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RESEARCH ARTICLE

NEW APPROACHES TO THE DIAGNOSIS OF ACUTE PURULENT-DESTRUCTIVE LUNG DISEASES

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Abstract: Diagnosis of acute purulent-destructive lung diseases is an urgent problem of modern medicine despite its long history. In this regard, the currently known achievements in the field of pulmonology, thoracic surgery and intensive care, including the entire arsenal of effective antibacterial drugs of the new generation, acute purulent-destructive lung diseases still retain their extreme prevalence and threat to human life. In this regard, our study aimed to increase the effectiveness of methods for early diagnosis of acute purulent-destructive lung diseases. As a result of the study, we proved the high diagnostic efficiency of computed tomography in detecting changes in the lung tissue in their acute purulent-destructive diseases, which makes it possible to timely and accurately determine the localisation and extent of the pathological process and identify the presence of destruction cavities in the lung tissue. From a practical point of view, we have proved that computed tomography is the main method for diagnosing acute purulent-destructive lung diseases and an effective method in assessing treatment dynamics.

Key words: Acute purulent-destructive lung diseases, acute lung abscess, abscessed pneumonia, computed tomography.

INTRODUCTION

In terms of the frequency of lethal outcomes, acute inflammatory lung diseases are the leaders among all infectious diseases. In 20-25% of cases, acute inflammatory lung diseases are the cause of death and rank fourth among its causes [1].

On average, the incidence of acute inflammatory lung diseases is 10-15 cases per 1000 adult population. According to the World Health Organization, more than 10% of all hospitalised patients with acute inflammatory lung diseases are acute purulent-destructive lung diseases [2].

In recent years, there has been a trend towards an increase in the number of patients with acute purulent processes in the lungs, which include abscessed pneumonia, acute lung abscess, and lung gangrene. There is a steady increase in the morbidity and mortality of people of working age. Temporary disability in these diseases is registered in 30-40% of cases [3].

Disability in these diseases ranges from 5.3-23% of patients. Mortality in acute purulent-destructive lung diseases reaches 15%, while in patients with lung abscesses, this value ranges from 25% to 28%, and in the conditions of pulmonary gangrene, it reaches up to 80% [4].

One of the most important and common methods for studying inflammatory diseases of lung tissue is X-ray. The advantages of the X-ray method in the diagnosis of destructive processes in the lungs, according to many authors, are low radiation exposure, sufficient information content and availability [5].

At the same time, the data of traditional radiography in the diagnosis of pneumonia often present significant difficulties because overdiagnosis can reach 16-36%, and underdiagnosis of pneumonia is 2%-33% [6].

At present, computed tomography is more widely used in the diagnosis of respiratory diseases because this method of radiation diagnostics is the most accurate, as it has expanded the possibilities of detecting destructive processes in the lungs and made it possible to clarify the macrostructure of the zones of pathological changes [7].

We are talking about the accurate determination of the localisation, the spread of the process, and the detection of destruction against the background of the consolidation of lung tissue, which, in general, makes it possible to make a timely and correct diagnosis to choose the most effective treatment. Often, there is an unreasonableness of the prescription of computed tomography by clinicians without a preliminary X-ray, which also allows you to obtain information on acute purulent-destructive lung diseases, which entails additional radiation exposure to the patient, overloads the additional work of the department staff and increases the cost of treating the patient.

All of the above requires the development of an optimal diagnostic algorithm for examining patients with acute purulent-destructive lung diseases, which will provide early and accurate diagnosis of destructive changes in the lung tissue at different stages of the pathological process to reduce the time of examination and improve the prognosis of the disease.

METHODS

A total of 237 patients with cavities in the lung tissue in patients with clinical and radiological pictures of destructive pneumonia and acute lung abscesses were examined. In 142 (59.9%) patients, there was the destruction of lung tissue that occurred against the background of various etiologies of pneumonia, and in 95 (40.1%), acute lung abscess was diagnosed at different stages of its development. The studies were carried out in the multidisciplinary clinic of the Tashkent Medical Academy from 2021 to 2023.

