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# COMPLEX TREATMENT ALGORITHM OF DESTRUCTIVE PULMONARY TUBERCULOSIS AND ITS RATIONALE

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**Abstract**
In destructive forms of pulmonary tuberculosis, especially if there is drug resistance of mycobacteria, one of the methods of increasing the effectiveness of therapy is the use of collapsotherapy methods in various modifications algorithm of patient treatment.

**Keywords:** destructive tuberculosis, prognosis, predictors, artificial pneumothorax, complex treatment, algorithm, specificity , sensitivity.

## Introduction:

Against the backdrop of a decrease in the incidence and mortality from tuberculosis (TB) in the world, serious negative changes are observed in its clinical structure, the main of which is an increase in the proportion of patients with multidrug resistance (MDR) and extensive (XDR).

TB is a disease requiring complex treatment. Currently, in phthisiology, only etiotropic therapy for TB is often used - chemotherapy (CT), although its leading place is beyond doubt. However, chemotherapy is not always effective enough, especially in the presence of MDR and XDR MBT, aggravating factors, and especially their combination. In this regard, it is necessary to use the principles of complex TB treatment more widely, i.e., along with chemotherapy drugs, use the necessary arsenal of pathogenetic, physiotherapeutic, collapse therapy and surgical methods for treating TB. In destructive forms of TB, especially in the presence of MDR and XDR MBT, one of the ways increasing the effectiveness of therapy - the use of collapsotherapeutic techniques in various modifications (artificial pneumothorax (IP), pneumoperitoneum , valvular bronchoplasty (CB)) along with surgical treatment.

It should be noted that many issues of their application and evaluation of effectiveness remain undeveloped and little studied.

## Purpose of the Study:

To develop and substantiate an algorithm for the complex treatment of destructive forms of pulmonary tuberculosis using artificial pneumothorax.

**Material and Methods:**

Criteria for inclusion in a retrospective study: the presence of lung tissue destruction in focal, infiltrative, subacute disseminated pulmonary TB; cavernous pulmonary TB. Exclusion criteria: tuberculous processes without destruction, miliary, chronic disseminated pulmonary TB, fibrous-cavernous pulmonary TB (FCT), cirrhotic pulmonary TB, caseous pneumonia.

In order to substantiate it, a cohort was formed - 78 people with destructive pulmonary TB, divided into two groups. There were 38 patients in the main group (CT+IP), and 41 patients in the comparison group (CT), all patients had bacterial excretion . The groups were comparable in terms of age and gender. In both groups, males with infiltrative pulmonary TB in the disintegration phase predominated (57.1 and 59.5%, respectively, p>0.05), patients who were repeatedly treated (59.5 and 51%, respectively, p >0.05), a high percentage of MDR-TB (73.8 and 76.2%, respectively, p>0.05), in almost half of the cases a widespread tuberculosis process was observed (54.8 and 59.5%, with - responsibly, p>0.05), one decay cavity was more often observed (76.2 and 69%, respectively, p >0.05), in both groups there was a high percentage of aggravating factors. In all patients, when using the prediction method, a high probability of preservation of decay cavities against the background of CT was established.

Statistical processing of the obtained results was carried out using the Statistica data processing package for Windows version 11.0, and the Excel office application . Differences were considered statistically significant at p<0.04. To build a mathematical forecasting model using the "Logistic regression" analysis, the prognostic value of the studied indicators was determined. Having received the final set of the most important variables (predictors), we built a regression equation. The calculation of sensitivity, specificity was carried out on the basis of the construction and analysis of ROC curves.

We have developed three models of mathematical forecasting :

1. Model for predicting the probability of preservation of decay cavities against the background of CT (Method for predicting the closure of the decay cavity in patients with destructive forms of pulmonary tuberculosis during chemotherapy: Pat. 1128 , Rep . Uzbekistan ):

Z1=6.456-4.907*KF-3.682*KP-2.169*SZA- A , (1)

where: CF (clinical form)=0 in case of infiltrative pulmonary TB in the decay phase; CF \u003d 1 with cavernous ;

KP (number of decay cavities) = 0 in the presence of 1 decay cavity; KP = 1 in the presence of 2 or more cavities;

SDA - alcohol dependence syndrome (0 - no sign, 1 - there is a sign);
A = 0 abacillation received within 3 months; A \u003d 4.115 - 3-4 months; A = 5.189 – 5-6 months; A = 25.249 - in the absence of abacillation. The sensitivity of the method is 97.0%, the specificity is 80.6%

2. Model for predicting the duration of CHT before the onset of IP ("Forecasting method for i- the effectiveness of chemotherapy before the imposition of artificial pneumothorax in a patient with a destructive form of pulmonary tuberculosis, Pat. 1128 , Rep . Uzbekistan ):

Z2=-5.617+1.305*(V)+3.617*(MDR)+1.344(D), (2)

where: B \u003d 1 - age over 30 years; B = 0 - age less than or equal to 30 years;
MDR = 1 if present and equal to 0 if absent;
D = 1 – the diameter of the decay cavity is more than 2 cm; D \u003d 0 - diameter less than or equal to 2 cm.
The sensitivity of the method is 90.0%, the specificity is 75%.

