Original Research Article

The performance of multi-slice spiral CT in pulmonary laceration and its application value

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ABSTRACT

Benzoxazine resin, a new type of phenolic resin, has many advantages such as strong molecular design, no small With the continuous development of social information and modernization, the deepening of medical technology in the social status and role is also more and more important. The digitization and visualization of medical science and technology provide great convenience for the reading and access of clinical information. At the same time, it also improves the efficiency and accuracy of information reading and access. In addition, as China's population continues to proliferate, various traffic accidents are appalling, and serious consequences such as chest trauma and head trauma are also common in hospital emergency cases. Patients with pulmonary laceration need CT timely diagnosis and repair of the pulmonary pleural rupture, if not timely and accurate judgments will seriously endanger the safety of patients. To explore the performance of multi-slice spiral CT in pulmonary laceration and its application value, aim to improve the accuracy of CT dynamic observation of disease changes, improve the medical diagnosis technology and reduce the mortality rate of patients. For patients with pulmonary laceration, the diagnosis of rapid and effective, review, you can avoid missed or misdiagnosed, rest assured. And multi-slice spiral CT in the early diagnosis, multi-slice spiral CT used in clinical examination or diagnosis, the effect of great reference value, it is worth promoting the use.

KEYWORDS: multi-slice spiral CT; pulmonary laceration; pulmonary cyst; application value

In 1987, Siemens developed and introduced the world's first spiral CT [1], continuous spiral scanning way to open a new era of medical field. In 1998, under the continuous efforts of medical and technical personnel, multi-slice spiral CT (MSCT) was introduced on the basis of single helix and double helix, and the development of CT technology was pushed to a new level [2]. Multi-layer CT with conical X-ray beam, multi-row detector, you can continuously rotate and scan a week to obtain multi-layer images, greatly improving the speed of clinical image scanning, rotation week scan time can be as short as 0.5 seconds. As a result of multi-slice spiral CT can quickly volume scan, you can in a short time on the patient's body to a wide range of continuous data collection, and then through the scientific treatment of the computer, you can get a layer of a variety of technologies formed only 0.75mm image [3].

At present, the clinical diagnosis of lung laceration mainly X-ray and multi-slice spiral CT as the main basis for diagnosis [13], but the X-ray presence of low resolution, before and after the overlap is not three-dimensional and other shortcomings make the patient small shadow the appearance is not obvious, to the doctor's patients with great inconvenience [14].

The application of multi-slice spiral CT technique makes it possible to observe the morphological details of patients with pulmonary laceration clinically, can we observe the changes of lung surface, pulmonary interstitium and pleura caused by early secondary infection in patients [15]. Is it possible to obtain detailed information on early lung function in patients with clinical diagnosis? Multi-slice spiral CT technology is a simple, quick, comprehensive, repeatable operation, convenient and practical medical imaging examination method [16], this technology is also the major clinical medicine in modern medicine to check the lung tear An important way of diagnosis of patients, through the multi-slice spiral CT technique, can clearly observe the patient's lung tissue cavity size, distribution, shape and evolution of the law, for patients with lung laceration , The diagnosis of fast and effective, review, you can avoid misdiagnosis or misdiagnosis, peace of mind [17]. In this study, 60 cases of traumatic patients admitted in our hospital in June 2014 were selected for the study. The patients were treated with multi-layer CT machine. The patients were observed and recorded. All the patients were observed and analyzed.

1. Materials and methods

1.1. Research objects

Six patients (37 males and 23 females, aged 16-58 years, mean age (26 ± 12) years) were enrolled in this study. Sixty male patients (22 males, 26 cases of patients, 12 cases of stroke patients). Clinical manifestations: the majority of patients conscious, mostly complex trauma; decimal patients with confusion, hemorrhagic shock and difficulty breathing, mostly caused by high-altitude falls or car accidents; no serious cases of death. So the patients were within 2h for the use of multi-layer CT machine chest scan, observe and record all patients with lesions. According to clinical treatment, 36 patients underwent CT review and 32 patients underwent X-ray review.

Exclusion criteria: history of exposure to toxic substances, lungs with pulmonary imaging diagnosis of the disease or dust, non-dust caused by abnormal lung function.