One hundred thirty-three men and 104 women aged 18 to 89 years were examined. The mean age of the patients was 56±5.4 years. The main contingent of patients with destructive pneumonia was at the age of 41-50 years, the average age was 44±0.5 years, and the acute lung abscess was at the age of 51-60 years, the mean age was 56±0.2 years. The duration of the disease ranged from 3 weeks to 2 months.

Clinical symptoms in patients with acute lung destruction were of the nature of both general and specific manifestations. Symptoms of intoxication were detected in 142 (100%) patients with destructive pneumonia and 95 (100%) patients with acute lung abscesses.

The main clinical symptoms were intermittent fever (rapid, significant fever that lasts several hours, with a rapid drop to normal values) and remitting fever (daily fluctuations in body temperature within 1.5-2°C, without decreasing to normal values), which was detected in 142 (100%) patients with destructive pneumonia and 92 (88.8%) patients with acute lung abscesses; increased sweating in 120 (85%)

patients with abscessed pneumonia and in 73 (77.7%) patients with acute lung abscesses; general acute weakness with abscessed pneumonia in 142 (100%) patients, acute lung abscess in 86 (91.1%) patients; cough of varying intensity in 132 (93.4%) patients with abscessed pneumonia and in 71 (75%) patients with acute lung abscess, with secretion of mucous and mucopurulent sputum in 124 (88%) patients with abscessed pneumonia and in 88 (93.3%) patients with acute lung abscesses. In 8 (17.7 %) patients with acute lung abscess, the presence of local tenderness was determined when pressing on the rib in the area corresponding to the location of the abscess. Chest pain was recorded in 99 (76%) patients with abscessed pneumonia and 92 (97.7%) patients with acute lung abscesses; dyspnea in 137 (97.8%) cases with abscessed pneumonia and in 60 (64.4%) cases with acute lung abscess; leukocytosis in 142 (100%) patients with abscessed pneumonia and 95 (100%) patients with acute lung abscesses; increased erythrocyte sedimentation rate in 122 (93.4%) patients with abscessed pneumonia and in 86 (91.1%) patients with acute lung abscesses. There was also a feeling of discomfort and pain in the chest, abdominal pain, and dyspeptic disorders.

Symptoms of intoxication were characteristic of both destructive pneumonia and acute lung abscess. However, cough and hemoptysis were prevalent in abscessed pneumonia compared to acute lung abscesses.

In 69 (48.5%) patients with abscessed pneumonia and in 51 (53.6%) patients with acute lung abscesses, the causative agent was detected during bacteriological examination of clinical material: sputum, bronchial lavage, pleural punctate.

In abscessed pneumonia, Pseudomonas aeruginosa was detected in 21 patients (30.4% of 69 patients) in most cases. In acute lung abscesses, the predominant causative agent was St. aureus, its incidence was 33.3% (in 17 patients out of 51). As follows from the analysis, no significant differences in the incidence of the pathogen were found for Klebsiella pneumoniae, Staphylococcus aureus and Streptococcus pyogenes. that an acute lung abscess can be caused by Peptostreptococcus, whereas in cases of destructive pneumonia this pathogen does not occur. Similarly to Pseudomonas, Aeruginosa occurs in 30% of cases of destructive pneumonia and does not occur in acute lung abscesses. The frequency of occurrence of pathogens in the last two cases is significantly different ($p<0.001$).

In 17 patients, the diagnosis was verified at autopsy (5 patients with abscessed pneumonia and 12 patients with acute lung abscesses). The main method of verification for abscessed pneumonia and acute lung abscess was computed tomography, which was carried out on the Sitaxi device (China). Chest X-ray was performed on Erocone X-ray machines (South Korea). In all cases, radiography was carried out in dynamics, necessarily in two projections.

The results of the studies were processed by the method of variation statistics. The differences were considered significant at $p<0.05$.

RESULTS AND DISCUSSION

When analysing the results of X-ray and computed tomography, the main forms of lung tissue damage identified in patients with destructive pneumonia were multiple air cavity formations, most of which were revealed against the background of zones of compaction and infiltration of lung tissue with the symptom of "air bronchogram".

