, its accuracy is closely related to the experience of ultrasound examiners.

6. Hematological examination

Blood lipids, blood sugar and other indicators are usually needed to assess whether there are risk factors for coronary heart disease. Myocardial injury markers are one of the important means for the diagnosis and differential diagnosis of acute myocardial infarction. At present, cardiac troponin is the main clinical manifestation.

7. Coronary CT

Multi-slice spiral CT angiography of heart and coronary artery is a non-invasive, low-risk, rapid method of examination, and has gradually become an important means of early screening and follow-up of coronary heart disease. Applicable to: (1) For patients with atypical chest pain symptoms, auxiliary examinations such as electrocardiogram, exercise load test or nuclide myocardial perfusion can not be diagnosed. (2) Diagnosis of low-risk patients with coronary heart disease. (3) Suspicious coronary heart disease, but not coronary angiography. (4) Screening of asymptomatic patients with high-risk coronary heart disease. (5) Follow-up of known coronary heart disease or interventional and surgical treatment.

8. Coronary angiography and intravascular imaging

Coronary angiography and intravascular imaging are the golden criteria for the diagnosis of coronary heart disease, which can determine whether coronary artery has stenosis, the location, extent and scope of stenosis, and guide further treatment accordingly. Intravascular ultrasound can determine the shape and degree of stenosis of the coronary artery wall. Optical coherence tomography (OCT) is a high resolution resolution tomography technology, which can better observe the changes of vascular lumen and wall. Left ventricular angiography can evaluate cardiac function. The main indications of coronary angiography are as follows: (1) for those who still suffer from severe angina pectoris, the condition of arterial lesions should be clarified to consider bypass grafting; and (2) for those whose chest pain is like angina pectoris and can not be diagnosed.

2.2. PET/CT examination

Positron emission tomography-X-ray computed tomography (PET-CT) system can be widely used in health examination and cancer diagnosis, curative effect evaluation and monitoring. In developed countries in Europe and the United States, PET-CT has been regarded as the best means of health examination and cancer diagnosis. PET-CT is a multi-mode imaging system composed of positron emission tomography (PET) and X-ray computed tomography (CT). It is the most advanced medical imaging equipment in the world, and it is also an imaging technology that can be imaged at the molecular level. PET-CT integrates PET and CT to make the advantages of the two imaging techniques complementary. PET images provide molecular information such as function and metabolism. CT provides fine anatomical and pathological information. Through fusion technology, the pathophysiological and morphological changes of the disease can be obtained by one imaging, and the effect of "1+1>2" can be achieved.

Clinical application of

1. Clinical application of PET/CT

At present, PET-CT is mainly used in the diagnosis of systemic tumors, evaluation of curative effect, monitoring of recurrence and metastasis. 1. Application of Positron Emission Tomography-X-ray Computed Tomography System (PET-CT) in Tumor

(1) Diagnosis of malignant tumors and differential diagnosis of benign and malignant lesions. In recent 10 years, the diagnostic accuracy of 18F-FDG PET imaging has been improved from 85% to 95%-100% by PET-CT.

(2) Detecting metastases of malignant tumors and staging and re-staging them before operation.

(3) When metastases or paraneoplastic syndromes or elevated tumor markers are found, primary tumors are sought.

(4) Monitoring the curative effect of malignant tumors, including judging treatment response and therapeutic effect, To judge the sensitivity of tumors to radiotherapy and chemotherapy, to guide the selection of reasonable treatment options, and to reduce the waste of medical resources.

(5) Detecting the recurrence of tumors, especially when the tumor markers are elevated.
(6) Residual abnormalities were found in physical examination or other imaging examinations after treatment, and the decision was tumor or fibrosis or necrosis after treatment.

(7) Choose the biopsy area which is most likely to obtain the diagnosis information of tumors.

(8) To guide the radiotherapy plan and delineate the biological target area before radiotherapy.

2. Application of PET-CT in health examination

With the improvement of people's living standards, people's awareness of self-health care has gradually increased, and there are higher requirements for health examination. PET-CT can detect serious life-threatening tumors in early stage. Especially for malignant tumors, there are no obvious discomfort symptoms in the early stage of the lesion, so that most patients have developed to the middle and late stages of treatment, so that the clinical can not achieve "early detection, early diagnosis, early treatment". PET-CT has been widely used in health examination of people over 40 years old, which has successfully solved this problem, and many cancer patients have been cured because of early diagnosis. Developed countries such as Europe and the United States have used PET-CT as a means of screening for these diseases among high-risk groups, striving for early diagnosis, early treatment and early benefit.

