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# Clinical value of enhanced CT in the diagnosis of pulmonary sequestration

**Mingqing Kou, Yaohua Chen[a,*]**

*Shaanxi Provincial People's Hospital, Xi'an City, Shaanxi Province, 710068, China*
*[a]279376894@qq.com*
*[*]Corresponding author*

***Abstract:*** *To explore the clinical value of enhanced CT in the diagnosis of pulmonary sequestration, our hospital randomly selected 100 patients with suspected pulmonary sequestration as the experimental study subjects between 2014 and 2021. All patients underwent enhanced CT, and the pathological examination results were used as the gold standard to analyze the sensitivity, missed diagnosis rate, and accuracy of enhanced CT diagnosis. Through experimental investigation, it can be concluded that enhanced CT has a high clinical diagnostic value for changes in pulmonary sequestration, with a sensitivity of 98% and a misdiagnosis rate of 7% for patients with pulmonary sequestration. Applying enhanced CT to the clinical practice of isolated lung segment patients will improve their clinical diagnostic accuracy and provide a basis for subsequent treatment work and formulation of appropriate treatment plans.*

***Keywords:*** *Radio enhanced CT; Diagnosis of Pulmonary Sequestration; Clinical Value*

## 1. Introduction

Pulmonary sequestration is a common type of congenital developmental malformation of the lung in clinical practice. Usually, the disease occurs in the posterior basal segment of the left lower lobe of the lung, supplying blood to the systemic circulation and not communicating with the bronchi [1] \. During the onset of the disease, normal lung tissue and some lung tissues are in a separate state, which can have adverse effects on the patient's normal life. It can even endanger the lives of patients, so in order to develop more scientific treatment plans, it is necessary to strengthen imaging examinations. Currently, enhanced CT is used in clinical practice in China for examination. Its examination process is relatively intuitive and has high accuracy, which can comprehensively display the range and degree of the patient's lesion, evaluate, and observe the lesion from multiple angles and directions, display the blood supply vessels, and develop appropriate treatment plans. This article analyzes the value of using enhanced CT examination in clinical practice when diagnosing pulmonary sequestration.

## 2. Experimental Data and Methods

### *2.1 Experimental data*

This article mainly conducts an experiment on patients who received diagnosis and treatment in our hospital from March 20, 2019, to March 20, 2020. Among them, 100 patients with suspected pulmonary sequestration were selected as the research subjects for this experiment. Divide these 100 patients equally into two experimental groups, each consisting of 50 patients. Among them, there are 20 male patients and 30 female patients in the control group; The minimum age is 30 years old; the maximum age is 36 years old, and the overall average age is 34 years old; 20 cases had hemoptysis symptoms, 12 cases had cough and sputum symptoms, and 18 cases had chest pain and bloody pus symptoms. In the experimental group, there were 19 male patients and 31 female patients; The minimum age is 33 years old; the maximum age is 38 years old, and the overall average age is 35 years old; 28 cases had hemoptysis symptoms, 16 cases had cough and sputum symptoms, and 6 cases had chest pain and bloody pus symptoms. There was no significant difference in basic data such as gender and age between the two experimental groups ($P>0.05$).

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### *2.2. Experimental Methods*

The control group of patients underwent contrast examination, using iodopropane injection as the contrast injection, and carried out a series of diagnostic work according to the imaging procedures. The experimental group of patients underwent radiation CT diagnosis. Before diagnosis, the patients were kept in a supine position and underwent routine chest CT plain scan, followed by enhanced CT diagnosis. The diagnostic range is from the tip of the lung to the top of the diaphragm and extends to the patient's bilateral kidneys based on it. Using pulmonary angiography, enhanced CT examination is used to determine the correlation between the entire lung tissue mass and abdominal blood vessels [2]. The layer thickness is set to 2mm, the voltage is set to 120kV, and the current is set to 220mA. Iodipamide injection solution is used as the contrast agent, with a dose control of 100ml and an injection rate of 3.5ml per second. After the end of injection, a delay of 20 seconds was observed, and the pulmonary vein curvature was delayed by 55 seconds. Scanning data was processed using techniques such as volume rendering and multiplanar reconstruction to reconstruct the patient's blood vessels and observe their supply and drainage arteries.

