Assessment Of The Dynamics Of Indicators Of Unstable Atherosclerotic Plaque In CT-Coronary Angiography With The Use Of Ganoderma Lucidum

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Abstract. This article presents data on CT angiography and the effect on the cardiovascular system of such a well-known fungus as Ganoderma Lucidum. It is known that Ganoderma Lutsidum improves the performance of the cardiovascular system due to the action of triterpenes and polyglucans, which improve the rheological properties of blood, improve blood flow and nutrients. However, a number of questions remain unclear to the end: what is the mechanism of the influence of the Ganoderma Lucidum on the cardiovascular system in the stage of decompensation. There are no clear and unambiguous answers to the question of how Ganoderma Lutsidum affects the state of atherosclerotic plaque. In this article, we will try to answer these and many other questions on the appropriateness of the application of the Ganoderma Lucidum.

Key words: atherosclerotic plaque; CT-coronary-angiography; Ganoderma Lucidum; coronary artery disease; low density lipoproteins; low density lipoproteins

INTRODUCTION

Despite the success of modern medicine in the diagnosis and treatment of coronary heart disease (CHD), this pathology continues to occupy a leading position among the causes of mortality and disability of people of active working age [1]. In this regard, today one of the main tasks of healthcare is to optimize the algorithms for the diagnosis of coronary artery disease, including screening examination of patients with low and medium risk of coronary artery disease, dynamic monitoring of patients with chronic coronary artery disease and atherosclerotic plaques with signs of instability, and the development and improvement of methods to detect atherosclerotic lesions with signs of instability, which are a threat from the point of view of the development of adverse cardiovascular event (acute coronary syndrome - acute coronary syndrome, myocardial infarction - infarction, sudden cardiac death) [2]. The non-invasive and most accessible method in clinical practice for screening and dynamic observation in patients with stable lesions of the space craft is multispiral computed tomodraphy (MSCT). [3]. A more difficult task is the diagnosis of unstable lesions. To this end, methods are used to assess the structure of an atherosclerotic plaque: optical coherence tomodraphy (OCT) and intravascular ultrasound (IVUS) [4]. However, due to the invasive nature of these studies and the high cost, the application of these techniques in clinical practice is limited to large clinical diagnostic centers and cannot be considered as a routine procedure recommended for widespread use.

Thus, a large number of drugs have been proposed for the treatment of coronary heart disease, but their long-term use, side effects associated with their use and high cost do not allow patients to get rid of this ailment. In this regard, I want to look at the mushroom Ganoderma Lucidum. Until now, there is no exact information on its application and the appropriateness of use [5-19], therefore, we consider it relevant to conduct such a study.

THE AIM OF THE STUDY.

To evaluate the dynamics of indicators of unstable atherosclerotic plaque during CT-coronary angiography with the use of Ganoderma Lutsidum.

MATERIALS AND RESEARCH METHODS.

We examined 74 patients with complaints of chest pain of a typical and atypical origin, lasting more than 3 weeks, which was planned to conduct MSCT CA. During the study, patients were divided into subgroups depending on the clinical manifestations of IHD (by the presence of a clinic of typical or atypical angina) and the result of the treadmill test (positive or negative). Typical symptoms of coronary heart disease included pain behind the sternum of a burning and / or pressing nature, arising from physical and psycho-emotional stress, with possible irradiation in the arms, neck, supraclavicular region and lasting no more than 5-10 minutes. Atypical symptoms included discomfort and pain in the chest, not associated with physical activity and lasting more than 10 minutes. Clinical examination, examination and medical history were carried out during initial contact with the patient. With all patients included in the study, periodic contacts were made by telephone (after 3 and 6 months). After 10-12 months of observation, patients with soft plaques were called for re-examination and MSCT of the SC. In case of obvious changes in the course of the underlying disease due to the development of coronary insufficiency, unscheduled examinations were carried out, if necessary hospitalization in a hospital. The examination included: A general blood test, a biochemical blood test with determination of the lipid spectrum parameters: OX, TG,
HDL, LDL, VLDL, atherogenic coefficient, blood test for thyroid-stimulating hormone.