3. Characteristics of PET-CT

1. Positron emission tomography-X-ray computed tomography combined system (PET-CT) can diagnose early diseases such as tumors. Because of the active metabolism and proliferation of tumor cells, the ability to absorb imaging agents is several times that of normal cells, forming obvious concentration points on images. Therefore, before the changes of anatomical structure occur in the early stage of tumors, other small lesions which are difficult to find in imaging can be found.

2. The whole body image can be obtained quickly by one examination of PET-CT. Other imaging examinations are to scan a selected part of the body, which is easy to miss the diagnosis of lesions in other parts of the body. PET-CT scan only takes about 20 minutes, and can obtain PET, CT and the fusion of the two sections and three-dimensional images of the whole body, which can intuitively see the lesions in the affected parts and distribution of the whole body.

3. PET-CT can realize the "four definitions" of medical imaging diagnosis. That is, "localization" refers to the discovery of lesions and the location of lesions; "qualitative" refers to the identification of pathological and pathophysiological properties of lesions (differentiation between benign and malignant); "quantitative" refers to PET-CT not only can provide the size, scope and density of lesions, but also can provide functional and metabolic indicators (glucose metabolic rate, local blood flow, oxygen consumption, etc.) which can be more in-depth and in-depth counter-essential. Reflect the nature and degree of the disease; "periodicity" refers to the determination of the stage of development of the disease.

4. PET-CT examination is safe and non-invasive. PET or PET-CT has been used in the United States and other developed countries for nearly 30 years. Radionuclide and X-ray radiation are within the safe range. The imaging agent used is the basic element of human life. The examination is very safe, non-toxic, allergic and other side effects.

4. PET-CT Examination Notes

Positron drugs used in PET-CT examination need to be produced on the same day, with short half-life and high cost. They need to be inspected on time according to the appointed time. Drinking more water 1 to 2 days before PET-CT examination is prohibited. Diabetics can take hypoglycemic drugs normally. If barium meal examination or barium enema has been done recently, the intestinal barium is required to be cleared before examination. Stop taking food or drugs that affect the results of the tests. Inspection day fasting 4 to 6 hours, appointment in the morning inspectors do not eat breakfast, appointment in the afternoon inspections do not eat lunch. High protein and low carbohydrate foods are required before fasting. Drink plain boiled water, prohibit alcoholic, sugar and coffee drinks, avoid high-intensity exercise, in order to limit the excessive intake of drugs in local muscles. If abdominal lesions are suspected, fasting should be carried out for 12 hours. Brain examinations should be fasting for at least 6 hours, and all unnecessary medications should be discontinued (consult a clinician). Cardiac examination may allow light diet, but coffee, tea and alcoholic beverages should be prohibited within the first two days, and aminophylline and other vasodilators should be discontinued (in special cases, please follow the doctor's advice).

In addition, there will be visiting physicians who will make inquiries about the patients. Please give a detailed description of the course of diagnosis and treatment, and try to provide comprehensive medical records, laboratory sheets, other imaging findings and image data, such as B-mode ultrasound, X-ray, CT, MR. If you have diabetes mellitus, dysuria, fecal incontinence, body metal foreign bodies, pregnancy and breast-feeding, unable to lie down, mobility inconvenience, consciousness disorders, recent barium meal examination, etc. If the patient is in a serious condition and can not stop taking the medicine, please ask the clinician to indicate it on the application form. After injection, rest quietly for 50 minutes or more. Avoid mental tension and emotional excitement during waiting period. Do not talk or walk with others. Do not chew or use mobile phones. Before imaging, urine should be emptied. Do not drop urine on clothes or skin to avoid affecting the diagnostic results.
If this happens, please inform the doctor in time.

In addition, all metal and dense articles should be removed. No jewelry should be worn. No metal jewelry or metal zippers should be worn. Movable dentures should be removed. Women should also remove underwear with metal washers. During machine scanning, it is usually necessary to lie on your back, raise your arms for over 30 minutes, and fix your limbs to avoid body movement. The examination takes a long time and requires the examiner to have a certain tolerance. For those with claustrophobia, anxiety disorder or children, relaxant drugs and psychotropic sedative drugs should be used when necessary, accompanied by family members and medical staff. Some patients may need to accept delayed imaging according to the situation. After the examination, please continue to wait in the designated rest area and leave only after the staff has given clear notice. Do not leave on your own.