1.2. Inspection methods and equipment

All 60 patients with lung laceration were treated with supine position, with both hands, using the GE Brightspeed elite 16-SCT to perform chest scans in the range of approximately 3 transverse widths from the thoracic entrance to the xiphoid, scanning parameters: 150 mAs, 120 kV, pitch 1.375: 1, matrix 512 X 512, DFOV = 36.0 cm, frame rotation time 0.8 s, reconstruction layer thickness 1.25 mm, reconstruction distance 1.25 mm, final standard algorithm reconstruction.

1.3. Image processing

All three-dimensional lung models (3D-lung) were modeled using a scientific surface shaded display (SSD) technique [53] and were manually resected according to the study's need [54]. Observation of the three-dimensional model, research and analysis were carried out.

1.4. Statistical methods

All data were processed using SPSS 17.0 statistical software [55]. Measurement data using t-test, count data comparison using chi-square test to $P < 0.05$ that the data were statistically significant.

2. Results

2.1. Lesions of the site statistics

In the study, 60 patients completed the first CT scan and thin-layer reconstruction within 0.5-2 hours after trauma. CT results showed that there were 35 cases of left upper lobe and 30 cases of left lower lobe, 25 cases of right upper lobe, 20 cases of right lower lobe and 20 cases of middle lobe. A total of 130 lesion sites were found in all patients, including 46 (35.4%) in the pulmonary central area, 84 (64.6%) in the surrounding area of the lungs and under the pleural position. There were 25 (41.7%) patients with only one lobe in the lesion, 30 (50%) patients with cumulative lobes, 5 (8.3%) patients with three or more lobes, The

Table 1 to study the location of patients with lesions and range statistics

Lesions Location	Number of lesions (%)	Number of lesions in the cumulative site (%)		
		Single lobe	Two lobes	3 lobes and above
Peripheral and sub-pleural	84 (64.6)	36 (42.9)	42 (50.0)	6 (7.1)
Lung central area	46 (35.4)	18 (39.1)	26 (56.5)	2 (4.4)
P	0.0000		0.0000	

Observation Table 1 shows 35.4% of the pulmonary central area, 64.6% of the lesions around the lungs and below the pleura, and the difference was statistically significant (P <0.05). There were 25 (41.7%) patients with only one lobe in the lesion, 30 (50%) patients with cumulative two lobes, 5 (8.3%) patients with three or more lobes, (P <0.05). There was no significant difference between the two groups (P <0.05). In Table 2 shows, the difference was statistically significant (P> 0.05). The number of lesions in the lung group was much more than the other groups, the data were statistically significant (P> 0.05). Suggesting that the use of multi-layer CT in patients with lung laceration of different manifestations of the display is very satisfactory in the study can be intuitively clear distinction between different types of patients with lung laceration lesion size and number of lesions, and clear different patients The size, morphology, evolution and distribution of the cavity in the lung. For the reality of patients with complications and differentiation, making the clinical diagnosis of different lung laceration and early treatment of significant significance.

Table 2 Patient test results analysis

Type	Number [n (%)]	Number of lesions [n (%)]	Lesions ($\bar{x} \pm s$) (mm)	CT performance
Lung Airbag	15 (25)	35 (27)	26.24 ± 18.32	Round, oval, glass
Lung air bladder	25 (41.7)	65 (50)	30.26 ± 19.14	Round, oval, fissure
Pulmonary hematoma	5 (8.3)	15 (11.5)	13.85 ± 5.48	
	15 (25)	15 (11.5)	10.69 ± 3.68	Oval, clear boundary
Total	60 (100.0)	130 (100.00)	3-50	Honeycomb-like, fissure, blurred

2.2. Multi-slice spiral CT diagnosis of the performance

1) Observed and analyzed the results of the results, among all the patients were diagnosed in emphysema in 15 cases, 35 lesions, including flat lesions 15, round or oval-shaped lesions 15, cyst wall thickness uneven uneven lesions 3, cyst wall thin and uniform lesions 2, cyst wall around the flaky frosted glass-like shadow, emphysema in the 3-28mm. The patient's image can clearly see a certain degree of pulmonary gas and cyst, in all patients with CT image analysis, pulmonary gas cysts in a total of 25 patients found 65 lesions, can be clearly seen Gas and liquid level, and the number of liquid within the lung gas capsule, which was arc lesions 30, was fissure-like lesions 5, the performance of circular or oval-shaped lesions 30. A total of 15 cases of patients with pulmonary hematoma, a total of 15 lesions were found, the shape of the main oval, and hematoma border clear, the size of 40-5-HU. The remaining 5 patients showed a honeycomb-like change, showing a low-density honeycomb-like shadow, there are many small round, fissure-like weather, the border blurred.

