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Exploration on Diagnostic Value of Spiral CT in Acute Chest Trauma

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Abstract: Objective: to explore the diagnostic value of spiral CT in acute chest trauma. Method: 100 suspected patients with acute chest trauma who were received and treated in our hospital from January to October 2019 were chosen as the objects of study. All patients underwent DR examination and spiral CT examination. Meanwhile, pathological diagnosis results were followed up, and the diagnostic value of different methods in acute chest trauma was evaluated. Results: the diagnostic accuracy rate of spiral CT in acute chest trauma was higher than that of DR examination method ($P<0.05$), and there was statistical significance. The time of DR examination was more than that of spiral CT examination ($P<0.05$), and there was statistical significance. The ray dose in spiral CT examination was more than that in DR examination and there was statistical significance ($P<0.05$). Conclusion: spiral CT can confirm trauma type, location and influencing range in acute chest trauma diagnosis, and consume short time. Besides, the overall accuracy rate of diagnosis is high. However, the radiation dose in spiral CT examination is large, and protective measures should be taken by combining patient's individual differences.

1. Introduction

Acute chest trauma belongs to a common injury type, and it is often seen in traffic accidents and mechanical damages. After acute chest trauma happens, multiple injury types may exist, such as rib fracture, hemothorax, pneumothorax, hemopneumothorax and pleural damage [1]. Different chest injury requires diverse treatment measures. Effective diagnosis and identification of different chest injury types can guide patients to treat as early as possible. Radiological technology is a major method of acute chest injury, such as X ray, DR and CT. In particular, the development of multi-slice spiral CT technique and post-processing technology offers more choices for the diagnosis of acute chest trauma [2]. In this study, 100 suspected patients with acute chest trauma

who were received and treated from January to October 2019 were chosen as the objects of study, and spiral CT diagnosis was used for all patients. The retrospective analysis is as below:

2. Data and Method

2.1 General Data

100 suspected patients with acute chest trauma who were received and treated from January to October 2019 were chosen as the objects of study, including 54 male cases and 46 female cases. The age of all patients ranged from 23 to 75 years old, with the average age of 44.66±6.29. The reasons for injuries are as below: 62 cases were injured due to traffic accidents; 26 cases were injured due to falling from high places; 12 cases were injured from chest crush fir other reasons. When the patients were received, they had typical chest pain, hemoptysis and dyspnea, etc. All patients were informed and willing to participate in this study. The Ethics Committee of our hospital supported this study.

2.2 Method

The examination instruments used in this study are Beijing Wandong DR-200 medical X-ray radiography system and American GE 16-row multi-slice spiral CT. The corresponding examination methods are as below:

DR examination: the relatives of patients assisted the patients in examining standing front and side position as well as orthotopic supination position. Then, horizontal lateral examination was carried out. For the patients with suspected rib fracture, rib spot perspective was performed.

Spiral CT examination: the examination parameters were set as below: tube voltage 120KV, tube current 50mA, slice thickness and inter-slice spacing 10mm, screw pitch 1.35. The interest areas of different patients were determined, and thin-slice scanning was conducted for the interest areas. After the thin-slice scanning was completed, thin-slice reconstruction was performed for the patients. The acute chest injury types of different patients were assessed through lung window, mediastinal window and bone window reconstruction.

The same person completed the examination of all patients. After the examination was finished, 2 persons with 5-year work experience independently read the films and gave the diagnosis results. 2 medical workers unified the opinion finally and offered the diagnosis opinion.

During the examination, LiF-TLD measuring instrument was used to calculate the radiation dose in the examination process. The pathological diagnosis results were followed up to assess the accuracy rate of different diagnosis methods.

2.3 Observation Indexes

(1) Pathological diagnosis results; (2) comparison of accuracy rate of DR and spiral CT diagnosis; (3) examination time of two methods; (4) comparison of radiation dose of two methods; (5) expression of imaging data.

2.4 StatisticalMethod

After the research data were collated, SPSS18.0 was used to analyze the data. Measurement data: ±s, t test; enumeration data: (n, %), c2 test; P＜0.05: the different has statistical significance.

3. Results

3.1 PathologicalDiagnosisResults

Pathological diagnosis results of 100 patients are as below: 35 cases with rib fracture (35.00%), 21 cases with pneumothorax (21.00%), 12 cases with pulmonary contusion (12.00%), 10 cases with hemopneumothorax (10.00%), 14 cases with pleural effusion (14.00%), 8 cases with fracture and pneumothorax (8.00%).

3.2 ComparisonofAccuracyRateofDRandSpiralCTDiagnosis

The accuracy rate of spiral CT in the diagnosis of acute chest trauma – fracture was higher than that of DR, and the data analysis had statistical significance (P＜0.05), as shown in Table 1.

Table 1 Comparison of accuracy rate of DR and spiral CT diagnosis [(n, %), n=100]

Chest trauma	DR	Spiral CT	χ^2	P
Rib fracture	35（35.00）	33（33.00）	/	/
Pneumothorax	20（20.00）	17（17.00）	/	/
Pulmonary contusion	11（11.00）	9（9.00）	/	/
Hemopneumothorax	9（9.00）	7（7.00）	/	/
Pleural effusion	13（13.00）	12（12.00）	/	/
Fracture and pneumothorax	8（8.00）	6（6.00）	/	/
Total	96（96.00）	84（84.00）	8.000	0.004

3.3 Comparison of Examination Time

The time of spiral CT in acute chest trauma diagnosis was smaller than that of DR method, and the data analysis had statistical significance (P＜0.05), as shown in Table 2.