3. Model for predicting the duration of the use of IP in complex treatment (Method for predicting the duration of the use of artificial pneumothorax in the treatment of a destructive form of pulmonary tuberculosis: Pat. 1128 , Rep . Uzbekistan ):

Z3=-1.076+1.385*(MDR)+1.315*( Pr )+1.357* (gender)+0.835*(IS), (3)

where: MDR = 1 if present and equal to 0 if absent;
Pr \u003d 1 - in the presence of a tuberculosis process in the volume of two or more segments; Pr \u003d 0 - with a process of less than two segments;
Gender = 1 - female and 0 - male;
IS = 1 - in the presence of intoxication syndrome, IS = 0 - in its absence.
The sensitivity of the method is 65.5%, the specificity is 83.3%.

Results and discussion

Based on the data obtained, we formulated an algorithm for the treatment of patients with destructive forms of pulmonary tuberculosis.

After the first control X-ray examination, in each specific case, the main predictors of the closure of the decay cavities are used and the regression equation 1 is solved. Based on this equation, the value of Z1 is calculated. At Z1 ≥-1.304, the closure of the decay cavity is predicted in patients with destructive pulmonary tuberculosis under CT conditions, at Z1 <-1.304, the decay cavity in the lung tissue will probably not close. Next, the question of the tactics of treating the patient is decided. With Z1 ≥-1.304, CT with X-ray control is indicated according to accepted clinical protocols. When Z1 <-1.304, it is advisable to decide on the earlier use of IP or surgical treatment, a consultation with a thoracic surgeon is indicated. If it is possible to use IP, the duration of chemotherapy is predicted before the imposition of IP, the main

predictors of the timing of chemotherapy before imposition are evaluated , and equation 2 is solved. 6 months. Then, the duration of IP application is predicted. To do this, the assessment of the main predictors of the duration of IP use is performed and regression equation 3 is solved. With Z3 ≤1.07, the duration of IP use is predicted for 3 months, with Z3 >1.07 - up to 6 months.

Thus, the use of this method makes it possible to determine the indications for the use of IP at the early stages and optimize the method of its use.

In order to substantiate the algorithm, immediate and long-term results of treatment were evaluated.

The duration of IP in the main group (MG) was 3 months in 20 patients (47.6%) and up to 6 months in 22 (52.4%). Some complications occurred during the imposition and subsequent administration of IP: spontaneous pneumothorax in 2 patients (4.8%), pneumopleuritis in 6 (14.3%) patients, severe pain reaction during the initial application of IP in 6 (14 .3%), which did not prevent the continuation of IP.

By the time PI was stopped, 40 (95.2%) patients had stopped bacterial excretion , and 39 (93%) had closure of the decay cavity. In the comparison group (GS), the abacillation rate was 88.1% (37 patients, p >0.05), closure of the decay cavities was achieved in 52.4% (22 patients, p<0.05) of cases.

Within 6 months, abacillation in the OH was achieved in 61.9% of cases (26 patients), HC - in 18.9% (8 people, p <0.05), by the 10th month of treatment, the closure of the decay cavities in the OG achieved in 78.7% of cases, in HS - 42.8% (p<0.05), and by 12 months - 92.1 and 52.4%, respectively (p<0.05).

The results of complex treatment and the use of CT alone after 24 months are as follows: successful treatment in the OH at 24 months was 80.9% (34 patients), bacterial excretion resumed in 6 patients (14.3%) and negative radiographic dynamics was noted . There was one lethal outcome (2.4%) due to the development of adverse reactions to chemotherapy, the patient developed severe toxic hepatitis. In 3 patients (7.1%), in whom complex treatment failed to achieve closure of the decay cavities, FCT developed. In the HS for this period, successful treatment was 47.6% ( p <0.05), ineffective treatment - 14.3 and 33.3% (p<0.05), respectively. By 48 months, the clinical cure in OH was 88.1% (37 patients), only in one patient the result was assessed as ineffective treatment (2.4%). One patient with FCT in terms of 36-48 months voluntarily interrupted the course of HT. Mortality was 4.8%, with TB treatment being effective in one of them. Thus, the long-term results of treatment of OH patients should be considered quite high. In HS, by 48 months, the clinical cure is 64.3% of cases ( p <0.05), however, there is an increase in the proportion of patients with FCT - from 4.8 to 16.7%. During the follow-up, three patients from the MG (7.1%)

developed LN amplification: in one ( 2.4%), HF turned into pre-XDR MBT, in two (4.7%) MDR - into XDR MBT . In the HS - in 21.4% (9 patients, p <0.05) cases, the development of LDR amplification was observed: in eight MDRs it turned into XDR MBT (19.%), in one (2.4%) MDR - into pre-XDR MBT.

Thus, the use of PIs as part of complex therapy in patients with destructive forms of pulmonary TB allows achieve significantly higher rates of effective treatment, according to long-term results.

**Conclusions**

The developed algorithm for the complex treatment of destructive forms of pulmonary tuberculosis makes it possible to personalize collapsotherapeutic methods. The use of this algorithm makes it possible to achieve abacillation at an earlier time (up to 6 months - in 61.9%); to increase the frequency of cavity closure by 39.6%, to achieve an increase in clinical cure (according to long-term results of treatment) by 23.8%, a decrease in drug resistance amplification by 14.3%, and mortality by 11.9%.

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