### *2.3. Observation indicators*

Compare the specificity, sensitivity, and accuracy of the two groups. The gold standard for diagnosis is surgical pathological examination and MRI. The calculation method for each indicator is: sensitivity=number of true positive cases/(true positive false negative) number of cases × 100%; Specificity=number of true negative cases/(true negative false positive) cases × 100%; Accuracy=(true negative true positive) number of cases/total number of cases in each group × 100%.

### *2.4. Statistical methods*

Using software SPSS 22.0 for data analysis, X2 test was performed with (%) representing the count. When $P<0.05$, significant differences in comparability were indicated.

## 3. Lesion principle

### *3.1. Location and morphology of lesions*

The research subjects in this group are all single lesions, and internal masses can be observed in the lung tissue of patients. The lesions are in the posterior basal segment of the lower lobes of both lungs, with 34 cases located in the left lower lung, accounting for about 65.38%, and 18 cases located in the right lower lung, accounting for about 34.62%; There are 41 cases of interlobar type, accounting for approximately 78.85%, and 11 cases of extra lobar type, accounting for approximately 21.15%.

### *3.2. Internal density characteristics and morphology of lesions*

Among the 100 patients in this group, there were a total of 58 cases (about 285%) with cystic lesions. The lesions were mainly characterized by atrial lesions, with the internal components mainly being liquid, and the thickness of the cyst wall was uneven; There were 15 cases of solid lesions, accounting for about 15%. The lesions had clear edges and internal masses with significant enhancement; There were 9 cases of cystic solid lesions, accounting for about 9%. The substantial components of the lesions contained multiple cystic areas, with the internal components mainly liquid and accompanied by gas. The thickness of the substantial components was uneven, and edge enhancement could be clearly observed.

### *3.3. Aortic blood supply and incidence of emphysema*

Among the 100 patients studied in this group, there were a total of 44 patients confirmed by surgery to have abnormal aortic blood supply, accounting for about 44%. Among them, there were 20 cases of abnormal thoracic aortic blood supply, 15 cases of abnormal vascular arterial blood supply, 3 cases of abnormal abdominal aortic blood supply, and 18 cases of abnormal diaphragmatic artery blood supply. The CT findings of patients with abnormal blood supply are consistent with the observations during surgery. There was a total of 42 patients with emphysema in this group, accounting for approximately 42%.

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## 4. Results

The misdiagnosis and missed diagnosis rates in the experimental group were lower than those in the control group (P<0.05). The detection rates of intrapulmonary type, extra lobar type, solid lesion, cystic lesion, emphysema at the lesion, and abnormal aortic blood supply in the experimental group were higher than those in the control group (P<0.05). The sensitivity, specificity, and accuracy of the experimental group were higher than those in the control group (P<0.05)

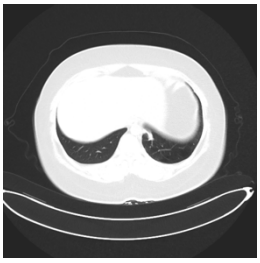
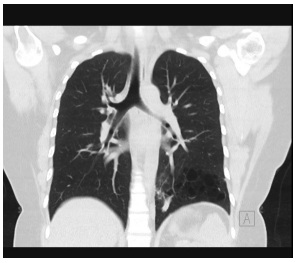


*Figure 1*



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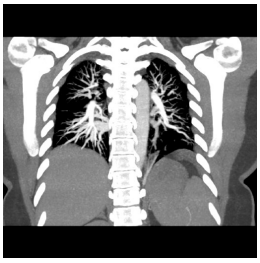

*Figure 3*

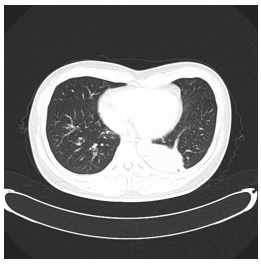

*Figure 4*

*Figure 5*

*Figure 6*

Figure 1-3: shows a 29-year-old male with pulmonary sequestration (interlobar type), with abnormal soft tissue density shadow in the left lower lung. After enhancement, a blood supply artery from the abdominal aorta can be seen in the coronal view.

Figure 4-6: A 33-year-old male with pulmonary sequestration (extra lobar type) has an abnormal soft tissue mass in the left lower lung. After enhancement, a blood supply artery from the abdominal aorta can be seen in the coronal view.