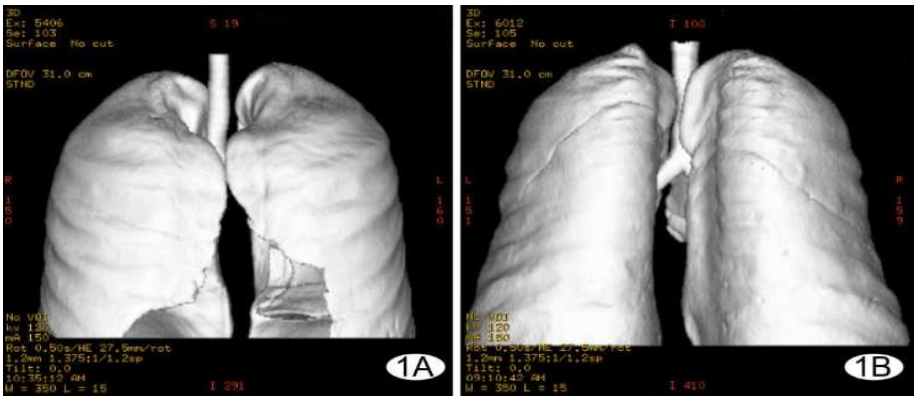
Note: Figure 1 pulmonary multiple gas cysts, subcutaneous emphysema; Figure 2 pulmonary airbag, subcutaneous emphysema; Figure 3 pulmonary hematoma

2) According to the statistical data of the study data, according to the occurrence of lung laceration in patients with different manifestations of the performance of the classification: + Type of lung tissue around the parenchyma liquid or flat air chamber, individual patients with pneumothorax This is due to the rupture of the lung tissue in the chest wall caused by violent oppression, which is the most common manifestation. Type: the main manifestation for the patient's lung tissue pressure plane or cystic lesions in the lesion on both sides of the spine, its formation is mainly due to the patient's lung tissue compression caused by displacement to the formation of the lung tear, this situation also more common. +++ Type: the occurrence of this situation is mostly due to the patient received external force caused by

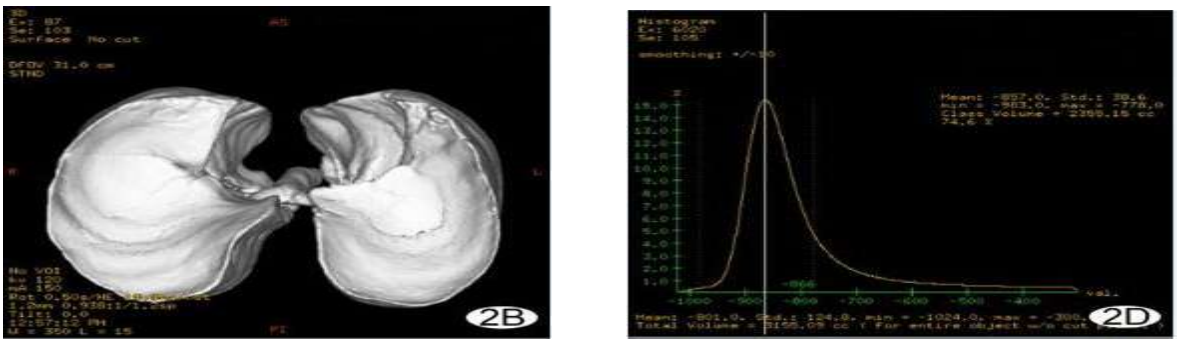
the adjacent rib fractures caused by thoracic bone perforation of lung tissue, imaging mainly for line-like translucent shadow and near the chest wall where small cysts, Patients are usually accompanied by a certain degree of subcutaneous hemorrhage or with gas-liquid chest. ++++ Type: clinically, this situation is generally rare, mainly caused by excessive compression of the lung tissue in the pleural area or by tearing of the rib fracture. In the clinical medical imaging examination, it is often affected by other types the impact of cover, it is difficult to easily find.