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Single foci and infiltrates in the lungs were visualised in 42.2% of cases by radiography and in 63.3% by computed tomography ($p<0.001$). In 71.1% of patients, lesions of one lung were noted, and in 28.9% of patients - both lungs.

Against the background of infiltration of lung tissue with the symptom of "air bronchogram", multiple air cavities were visualised, like swollen bullae without a wall, from 0.5 to 1 cm in 34 (23.9%) patients on X-ray and in 77 (54.2%) on computed tomography ($p<0.001$). Most of the cavities formed in the destruction zone did not contain fluid.

In 26 (18.3%) patients, radiographs and 41 (28.8%) patients with septic (metastatic) pneumonia showed multiple lung parenchymal decay cavities ($p<0.0504$). At the same time, standard X-ray revealed multiple lesions of lung tissue in 22% of patients and computed tomography - in 56%. In about half of the cases, bilateral lesions were observed [8].

Multiple air cavity formations ranging in size from 5 mm to 20 mm were visualised in 31.6% of patients on X-ray examination and in 50% of patients on computed tomography ($p<0.003$).

In several patients with destructive pneumonia, decay cavities were formed, having walls in which liquid contents (pus, sequesters) were determined. These complications were found in patients with Friedlander's pneumonia, pneumonia caused by hemolytic streptococcus and Escherichia coli [9].

Complications of pneumonia - abscesses were observed in 15 patients, against the background of the zone of pulmonary tissue compaction, a decrease in density was visualised - the appearance of an abscess, which is characteristic of abscessed pneumonia, this phenomenon was visualised on X-ray in 6 patients (4.2%), on computed tomography in 15 patients (10.5%) ($p<0.070$).

In addition, in 6 patients, cavities of lung tissue destruction were formed during pulmonary embolism. In all patients, the areas of lung parenchyma decay were single, up to 15-20 mm in size and localised in the lower lobes of the lungs, visualised on X-ray imaging in 1.4% of patients, and 4.2% on computed tomography ($p<0.282$).

A lung tissue decay cavity with a horizontal fluid level was recorded on X-ray imaging in 35 (24.6%) patients and 72 (50.7%) patients on computed tomography ($p<0.001$).

In three patients with abscessed pneumonia, a combination of the infiltration zone with multiple abscess cavities and the presence of multiple disseminated small cavities of hematogenous decay was detected on X-ray imaging in 1 patient (1%) and on computed tomography in 3 patients (2.3%) ($p<0.615$).

Also, in the presence of abscess areas, the presence of free fluid in both pleural cavities was noted in 20 (14%) patients on radiographs 46 (32.3%) on computed tomography ($p<0.001$). In 7% of patients, computed tomography revealed infiltrative changes and abscess cavities in the lungs, which were not visualised by X-ray examination but were determined by computed tomography, which required correction of the treatment.

Free air in the pleural cavity was observed in 3 (2.3%) patients on radiography and in 5 (3.5%) patients on computed tomography ($p<0.72$).

The outcome of abscessed pneumonia after treatment in 113 patients in the process of dynamic observation was local pneumofibrosis and carnification [10], and in 29 patients, complete recovery of the macrostructure of the lung tissue was noted.

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Thus, the main signs of destructive staphylococcal pneumonia detected by computed tomography were air cavities of different calibres of destruction of lung tissue by the type of bullous swelling against the background of consolidation zones, some of which had fluid content with a horizontal level. In abscessed pneumonia of other aetiology, the presence of separate rounded, as a rule, multiple formations in the lung tissue with air cavities of decay was noted. In infarction pneumonia, decay cavities were noted in the peripheral parts of the lower lobes of the lungs.

In the initial phase of the process, massive compaction of lung tissue was observed in 56 (58.8%) patients on X-ray and in 77 (81%) patients on computed tomography ($p<0.002$). In most cases, the infiltrate was located in the peripheral parts of the lung tissue and was adjacent to the costal pleura. In 75 patients, the process was polysegmental; this phenomenon was determined by X-ray in 68 patients (71.5%) and by computed tomography in 75 patients (79.9%) ($p<0.313$). On X-ray, a rounded form of the infiltrate, with the presence of an increase in density in its centre, was noted in 33 (34.7%) patients on radiographs and on computed tomography in 45 (47.3%) patients ($p<0.105$).