## 5. Discussion

Pulmonary segment isolation disease refers to the abnormal development of a portion of lung tissue, which leads to its inability to achieve the respiratory function it should have during normal physiological activities in the human body, and the isolation between other lung tissues that still have normal physiological functions. The main reason for the above pathological changes is due to significant abnormalities in the arterial blood supply system of the patient's lungs. This can lead to varying degrees of cysts in the lungs [3]. Lung tissue, which is in a pathological state at the same time, can only obtain a certain amount of blood through a limited internal circulation system during normal bodily activities and metabolic processes.

Exploration of the Application Value of Radio CT Diagnosis in Patients with Pulmonary Segmental Sepsis

Pulmonary segment isolation is a rare lung disease characterized by obstruction of segmented alveoli and small bronchi in the lungs, resulting in some lung tissues being unable to ventilate properly and ultimately leading to pulmonary segment isolation. The exact cause of this disease is not yet clear, and the current diagnosis mainly relies on radiation CT examination. This article aims to explore the application value of radiation CT diagnosis in patients with pulmonary sequestration [4].

Radio CT can provide high-resolution images of the lungs from different angles and levels and can clearly display the anatomical structure of lung segments. By evaluating the shape, size, position, and distribution of lung segments, it can help determine the location and range of lung segment isolation, thereby guiding the development of treatment plans. Radio CT can also detect the ventilation function of lung tissue after lung segment isolation, determine whether the ventilation function of the isolation

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segment is completely lost, and provide a basis for surgical treatment.

Radio CT can also evaluate the hemodynamic status of pulmonary circulation by observing the diffusion perfusion images of the lungs in patients with pulmonary segmentizes. After pulmonary segment isolation, lung tissue usually exhibits pulmonary artery dilation and pulmonary capillary bed proliferation, leading to abnormal changes in pulmonary circulation [5]. Quantitative analysis of radiation CT can accurately evaluate indicators such as pulmonary blood flow, blood flow velocity, and vascular resistance, quantitatively describe abnormal changes in pulmonary circulation, and have important value for clinical treatment and prognosis judgment.

Radiological CT can also be used as one of the means to evaluate pulmonary infections and other complications. Patients with pulmonary sequestration are prone to pulmonary infections and complications due to obstruction of lung tissue. Radiological CT can clearly observe the lesions and inflammatory manifestations of lung infections, including pulmonary parenchymal lesions, inflammatory exudates, and abscess formation. It can also determine the progression of infections and the extent of lesions, providing reference for clinical treatment.

The application of radiation CT in patients with pulmonary segregations has important clinical significance. It can provide accurate anatomical images, evaluate pulmonary hemodynamics, evaluate pulmonary infections and complications, and has the characteristics of non-invasive, fast, and safe. For clinical doctors, mastering radiation CT technology proficiently and applying it reasonably can improve the diagnostic accuracy and treatment effect of patients with pulmonary segregations.

For a considerable period in the past, the clinical medical community has been discussing the causes of pulmonary segment isolation diseases, and there have been several different views. However, currently, a relatively scientific view is that congenital developmental abnormalities in the lungs of patients are a fundamental cause of pulmonary segment isolation diseases. For pulmonary segment isolation diseases caused by congenital developmental abnormalities of the lungs, partial pulmonary developmental abnormalities are the main symptom. This part of the lung tissue is not connected to the trachea and trachea, lacks normal respiratory function, and is also isolated from the normal physiological parts of adjacent lung lobes. In addition, it can also manifest as the lungs not being affected by the normal blood supply of the pulmonary arteries but being provided with corresponding blood by the aorta in an abnormal state. Patients with pulmonary segment isolation diseases are mainly divided into two types in clinical practice: interlobar and extra lobar. For the former, the lobes mainly exist inside the visceral pleura, while for the latter, the lobes mainly exist outside the visceral pleura. Compared to the pathological changes of these two types, interlobar lung disease is relatively common in practical clinical work.