2.3. Three-dimensional reconstruction of lung surface reconstruction images

In the study, 60 patients with three-dimensional surface reconstruction images showed that both sides of the lung tissue is not smooth, lack of full. Tongduo multi-angle of its rotation, you can very intuitive to find the patient's lung surface appears in the curvature of the diaphragm and the tip of the lung. At the same time in the individual patients with three-dimensional reconstruction of the image can be seen on a certain point-like plus cable-like shadow, scattered in the dotted shadow and groove and groove. With the help of computer technology for data collection and processing at the same time, and after the processing technology collectively referred to as medical imaging processing technology. Image analysis includes image description and image segmentation, image description, simply to have a basic understanding of the image, and for different images of different characteristics and relationships described, so before the analysis should be all the image segmentation. Including the different images of the arts, color, statistical characteristic and grayscale to distinguish between different organizations or organs, after segmentation of the image in the lesion area changes and changes with the normal tissue has many changes, which can be multi- Angle more intuitive to show the effect. At present, the two most commonly used display technologies are surface rendering (SR) and volume rendering (VR). The commonly used SR technique is used as an SSD post-processing.



Note: Figure 2 patients with three-dimensional lung surface reconstruction image 1A front view, 1B rear view.



Note: 2B lung laceration in patients with diaphragmatic tendon pleural surface reconstruction; 2D laceration in patients with lung volume histogram

In the observation of Figure 2, the display of small shadows is very important for the diagnosis, the main is to rely on high EC chest radiographs to define, the depth of the overlap before and after the resolution caused by the judgment is not accurate, through the observation shows that in patients of the three-dimensional lung surface reconstruction images show that the visceral pleura, lung tip and diaphragm surface do not smooth, which indicates that the lungs are subject to certain tearing caused great consequences, although there is no serious traction deformation changes, but its small scars have been locally distributed, not yet covered by the whole lung, the state is more stable.

2.4. CT results

According to the degree of lung laceration of patients with varying degrees, according to the degree of patients were divided into different time periods to review, of which 1-5 days to review the patient in 20 cases, the patient's performance of the lungs capsule cavity fluid into the formation of lung gas cysts, there was a flat phenomenon, and the scope of lung laceration than the first CT observation was significantly increased, the lesion around the blurred; in the 6-21 days to review the patients had 18 cases, the patient after the review of the image shows that the patient's lung The liquid in the gas-liquid capsule cavity is more obvious than the first examination, the formation of high liquid level, the patient's lung gas capsule around the ground-glass shadows were gradually dilute the situation, indicating that gradually absorbed, making the patient lesions around more and more smooth, before showing a large number of non-edge blurred hemorrhagic lesions gradually formed a clear edge of the hematoma. A total of 12 patients were examined in 22-3 months. CT images showed that the lungs and pneumocysts of the patients had a tendency to decrease gradually, and even disappeared, the boundary line became clear and the fiber spline, the patient's lesion began to shrink, the other no significant changes. 10 patients in 6 months to 1 year review, hematoma has not yet fully absorbed, the image of the spindle-shaped high-density shadow.

2.5. Manifestations of complications

Through the clinical manifestations of all patients found that a total of 36 patients with laceration can be seen in varying degrees of pulmonary contusion, no bleeding status, the main performance of the patient's lung tear parts or around adjacent to the flaky, plaque-like shiny-like density of the shadow, the longitudinal diaphragm of the situation of pneumatics there are 6 patients with obvious manifestations, pericardial pneumococcal patients in 6 cases, 3 cases of blood pneumothorax, chest wall subcutaneous accumulation of gas in patients 10 cases of patients with rib fractures in 26 cases, including scapular fractures in 3 patients, 6 patients with clavicle fractures, thoracic or lumbar fractures in 16 cases, and there are 2 cases of severe patients with brain or abdominal injury , The condition has been basically effective mitigation.

3. Discussion

Clinical diagnostic methods commonly used in imaging: X-ray plain film: low cost and simple method [56], usually in the display of the medial joint space, bone bearing area, skeletal malformations and bone articular surface has a significant advantage [57], better than MRI and single spiral CT [58]. So it can be used as the preferred medical imaging method for bone or joint disease.

MRI examination: Compared with X-ray, MRI has the characteristics of multi-parameter imaging and multi-planar imaging [59], but also includes some similar CT techniques for bone or joint capsule and surrounding soft tissue, intra-articular free body. Antero-posterior joint space and the adjacent joint bone lesions show the advantages, but also can directly show bone marrow infiltrative lesions, edema and articular cartilage changes. MRI in the bone and joint system there are some deficiencies, mainly relative to the bone and soft tissue lesions of the qualitative diagnosis of non-specific, and relatively slow to imagine the imagination. In contrast to CT, the display of a small amount of joint effusion is clearer, and the prediction of the fracture of the articular surface of the patient and the fracture of the fracture and the articular surface, as opposed to the X-ray and CT, ambiguous but have a certain reference value, MRI examination is mainly used to diagnose early necrosis.