2.3. Arrhythmia

Arrhythmia is caused by abnormal activation or excitation of sinoatrial node outside the sinoatrial node. The conduction of excitation is slow, blocked or transmitted through abnormal channels, i.e. the origin of cardiac activity and/or conduction disorders lead to abnormal heart beating frequency and/or rhythm. Arrhythmia is an important group of cardiovascular diseases. It can occur alone or in association with other cardiovascular diseases. Its prognosis is related to the cause, inducement, evolutionary trend of arrhythmia and whether it leads to severe hemodynamic disorder. It can cause sudden death by sudden onset, and can also cause heart failure by sustained involvement.

1. Common causes of arrhythmia

Hereditary arrhythmias are mostly caused by mutations in gene channels, such as long-QT syndrome, short-QT syndrome, Brugada syndrome and so on. Acquired arrhythmias can be seen in various organic heart diseases, including coronary atherosclerotic heart disease (CHD), cardiomyopathy, myocarditis and rheumatic heart disease (RHD), especially in the occurrence of heart failure or acute myocardial infarction. Arrhythmias occurring in basic health or in patients with autonomic nervous dysfunction are also rare. Other causes include electrolyte or endocrine disorders, anesthesia, hypothermia, thoracic or cardiac surgery, drug effects and central nervous system diseases, some of which are unknown.

2. Assessment of arrhythmia

1) Evaluation of serum potassium

(1) Determination of serum potassium

Serum potassium levels were measured in all patients within 2 hours after admission. The Laboratory of our hospital uses the full automatic biochemical analyzer E1 Li 7600 to detect, uses the whole reaction process photometric method, continuously determines the absorbance of the reaction solution, and then converts the light signal into electrical signal to output the test results.

(2) Serum potassium stratification method

The results showed that the fluctuation of serum potassium at 3.5-3.3 mmol/L was normal and lower than 3.5 mmol/L (normal). The lower limit is hypokalemia.

2) Evaluation of serum brain natriuretic peptide (BNP)

(1) Detection of BNP

Serum BNP levels were measured in all patients within 2 hours after admission. It is completed by the Laboratory Department of our hospital. Abbott i1000 automatic chemiluminescent immunoassay instrument was used to detect by electrochemiluminescent method. There are two kinds of substrates: ruthenium trichlorobipyridine complex and tripropylamine. Its basic principles include electrochemical reaction process and chemiluminescence process.

(2) BNP Hierarchical Method

The results showed that the fluctuation of serum BNP at O-100pg/ml was normal and above the normal upper limit of 100pg/ml.

3. Experiments

3.1. Research subjects

In this study, 772 patients with coronary heart disease (CHD) underwent 18 F-FDG PET/CT myocardial imaging in hospital, including 501 males and 271 females. The age ranged from 35 to 65 years, with an average of (54.36 + 10.40) years. The patients were examined by chest X-ray, electrocardiogram, color Doppler echocardiography and F-FDG PET/CT myocardial metabolic imaging. Coronary angiography was performed within one week.

3.2. Experimental Equipment
3.3. Experimental Operation

Six hours before the examination, the blood sugar concentration was measured by automatic blood glucose meter. The patients with blood sugar < 7.77 mmol/L took 0.6 g/kg of glucose orally according to their body weight. The blood sugar was adjusted to 7.77-8.88 mmol/L. The patients were injected 18F-FDG imaging agent into the median elbow vein within 30 minutes (5-7 MBq/kg according to their body weight). After injection, rested for 40 minutes quietly, performed cardiac pre-positioning scanning, and collected images for 7 minutes. The images of the horizontal long axis, vertical long axis and short axis of the heart were obtained by special computer software according to the axial direction of the heart. Using the American Heart Association (AHA) 17-segment scoring method, the left ventricular 17 myocardial segments were semi-quantitatively scored by 4-point method: normal = 0, sparse = 1, obvious sparse = 2, defect = 3. Myocardial viability index = the sum of segments/stages.

4. Discussion

4.1. Arrhythmia Analysis

The relationship between arrhythmia types and influencing factors (number of coronary artery lesion branches, blood potassium level, serum BNP and cardiac function): There was no significant difference between the types of arrhythmia and the number of coronary lesion branches, BNP level (P > 0.05); while the types of arrhythmia were related to blood potassium level, and the incidence of ventricular arrhythmia was higher in hypokalemia (65.9%, P < 0.05). With the increase of the number of coronary artery lesions, the incidence of arrhythmia in three-vessel lesions is high. As shown in Table 1 and below.