Electrocardiogram at rest. Registration was performed in 12 standard leads on a SHILLER MAC 6 PN 407465-034 cardograph with an automatic analysis function. Holler daily ECG monitoring was performed once. Registration system - 2-channel monitor SHILLER MT-100. Data analysis system - SHILLER MT-200 program. The load test of treadmill was performed once against the background of cancellation of therapy with beta-blockers, antagonists of Ca-receptors and nitrates 3 days before the study. The generally accepted absolute and relative contraindications to the study, the criteria for terminating the load, and the criteria for identifying myocardial ischemia were taken into account. The test was conducted on the device MARQUETTE MAX 1, the treadmill - MARQUETTE 2000 TREADMILL. The BRUCE protocol was used with a continuously increasing load, with a duration of steps of 3 minutes. Ultrasound of the heart was performed on a VIVID 5 GE apparatus (General Electric). Local kinetics of the left ventricle was evaluated using a 16-segment model. The segments of hypo-, a- and dyskinesia, changes in myocardial thickness, the presence of heart aneurysm, and other standard parameters were determined. MSCT KA was performed on an AquilionONE 640 computed tomograph (Toshiba, Japan), which allows one to simultaneously obtain 640 tomograms with a minimum slice thickness of 0.5 mm per one revolution of the x-ray tube (0.275 s). To reduce heart rate (HR) in order to obtain CT images of optimal quality, all patients who had a heart rate of more than 60 beats / min were given an additional dose of 50 mg metoprolol tartrate adrenergic blocker an hour before the study. Patients who had a pressure greater than or equal to 110/70 mm Hg were prescribed a sublingual dose of 0.5 mg nitroglycerin in 5 minutes. before the procedure. The study was conducted according to the standard protocol in the native and arterial phases of contrast enhancement. The native phase was performed with prospective ECG synchronization to assess the severity of calcification of the coronary arteries and the calculation of the coronary calcium index. When performing the arterial phase, retrospective ECG synchronization was used. Through the peripheral venous catheter (sizes 18 and 20 G, depending on the patient’s weight), an iodine-containing X-ray contrast preparation Ultravist 370 was sequentially injected using an automatic syringe at a dose of 1 ml per kg of body weight and 100 ml of physiological saline at a speed of 4, 5 ml / s. Upon reaching an x-ray density in the descending aorta of 180-200 HU, the arterial phase of the study automatically started. The average effective dose was 10-15 mSv. The SCORE and ACC / AHA scales were used to stratify the risk of cardiovascular complications. Also, the pre-test likelihood of coronary heart disease was determined for all patients. To assess adherence to therapy, we used the Morisaki-Green test; this test is widely used in clinical practice to screen patient adherence to medication.

**STATISTICAL RESEARCH METHODS.**

For continuous variables, the difference between the groups was determined using the Student t-test under normal distribution, using the Wilcoxon sum method and the Man-Whitney test for abnormal distribution, as well as the hequadrate method and the exact Fisher method for discrete variables. Statistical processing of the study was performed on SPSS software version 11.5 (Biostat). Differences were considered statistically significant at p <0.05.

**THE RESULTS OF THE STUDY.**

The average age was 63.9 ± 10.4 years. The average glomerular filtration rate is 71 ± 12.8. Typical symptoms of angina pectoris were observed in 53 (71.6%) patients, atypical - in 21 (28.4%). The medical history and the results of laboratory and instrumental examination methods revealed the following risk factors for the development of coronary heart disease: arterial hypertension, smoking, obesity, diabetes mellitus, aggravated heredity, dyslipidemia. The most common risk factor in these patients was arterial hypertension, which was observed in 52 (70.3%) patients. In addition, obesity and smoking were frequent risk factors, respectively 58.8% and 54.1% of cases. Diabetes mellitus was observed in 12 (16.2%) patients.

**Table 1. General characteristics of patients included in the study (n = 74)**

<table>
<thead>
<tr>
<th>Probability</th>
<th>Low</th>
<th>Medium</th>
<th>High</th>
<th>Very high</th>
</tr>
</thead>
<tbody>
<tr>
<td>Number of patients, n (%)</td>
<td>9 (12,2%)</td>
<td>49 (66,2)</td>
<td>14 (18,9)</td>
<td>2 (2,7)</td>
</tr>
</tbody>
</table>

**MSCT DATA CA**

Due to the poor image quality and high values of the calcium index (more than 600 units) of the coronary arteries, 6 patients were excluded from the study. The data of the remaining 68 people were analyzed: in 19 (27.9%) patients there were no signs of atherosclerotic lesions of the coronary arteries, in 12 (17.6%) - less than 50% stenosis was revealed, in 24 (35.3%) - stenosis was from 50 to 69%, 11 (16.2%) - stenosis from 70 to 99% and in 2 (2.9%) cases, coronary artery occlusion was detected. Patients in whom hemodynamically significant stenosis and occlusion of the coronary arteries were detected were referred for invasive coronary angiography, during which MSCT data were confirmed. At the next stage, the MSCT and load test data were compared.
Table 3. Comparison of MSCT data and exercise tests in different groups of patients.