CT examination: CT technology since its inception, with its unique value to be used clinically [62]. CT in the multi-layer spiral technology, and MSCT has a high density resolution, relative to the X-ray film [63], can be found difficult to find the soft tissue abnormalities, and can be very clear understanding of patient lesions the scope of the border and the location, can be effective in distinguishing joint capsule hypertrophy, bone and soft tissue around the joints edema, cysts and tumors and distinguish between articular effusion. But also can enhance the scan of blood vessels and blood supply information; in the image processing, the resolution is high, there is no overlapping shadow, to the image of the specific x-ray film is difficult to find intra-articular calcification and bone free state, so as to specifically determine the internal structure of the location, size and other information.

Multi-slice spiral CT technology has been widely used in all areas of clinical medicine today, MSCT CT history is a historic breakthrough in the patient's condition to make a reasonable and effective diagnosis, in addition to the basic clinical basis of the patient's physical characteristics and the performance of symptoms, you can have a powerful post-processing function of the MSCT technology to damage the location of patients with quantitative and quantitative analysis of a detailed understanding of the degree of damage to the patient's lung tissue, which also more intuitive understanding of the patient's lung Surface and internal histopathological changes, so as to provide a more objective basis for the early treatment of patients with pulmonary tear, and to analyze the CT manifestations of pulmonary laceration [66] by analyzing the data of the study and to deepen knowledge of lung laceration.

The application of three-dimensional reconstruction of clinical multi-slice spiral CT analysis: the common three-dimensional reconstruction and multi-planar technology are used in the principle of surface covered imaging (shaded surface display, SSD) technology, its first applied to Google's 3D imaging technology, with society continuous development and progress, SSD technology gradually applied to airway imaging and various parts of the blood vessel imaging, its main role is through the computer to develop upper and lower CT value of the structure of imaging. Through the selective settings, can make lung organs imaging, and higher than the density of the chest wall and mediastina vessels and other large blood vessels and other organizations are not imaging, but also on different vascular structure imaging. At the same time, there are some limitations, the first is the SSD is very sensitive to the changes in the CT, if the choice of inappropriate threshold will destroy its related structure, or cause false situation, and secondly, if the thickness of the correlation, there will be part of the edge effect or the volumetric effect of the error, and finally relative to the data collected during the movement of the patient, such as the patient's heart fluctuations and inhibition of breathing will form a certain virtual shadow.

Minimum intensity projection (mIP) and maximum density projection (MIP): both are simple form of volume display, the same imaging principle. MIP is the lowest pixel intensity produced by a computer through a chest ray, and the lowest intensity pixel is selected, that is, using mIP to perform bronchial imaging or both low-density trachea imaging, airway stenosis may be overly assessed [60]. In contrast, MIP technology is based on the original data acquisition, the choice of the highest intensity of the pixel imaging, usually in the vascular imaging into a wide range, through the maximum intensity of imaging pixels [78], to distinguish between blood vessels and pulmonary blood vessels between the structures, the effect is obvious. The drawback of MIP is that the overlapping effects of vascular structures are not well demonstrated, and this single effect cannot adequately explain the three-dimensional spatial arrangement of vascular anatomy to a certain extent.

Volume rendering technique (VRT): Compared with SSD and MIP, there are many similarities between the three, VRT technology does not need to define the surface of the definition, which contains the information and SSD and MIP have more significantly, it contains a greater amount of information and retains the anatomical relationship of the original data [82], forming a more realistic three-dimensional image. At the same time in the imaging and data processing takes a long time, but also need a more powerful computer function of the auxiliary.

In the use of modern medical imaging technology and computer technology for data collection and processing, can distinguish the total image of different substances or organizations, so in the three-dimensional lung surface reconstruction can be multi-angle, all-round, more intuitive observation of patients of the lesion area changes and the condition of development. This qualitative approach, to a certain extent, out of personal experience brought about by the differences in subjective factors, for the early diagnosis and early treatment of patients play a positive role. CT scanning technology and subsequent processing techniques include CPR, VRT, MPR and MIP and other multi-technology joint application, CPR technology can be curved in the rib imaging on a plane, the impact of the formation of patients with temporary hidden fractures display more intuitive, VRT as a representative of the three-dimensional images, to carry out any orientation of the rotation observation, and MIP technology with the joint application of the effect more intuitive and clear show the patient's condition, and MPR technology is the patient's condition transmission sexual results, and in particular, some of the details of the problem, making the diagnosis of patients with the credibility of the decision to improve. In order to improve the detection rate of lung trauma in patients with early lung laceration and localized pulmonary laceration. In addition to the dynamic observation of patients, in clinical diagnosis and follow-up treatment is of great significance.