Table 2 Comparison of examination time ($\bar{\chi}$ ±s, n=100, s)

Examination method	n	Examination time
DR	100	19.12±1.85
Spiral CT	100	17.45±2.03
t	/	6.080
P	/	0.035

3.4 Comparison of Radiation Dose

The radiation dose of spiral CT in acute chest trauma diagnosis was more than that of DR method, and the data had statistical significance, as shown in Table 3.

Table 3 Comparison of radiation dose ($\bar{\chi}$ ±s, n=100, mSv)

Examination method	n	Radiation dose
DR	100	0.38±1.06
Spiral CT	100	5.34±1.23
t	/	30.546
P	/	0.000

3.5 Expression of Imaging Data

P / 0.000

2.5 Expression of imaging data

Main expressions of imaging data of acute chest trauma diagnosed by spiral CT include the following: (1) rib fracture, clear cortical fracture line of the rib can be seen in the examination; malposition or non-malposition exists at the fracture end, and there are certain insertion and angulation problems; (2) pneumothorax, strip-shaped or semilunar non-lung textured transmittance area exists at the front edge of the patient's chest in the examination; (3) pulmonary contusion, pulmonary texture increase and thickening can be seen in the patients during the examination, and the peripheral contour is fuzzy; the lesion area is of high density shadow and presents single or multiple spots, patch and large flake shapes. The lesion edge is fuzzy. The distribution of pulmonary contusion is related to the injury area; (4) hemopneumothorax, patient's injured mediastinum is close to the uninjured side in hemopneumothorax examination, and hemopneumothorax is mostly combined with rib fracture and thoracic vertebra fracture, etc.; (5) pleural effusion, liquid density image of the chest cavity can be seen in the CT examination.

Different patients have different volume and property of effusion, so the corresponding imaging data differ; (6) fracture combined with pneumothorax, there is an obvious fracture line in the examination, and meanwhile there is image data expression of pneumothorax.

4. Discussion

Acute chest trauma has a high morbidity clinically. Car accident injury and fierce bumping are the major pathogeneses of acute chest trauma, after the chest suffers sudden exogenic action, the energy can further transmit inward, thus leading to corresponding injury to the chest and pulmonary parenchyma [3]. Acute chest trauma includes multiple types. Clinical documents indicate that the overall fatality rate and disability rate of acute chest trauma are high. The effective early treatment can help patients save themselves, eliminate the pains and improve the therapeutic effect [4-5]. Considering therapeutic measures of different types of acute chest trauma differ, the timely and fast diagnosis is the key to the treatment of acute chest trauma.

Except inquiring patients' medical history, symptoms, signs and other basic information, imaging data examination also plays an important role in acute chest trauma examination. X-ray examination owns a high application rate in the early diagnosis of acute chest trauma. However, X-ray examination method has some problems, like missed diagnosis and misdiagnosis. In addition, it can provide only limited information for the clinical treatment scheme. Thus, misdiagnosis and therapeutic error may happen to some patients [6-7].

Acute chest trauma involves multiple types, and it is required to make the diagnosis and assessment fast. From this perspective, spiral CT has a high accuracy rate for the diagnosis of acute chest trauma. For example, apart from acute chest trauma, other injuries may exist in a car accident, and the harm of compound damages is large. The injury of patients' internal abdominal organs can be known from spiral CT, and the therapeutic schedule can be determined according to the injury diagnosis [8]. The clinical documents indicate that acute chest trauma often covers multiple rib fracture combined with pulmonary contusion or various emphysema problems. Mediastinum shift appears in the injury area of some patients. At this time, it is necessary to assess the positional relation between mediastinum and lung. Missed diagnosis may easily appear in conventional DR examination of various compound injuries, but spiral CT can be better used to diagnose all kinds of compound injuries, and contributes to standard treatment as early as possible [9].

In this study, DR examination and spiral CT examination were performed for the patients with acute chest trauma. According to the examination results, the accuracy rate of spiral CT (96.00%) was higher than that of control group (80.00%), verifying that spiral CT has the higher accuracy rate than DR in acute chest trauma diagnosis. This is because spiral CT has the higher accuracy rate of diagnosis. Besides, after thin-slice scanning, post-processing technology can be applied to complete the analysis, which can effectively improve comprehensiveness of injury examination and diagnosis and reduce missed diagnosis and misdiagnosis [10]. The time of spiral CT was smaller than that of DR in acute chest trauma examination, because multi-slice spiral CT has a high resolution ratio and can complete the examination fast. Moreover, it can achieve the large-scope examination and save time for the diagnosis of acute chest trauma. The radiation dose of spiral CT in the examination process was higher than that of DR. Hence, the protective measures should be taken for those who are sensitive to radiation in spiral CT examination. Since acute chest trauma involves multiple types

in the actual diagnosis, it is necessary to continuously summarize the corresponding spiral CT imaging data expression of different injury types so as to keep improving the accuracy rate of diagnosis.

Luo Kun analyzed the clinical diagnosis effect of 16-rwo spiral CT in acute chest trauma, and considered that multi-row spiral CT could diagnose acute chest trauma fast and accurately [11]. Wang Xiaobo investigated the application of multi-slice spiral CT in chest trauma diagnosis and held that ray dose of multi-row spiral CT is high, but the time consumed is short and the diagnosis result is more accurate [12]. The above studies are close to the conclusion of this study.

In conclusion, spiral CT can confirm trauma type, location and influencing range in acute chest trauma diagnosis, and consume short time. Besides, the overall accuracy rate of diagnosis is high. However, the radiation dose in spiral CT examination is large, and protective measures should be taken by combining patient's individual differences.

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