<table>
<thead>
<tr>
<th>Table 1. Analysis of arrhythmia related factors</th>
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<tbody>
<tr>
<td>Number of coronary artery lesion branches</td>
</tr>
<tr>
<td>Single branch</td>
</tr>
<tr>
<td>Double branch</td>
</tr>
<tr>
<td>Three branches</td>
</tr>
<tr>
<td>Blood potassium</td>
</tr>
<tr>
<td>normal</td>
</tr>
<tr>
<td>Low potassium</td>
</tr>
<tr>
<td>BNP</td>
</tr>
<tr>
<td>normal</td>
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<td>Rise</td>
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![Figure 1. Comparison of the number of coronary artery lesions and types of arrhythmias](image-url)
4.2. Analysis of PET/CT

All patients underwent 18F-FDG PET/CT myocardial metabolic imaging without discomfort. All patients completed the examination in good condition and obtained high-quality imaging results. All patients had different degrees of abnormal myocardial metabolism in myocardial segments, as shown in Figure 4.

Combined with the results of PET/CT imaging, the overall myocardial viability index was (0.48-0.93) according to the 4-point semi-quantitative method. Among them, 15 segments were sparse, 18 segments were obviously sparse and 13 segments were defective. The Echo semi-quantitative motor score showed that there were 39 segments with or without motor activity, which were consistent with the survival index of PET metabolic imaging (P=0.60). However, the detection rate of PET/CT for Grade 1 myocardial activity was 8.0%,
which was higher than that of color Doppler echocardiography (4.8%), as shown in Table 2.

<table>
<thead>
<tr>
<th>Segmental score (score)</th>
<th>Number of segments in PET/CT</th>
<th>Segmental Number of Cardiac Color Doppler Ultrasound</th>
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<tbody>
<tr>
<td>0</td>
<td>142 (72.6%)</td>
<td>147 (80.1%)</td>
</tr>
<tr>
<td>1</td>
<td>14 (8%)</td>
<td>8 (4.8%)</td>
</tr>
<tr>
<td>2</td>
<td>17 (8%)</td>
<td>18 (10.1%)</td>
</tr>
<tr>
<td>3</td>
<td>12 (6%)</td>
<td>13 (5%)</td>
</tr>
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According to the blood supply area of three coronary arteries, LAD is responsible for 1, 2, 7, 8, 13, 14 and 17 segments, LCX is responsible for 5, 6, 11, 12 and 16 segments, RCA is responsible for 3, 4, 9, 10 and 15 segments. The total number of abnormal or defective segments of LAD was 21, accounting for 27.3% of the blood supply segments of LAD. The number of abnormal or defective segments of LCX was 13 (23.6%) and 14 (25.4%) segments of RCA had abnormal or defective metabolism. According to the semi-quantitative survival index, the most severely damaged segment was the apex, and the survival index was (1.55 +1.21).

5. Conclusions

(1) According to the analysis of arrhythmia, there was no significant difference between the types of arrhythmia and the number of coronary artery lesions and the level of BNP (P > 0.05); while the types of arrhythmia were related to the level of blood potassium, and the incidence of ventricular arrhythmia was higher when blood potassium was low (65.9%, P < 0.05). With the increase of the number of coronary artery lesions, the incidence of arrhythmia in three-vessel lesions is high.

(2) BNP can promote the excretion of sodium and water, relax blood vessels, antagonize renin, angiotensin, aldosterone system and block the conduction of sympathetic nervous system. Besides, BNP can also inhibit the induction of cardiac fibroblasts (CFS) by transforming growth factor-131 (TGF.p1), thereby preventing the occurrence of myocardial fibrosis and hindering it. Cardiac signal transduction pathway smoothly transmits abnormal ECG signals.

(3) In this study, the non-invasive myocardial perfusion and the degree of coronary stenosis were evaluated simultaneously by PET/CT, and the diagnostic efficacy of adenosine perfusion imaging with PET/CT and color Doppler ultrasound in coronary heart disease was discussed. The results showed that the detection rate of coronary heart disease by PET/CT was higher than that by color Doppler echocardiography.

Acknowledgements

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