At present in the clinical doctors will encounter a lot of sudden situation, if the loss of consciousness after the trauma of patients, they cannot subjective evaluation of their feelings, as in this case, imaging is difficult to determine when the CT should be on the patient , but with the progress of the times, in recent years to promote the popularization of CT at the same time, the corresponding improvement of these aspects [65], based on the needs of patients, combined with multi-slice spiral CT can be all aspects large-scale scanning function, specially designed to develop from the head to the lower limbs of the multi-layer spiral fast scan program, so that the patient's body scan, you can find the patient's underlying cause, reducing misdiagnosis by doctors and improves the patient's treatment rate and survival rate.

Now, in modern clinical, many method to check for the laceration but the results are uneven, through clinical research and comparative tests found that multi-slice spiral CT technology is a simple and fast, comprehensive, repeatable operation, the effect of a new type of medical imaging examination, for the examination of lung laceration has an extremely important guiding value. The late treatment techniques include the diagnosis of lung laceration have a great advantage. Not only in the diagnosis of credibility on the possession of a great advantage, but also to get more clear images to reduce the amount of X-ray radiation in patients with critically ill patients in the implementation of effective treatment at the same time, they avoid the chance of misdiagnosis or missed, For the clinical treatment provides a reliable basis [66].

4. Conclusion

In this study, 60 cases of traumatic patients admitted in our hospital in June 2014 were selected as the subjects, including 37 males and 23 females, aged 16-58 years, mean age (26 ± 12) years, 22 cases were injured, car accident patients in 26 cases, 12 cases of stroke patients. Clinical manifestations: the majority of patients conscious, mostly complex trauma; decimal patients with confusion, hemorrhagic shock and difficulty breathing, mostly caused by high-altitude falls or car accidents; no serious cases of death. So the patients were within 2h for the use of multi-layer CT machine chest scan, observe and record all patients with lesions. The scaffolds were scanned in the range of approximately 3 transverse widths from the thoracic entrance to the xiphoid, using the GE Brightspeed elite 16-SCT, with scanning parameters: 150 mAs, 120 kV, pitch 1.375: 1, matrix 512 X 512, DFOV = 36.0 cm, the rack rotation time of 0.8 s, reconstruction layer thickness 1.25 mm, reconstruction distance 1.25 mm, the final realization of the standard algorithm reconstruction. All three-dimensional lung models (3D-lung) were modeled using a scientific surface shaded display (SSD) technique and manually corrected according to the study's needs. Observation of the three - dimensional model, research, analysis. According to clinical treatment, 36 patients underwent CT review and 32 patients underwent X-ray review. To study the clinical manifestation and application value of multi - slice CT scanning technique in pulmonary laceration. (MSCT) images of high resolution computed tomography (CTCT) were used to analyze the relationship between lung tissue data and clinical diagnosis in the aspects of pulmonary laceration, airway and pleural changes. At the same time, the application of multi-slice spiral CT is summarized, which makes the morphological detailed description of the patients with pulmonary laceration clinically. The multi-layer image can observe the pulmonary surface, pulmonary interstitium and pleura change. Can be in the clinical diagnosis of quantitative access to patients with early lung function of the detailed information. Clinically, patients with mild lung laceration need to use some relatively sensitive means or diagnostic measures, and in order to further improve the performance of patients with mild pulmonary laceration in order to take the necessary intervention or timely treatment measures, never stabilized the patient's condition, to prevent secondary infection to prevent further development of the disease, improve patient quality of life and health status. General lung laceration are associated with varying degrees of lung contusion and a certain degree of chest injury and other injuries, for the differential diagnosis of clinical medicine is of great significance. At the same time in the diagnosis and treatment for patients at the same time, should be closely combined with the patient's history of trauma, and dynamic observation of the clinical characteristics of absorption analysis. And multi-slice spiral CT in the early diagnosis, relative to the chest in the comparison, can accurately detect a round or oval-shaped balloon or fissure image, multi-slice spiral CT used in clinical examination or diagnosis, the effect of the pole with reference value, it is worth promoting use. I believe that image navigation will be in the surgical trauma in a wide range of applications.

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