In the subsequent phase of lung abscess development, a decrease in density in the centre of the infiltrate was observed in 4 (4.2%) patients on X-ray and in 22 (22.9%) patients on computed tomography ($p<0.001$). Further, due to the melting of the infiltrated tissue, a decrease in density in its centre to liquid density was determined. Fluid occupied almost the entire volume of the abscess, which was visualised by X-ray examination in 11 (11.5%) patients by computed tomography in 27 (60%) patients ($p<0.007$). In 9 (9.4%) patients, computed tomography ($p<0.001$) showed a symptom of sagging of the interlobular pleura, which was not found on radiographs.

After the abscess rupture into the bronchus, visualisation of the air cavity was noted, as a rule, with unevenly thickened walls, irregular shape, and indistinct contours due to perifocal inflammatory infiltration of the lung tissue in 73 (76.8%) patients on X-ray and in 89 (96.3%) patients on computed tomography ($p<0.002$). The walls of the cavity were uneven in thickness, with a "cove-like" internal outline [11, 12]. A draining bronchus was visualised.

After the rejection of necrotic masses and the formation of the abscess capsule, the cavity took on a more or less regular rounded shape, uniform wall thickness and smooth, clear internal contours, this phenomenon was determined in 12 (12.6%) patients by X-ray, by computed tomography in 26 (27.3%) patients ($p<0.0184$). The size of the decay cavities ranged from 8 mm to 40 mm.

Communicating cavities were visualised by X-ray imaging in 2 (2.1%) patients and by computed tomography examination in 5 (5.2%) patients ($p<0.441$). In the lung tissue adjacent to the abscess capsule, infiltrative changes were usually visualised.

Damage to both lungs was recorded on X-ray imaging in 3 patients (3.1%) and computed tomography in 6 patients (6.3%) ($p<0.718$). In 3 (3.1%) patients, a gangrenous abscess was recorded on X-ray and in 7 (7.3%) patients ($p<0.33$).

The outcome of acute lung abscess in 15 (15.7%) patients was the formation of cicatricial changes, and in 58 patients (61%), residual air cavity - cysts, in 11 (11.5%) patients, complete recovery of lung tissue in the period of invalidity was determined.

Computed tomography in patients with suspected decay (abscess) in the infiltration zone was performed, as a rule, 5-10 days after the X-ray examination in the absence of positive dynamics against the background of treatment, as well as in the presence of areas of lumen against the background of infiltration of lung tissue on radiographs and in a severe clinical course with the secretion of a large amount of purulent sputum. In severe cases, computed tomography was performed immediately after an X-ray examination to clarify the nature and extent of lung tissue damage. The ratio of computed tomography changes during dynamic observation is important for the clinician, as it makes it possible to assess the positive or negative dynamics against the background of the therapy, allowing to change the treatment tactics in severe cases [13].

CONCLUSION

Typical signs of abscessed pneumonia are cavities of destruction against the background of zones of compaction of lung tissue, which are determined by X-ray in 41.5% of patients and by computed tomography - in 71.1% of patients. The main signs of an acute lung abscess are massive compaction of lung tissue, which is determined by X-ray in 58.9% of patients, and computed tomography - in 81%. The formation of an air cavity with unevenly thickened walls was noted in 76.8% of patients on X-ray and in 96.3% on computed tomography, which coincided with the clinical signs of abscess emptying. In acute lung abscesses, computed tomography always visualises the wall of the decay cavity, which is different in thickness depending on the stage of the process. Computed tomography in dynamics in patients with abscessed pneumonia and acute lung abscess makes it possible to assess the effectiveness of therapy and determine the outcomes of destructive processes in the lungs, such as the formation of a residual air cavity, a star-shaped scar or complete restoration of lung tissue.

Conflict of Interest – None

Ethical aspect – the article is reviewed, and the information presented has a cited reference to primary sources.

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