The specific pathogenesis of pulmonary sequestration in clinical practice has not been fully elucidated, but foreign experts in related fields have published Prwce theory and accessory lung bud theory to explain this disease. The Ptwce theory is highly recognized in Western medicine clinical practice, which states that in the early stages of embryonic development, the visceral capillaries around the primary intestine and lung buds are connected to the dorsal aorta. Therefore, when the lung lobe tissue and other tissues detach and develop, the connected blood vessels undergo occlusive absorption. However, due to certain influencing factors, the above normal blood vessel occlusion absorption does not occur, forming abnormal branches of the aorta, Part of the embryonic lung tissue is pulled back to form pulmonary sequestration. Therefore, this study explores in detail the misdiagnosis, missed diagnosis, and accuracy of radiation enhanced CT in diagnosing pulmonary sequestration.

The specific pathogenesis of pulmonary sequestration in clinical practice has not been fully elucidated, but foreign experts in related fields have published Prwce theory and accessory lung bud theory to explain this disease. In Western medicine clinical practice, there is a high recognition of the Ptwce theory, which states that in the early embryonic stage, the visceral capillaries around the gastrula and lung buds are connected to the dorsal aorta. Therefore, when the lung lobe tissue and other tissues detach and develop, the connected blood vessels undergo occlusive absorption, but due to certain influencing factors, the above normal blood vessels do not undergo occlusive absorption, forming abnormal branches of the aorta, After traction, a portion of embryonic lung tissue forms pulmonary sequestration[3]. Therefore, this study explores in detail the misdiagnosis, missed diagnosis, and accuracy of enhanced CT in the diagnosis of pulmonary sequestration. Pulmonary sequestration is a common clinical malformation of lung development, which can be divided into two types based on anatomical structure: (1) Intralobar type: tissue in the pleural layer of the lung, which was originally not connected to the bronchi, becomes connected to it after infection and forms a cyst; (2) Lobar type: Surrounded by a separate pleura, entering the systemic vein from the vein. The above two types are

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both supplied by the aorta or intercostal artery. Once supplied to the middle segment, it can affect blood flow and endanger life safety. In order to save the patient's life in a timely manner, early detection, diagnosis, and treatment are also necessary. The main advantages of enhanced CT are: (1) Enhanced CT has the characteristics of simple operation, more intuitive and accurate imaging information, and can clearly display the relationship between the lesion and surrounding tissues, display the structure of the bronchovascular bundle, and the examination time is short. Under conventional circumstances, it only takes 30 seconds; (2) Radioenhanced CT can accurately display lung lesions, distinguish pathological types, and clearly and accurately display abnormal blood supply arteries, thus providing a basis for formulating treatment plans; (3) Radioenhanced CT can display the specific situation of abnormal blood supply arteries, display multi-plane and three-dimensional imaging techniques for lesion tissue, and have high resolution, which can reduce the misdiagnosis rate[4] . Clinical diagnosis of pulmonary sequestration mainly involves the use of X-rays, CT, etc., to analyze the clinical value of enhanced CT diagnosis for pulmonary sequestration. Radioenhanced CT can provide a more intuitive understanding of the dense strip like shadows in the aorta connecting the patient's lung tissue lesions, evaluate whether they are abnormal blood supply arteries, and use them as an important reference for disease diagnosis results. In enhanced CT, abnormal blood vessels in the lesion are displayed in detail, and then a three-dimensional rotation method is used to observe comprehensively. Combined with three-dimensional imaging and the condition of the patient's bronchial vascular tree structure, it is determined whether the patient has specific lesions and to understand the condition of the patient's pulmonary sequestration. The detection rate of abnormal blood supply arteries in this study is 100.0%, and the origin, course, and size of the abnormalities can be clearly displayed. However, traditional detection mainly uses arteriography, which is highly traumatic and fails to display the condition of adjacent tissues outside the bronchial vessels during diagnosis[5] . In addition, the situation of reflux veins in the pulmonary vein phase is clearly displayed during enhanced CT scanning, resulting in high accuracy and significant clinical value.

## 6. Conclusion

In summary, the clinical application of enhanced CT in the diagnosis of pulmonary sequestration is more effective. Compared with traditional imaging examinations, it can provide more intuitive and accurate information about abnormal blood supply artery branches, venous reflux, and other abnormalities in patients. Multiple plane volume structures are used to reduce the misdiagnosis rate of the disease, which can be used as a reference to develop effective surgical treatment plans, widely promote and apply to clinical practice.

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