<table>
<thead>
<tr>
<th>Stenoses ≥70% (n)</th>
<th>Stenoses 50-69% (n)</th>
<th>The absence of atherosclerotic lesions (n)</th>
<th>Summary</th>
</tr>
</thead>
<tbody>
<tr>
<td>Men with typical pain, stress test positive</td>
<td>4</td>
<td>6</td>
<td>4</td>
</tr>
<tr>
<td>Men with atypical pain, stress test positive</td>
<td>1</td>
<td>0</td>
<td>2</td>
</tr>
<tr>
<td>Men with typical pain, negative stress test</td>
<td>1</td>
<td>6</td>
<td>3</td>
</tr>
<tr>
<td>Men with atypical pain, stress test negative</td>
<td>2</td>
<td>1</td>
<td>1</td>
</tr>
<tr>
<td>Women with typical pain, stress test positive</td>
<td>4</td>
<td>3</td>
<td>6</td>
</tr>
<tr>
<td>Women with atypical pain, stress test positive</td>
<td>1</td>
<td>1</td>
<td>2</td>
</tr>
<tr>
<td>Women with typical pain, negative stress test</td>
<td>0</td>
<td>5</td>
<td>1</td>
</tr>
<tr>
<td>Women with atypical pain, negative stress test</td>
<td>0</td>
<td>1</td>
<td>0</td>
</tr>
</tbody>
</table>

Due to the fact that during the study hemodynamically significant atherosclerotic lesions were detected in three patients and they were aimed at revascularization, 30 patients continued to participate in the study. After 10-12 months, all patients underwent a repeat CT scan.

Table 4. Indicators obtained during repeated MSCT SC and measurement of cholesterol and LDL.

<table>
<thead>
<tr>
<th>Indicator</th>
<th>Initial value</th>
<th>Value in 10-12 months</th>
<th>p</th>
</tr>
</thead>
<tbody>
<tr>
<td>Total cholesterol, mmol / l</td>
<td>5.75±0.45</td>
<td>4.42±0.57</td>
<td>0.03</td>
</tr>
</tbody>
</table>

In the high adherence group, there was a significant decrease in total cholesterol from 5.71 ± 0.69 to 4.15 ± 0.60 mmol / L (p<0.05). Positive dynamics in the high adherence group was demonstrated with respect to a decrease in the total volume of plaques (from 192.53 ± 67.02 to 175.65 ± 63.53 mm3 (p<0.05)).

In the medium adherence group, there was a slight decrease in the total volume of plaques (from 225.45 ± 55.83 to 219.08 ± 59.51 p> 0.05) and the volume of low-density components in the plaque (from 70.77 ± 27.14 up to 77.33 ± 28.37 mm3). In contrast, in the low adherence group, an increase in the total volume of plaques (from 148.77 ± 31.85 to 169.10 ± 34.08 mm3 (p> 0.05)) and the volume of low-density components in the plaque (from 50.86 ± 15.30 to 54.31 ± 16.59 mm3 (p> 0.05)).

Changes in the percentage of stenosis did not significantly differ between groups: from 52 ± 7.12 to 51.38 ± 6.60% (p> 0.05) in the high adherence group, from 55.54 ± 7.53 to 53.54 ± 7.58 (p> 0.05) in the medium adherence group and from 45.66 ± 7.63 to 49.75 ± 6.07 (p> 0.05). The volume of components of the average x-ray density in the plaque in the high adherence group decreased from 89.9 ± 38.43 to 86.84 ± 36.75 mm3 (p> 0.05), while in the medium adherence group the insignificant increased from 104.38 ± 33.04 to 101.79 ± 32.36 mm3 (p> 0.05).

In the low adherence group, an increase in volume was observed from 69.57 ± 14.86 to 76.14 ± 16.36 (p> 0.05). The volume of high X-ray density components in the plaque in the high adherence group increased from 36.69 ± 12.30 to 42.00 ± 30.19 mm3 (p => 0.05), in the medium adherence group, the volume decreased from 51.06 ± 14.35 to 47.06 ± 7.88 mm3 (p> 0.05), and in the low-adherence group it increased from 28.32 ± 11.64 to 34.59 ± 10.74 mm3 (p> 0.05).

The remodeling index did not significantly change in all groups: 1.26 ± 0.15 versus 1.17 ± 0.06 (p> 0.05) in the high adherence group, 1.21 ± 0.08 versus 1.13 ± 0.07 (p> 0.05) in the medium adherence group, and in the low adherence group 1.37 ± 0.13 versus 1.31 ± 0.15.

CONCLUSIONS:
1. With a good adherence to Ganoderma therapy, Lutsidum within 10-12 months shows a significant decrease in the volume of soft atherosclerotic plaque (-13.3 mm$^3 \pm 5.6$ mm$^3$ vs +20.3 mm$^3 \pm$ compared with patients with low adherence to therapy) 8.1 mm$^3 p = 0.02$), mainly due to areas of "low X-ray density" (-6.1 mm$^3 \pm 3.0$ mm$^3$ vs +3.45 mm$^3 \pm 2.8$ mm$^3 p = 0.002).

2. The decrease in the volume of plaques according to MSCT has a significant positive correlation with a decrease in LDL levels (R = 0.51; p = 0.002).

3. The diagnostic value of MSCT CA is superior to that for a standard test with physical activity in identifying obstructive lesions of the coronary arteries. The sensitivity of the standard test with physical activity in the detection of stenosis is more than 70% = 76%. The sensitivity of the standard test with physical activity in the detection of stenosis is more than 50% = 40.8%.

REFERENCES:


