# Application of Low-dose CT Scanning Combined with Serological Index Detection in the Diagnosis of Lung Cancer

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**Abstract: Objective:** To analyze the role of low-dose CT combined with serological indexes in the diagnosis of lung cancer. **Methods:** 67 patients with lung cancer in our hospital from August 2019 to August 2021 were selected as group A, and 67 healthy persons accepting physical examination in our hospital during the same period were selected as group B. Low-dose CT scanning and serological index detection were performed. The serological indexes of the two groups were compared, and the diagnostic accuracy of low-dose CT simple scanning and combined diagnosis for lung cancer was compared. **Results:** The levels of serological indexes in group A were higher than those in group B (P < 0.05). Taking surgical pathology as the gold standard, the accuracy and sensitivity of combined diagnosis were higher than those of low-dose CT scanning (P < 0.05). The image quality of low-dose CT scanning was excellent, accounting for 77.61% (52 / 67), and the size of nodules could be clearly detected. **Conclusion:** Low-dose CT combined with serological index detection can improve the diagnostic accuracy, and the serological indexes of lung cancer patients is higher. The image quality of low-dose CT scanning is better and lung cancer diseases can be effectively detected through joint diagnosis.

## 1. Introduction

The incidence rate of lung cancer is the first in many kinds of malignant tumors. The causes include long-term smoking, inhalation of dust, environmental pollution and mental stress [1]. The early diagnosis of lung cancer is difficult because there are few typical symptoms, and it is easy to be missed and misdiagnosed. CT scanning is a common diagnostic method of lung cancer. It can observe the lung images and find the lung lesions. However, the dose selection of CT scanning is controversial. Clinical practice has found that low-dose scanning can obtain ideal image quality, low radiation and higher diagnostic safety. On this premise, combined with serological detection can effectively improve the disease detection rate [2]. Therefore, 67 patients with lung cancer and 67 healthy people were selected to analyze the diagnostic significance of low-dose CT scanning combined with serological index detection.

## 2. Data and Method

### 2.1 General Data

67 patients with lung cancer admitted from August 2019 to August 2021 were selected as group A, including 36 males and 31 females (41-80 years old). The average age was (51.24 $\pm$ 1.62) years old. The body weight ranged from 46 kg to 91 kg, with an average of (68.24 $\pm$ 1.62) kg. 67 healthy persons admitted for physical examination during the same period were selected as group B, including 38 males and 29 females (40-82 years old). The average age was (51.35 $\pm$ 1.40) years. The body weight ranged from 45kg to 90kg, with an average of (68.61 $\pm$ 1.33) kg. There was no difference in data by hypothesis test (P > 0.05).

### 2.2 Method

First, the subjects of the two groups were scanned with low-dose CT. 64-row spiral CT machine was used with the voltage set at 90kV, the pitch set at 1.0, the current set at 30mA, the layer thickness set at 5.0mm, the scanning range set from chest to lung bottom, the mediastinal window width set at 350HU, the window level set at 25 to 35HU, the lung window width set at 1500HU, and the window level set at 600 to 700HU. The scanned images were double-blind read by two imaging doctors, and the unified diagnostic results were given. Then we took serological index detection, collected 5ml venous blood under fasting state, separated the serum after centrifugation, and put it in the environment of minus 30 ℃ for standby. Laminin (LN) and neuron specific enolase (NSE) were detected by quantitative enzyme-linked immunosorbent assay, and carcinoembryonic antigen (CEA) and acidic ferritin (AIF) were detected by radioimmunoassay.

## 2.3 Observation Indexes

The normal range of LN was (115.7 ± 17.3) ng / ml and that of NSE was < 12.5 μ g / L. The normal range of CEA was < 3.0ng/ml, and the normal range of AIF was 15-200 μ g / L. Beyond the above range, it was positive.

Taking surgical and pathological results as the gold standard, the accuracy = (true positive number + true negative number) / number of detection cases, sensitivity = true positive number / (false negative number + true positive number), specificity = true negative number / (false positive number + true negative number).

Excellent CT scanning quality: no artifact, clearly displayed lung texture and lesion contour. Medium: artifacts did not affect the diagnosis, and the lung texture and lesion contour were normal. Poor: artifacts affected the diagnosis, lung texture development and lesion contour development were blurred. The detection of nodules by CT scanning was recorded.

## 2.4 Statistical Analysis

The data processing was completed by SPSS21.0 software, the measurement data was compared and tested by t value, and the counting data was compared and tested by $x^2$ value. Assuming that the verification is meaningful, the P value is less than 0.05.

## 3. Results

### 3.1 Comparison of Serological Indexes between the Two Groups

The serological indexes in group A were higher than those in group B (P < 0.05).

Table 1 Comparison of serological indexes between the two groups[$\bar{x} \pm s$]

| Group | Cases | LN（ng/ml） | NSE（μg / L） | CEA（ng/ml） | AIF（μg/L） |
|---|---|---|---|---|---|
| Group A | 67 | 205.34±10.26 | 16.25±2.32 | 9.24±1.32 | 221.32±15.32 |
| Group B | 67 | 130.21±5.35 | 5.82±0.65 | 2.01±0.32 | 73.26±4.32 |
| t | - | 53.147 | 35.434 | 43.571 | 76.138 |
| P | - | 0.000 | 0.000 | 0.000 | 0.000 |

### 3.2 Comparison of Accuracy between Low-dose CT Scanning and Combined Diagnosis

The accuracy and sensitivity of combined diagnosis were higher than that of low-dose CT alone (P < 0.05).

Table 2 Comparison of accuracy between low-dose CT scanning and combined diagnosis [n /%]

| Diagnostic mode | | Pathologic diagnosis | | | Sensitivity | Specificity | Accuracy |
|---|---|---|---|---|---|---|---|
| | | Positive | Negative | Total | | | |
| Low-dose | Positive | 54 | 5 | 60 | 90.00 | 16.67（1/6） | 82.09（55/67） |
| CT | Negative | 6 | 1 | 7 | （54/60） | | |
| Combined | Positive | 61 | 2 | 63 | 98.39 | 60.00（3/5） | 95.52（64/67） |

| diagnosis | Negative | 1 | 3 | 4 | （61/62） | | |
|---|---|---|---|---|---|---|---|
| x2 | - | - | - | - | 3.966 | 2.213 | 6.081 |
| P | - | - | - | - | 0.046 | 0.137 | 0.014 |

### 3.3 Analysis of Image Quality and Nodule Detection of Low-dose CT

The image quality of low-dose CT scanning was excellent, accounting for 77.61% (52 / 67), and the image quality accounted for 14.93% (10 / 67). Poor image quality accounted for 7.46% (5 / 67). The average minimum diameter of the nodule was (0.17 $\pm$ 0.15) cm, the average maximum diameter of the nodule was (2.95 $\pm$ 0.24) cm, and the average diameter of the nodule was (3.42 $\pm$ 0.24) cm.

### 4. Discussion

The most common location of lung cancer is bronchial epithelial epithelium, which has a high incidence rate [3]. The cure rate of early lung cancer after targeted surgical treatment is about 70%, but most lung cancer patients are diagnosed in the late stage of the disease, and the 5-year survival rate is only 9%. Therefore, it is considered that the diagnostic technology of lung cancer should be strengthened and the combined diagnostic method should be adopted. CT scanning is a common imaging diagnostic technique for lung cancer, but conventional dose has strong radiation. Low-dose CT scanning can inhibit radiation damage and reduce the damage of detector or X-ray tube [4]. In addition, low-dose CT scanning does not affect the discrimination of lung lesions, and the image quality is better, and the diagnostic effect equivalent to the conventional dose can be obtained. Combined with the detection of serological indexes on the basis of CT scanning can improve the diagnostic effect. LN is distributed in the basement membrane of cells and belongs to non-collagen glycoprotein. It mediates immune response, inflammatory development and tumor metastasis. After binding with LN receptor on tumor cells, it can provide favorable conditions for tumor metastasis and infiltration [5]. NSE is considered as a tumor marker of lung cancer. It is mainly distributed in neuroendocrine cells such as adrenal gland and pituitary gland. The increase of its synthesis and release will accelerate the development of tumor. CEA is a tumor-associated antigen, which has strong expression ability in malignant tumor affected organs and high sensitivity for the detection of lung cancer. AIF is a ferritin isomer and one of the tumor markers, which can evaluate the severity of lung cancer [6].

The results showed that the level of serological indexes in group A was higher than that in group B ($P < 0.05$). It shows that serological indexes are related to the development of lung cancer and can be used as an evaluation index of lung cancer. The accuracy and sensitivity of combined diagnosis were higher than that of low-dose CT alone ($P < 0.05$). It shows that the effect of combined diagnosis is better and can clearly detect lung cancer. In addition, low-dose CT scanning can clearly detect the size of nodules, and the image quality is better, indicating that it is more practical.

In conclusion, low-dose CT scanning combined with serological index has better diagnostic effect, and can be used as a common diagnostic method for patients with lung cancer.

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