

# Surgical approach in multi- and extensively drug-resistant tuberculosis: resection and thoracomioplasty



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## ABSTRACT

**Objective:** To define a surgical approach in treatment of multi- and extensively drug-resistant tuberculosis.

**Design:** The article described a retrospective analysis of surgical treatment of 246 multi- and extensively drug-resistant tuberculosis patients who were divided into 3 groups: 152 multi-drug-resistant tuberculosis patients operated during the chemotherapy with second-line anti-tuberculosis drugs, 65 multi-drug-resistant tuberculosis patients operated during the chemotherapy with first-line anti-tuberculosis drugs, and 29 extensively drug-resistant tuberculosis patients who were treated with second- and third-line drugs.

**Results:** Resection methods of treatment produce positive results in 98.0% of multi-drug-resistant tuberculosis cases when rational chemotherapy is available. In case of extensively drug resistance a choice of surgical intervention depends on a degree of lung involvement, clinical form of disease. With restrictive lung involvement it is possible to use resection methods and with extensive lung involvement it is preferable to apply collapse surgical methods of treatment.

**Conclusion:** A surgical approach in treatment of multi- and extensively drug-resistant tuberculosis patients depends on a spectrum of anti-tuberculosis drug resistance, degree of involvement, and clinical form of disease.

**Keywords:** tuberculosis, drug resistance, surgical treatment, pulmonary resection, thoracomioplasty

## INTRODUCTION

Surgical treatment of pulmonary tuberculosis patients is used when drug treatment is not effective and it is noted that there is a need to expand indications for surgical intervention (1).

At the same time, a nature of planned surgical intervention is defined by various factors. Use of resection, collapse surgical methods or combination of these methods depends on a nature, localization, incidence of pulmonary tuberculosis process, type of drug resistance, and many other reasons.

Bogush noted that "resection cannot solve the problem of effective surgical care of most chronic fibrous-cavernous tuberculosis patients (2).

Stoyanovskiy also pointed out that post-resection complications are observed 3 times more in drug-resistant tuberculosis cases. Collapse surgical procedures are indicated for such cases (3).

Scientific publications of some authors describe common complications after resection procedures which are related to the presence of resistant tuberculosis (4).

At the same time, a proportion of favorable treatment outcome was observed in 90-95% of patients in cases of limited forms of pulmonary tuberculosis and in 65-75% in cases of common forms of tuberculosis (5).

All data about results of resection methods applied in tuberculosis cases confirms a need to perform these surgical procedures as strictly indicated and also makes clear that these methods should not be presented as universal, able to replace collapse therapy methods.

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**Table 1: Nature of Surgical Procedures**

Surgery nature	MDR TB				XDR TB	
	I group (n=152)		II group (n=67)		III group (n=29)	
	abs	%	abs	%	abs	%
Segmental resection	40	26.3	7	10.7	3	10.3
Lobectomy	61	40.1	14	21.5	6	20.7
Pneumonectomy	36	23.7	4	6.1	8	27.6
Combined resection	3	2.0	1	1.5	1	3.4
Thoracomioplasty	12	7.9	39	60	11	37.9
Total	152	100	65	100	29	100

## MATERIALS AND METHODS

There was used a retrospective analysis of surgical treatment methods applied in 246 multi-drug-resistant tuberculosis (MDR TB) patients and extensively drug-resistant tuberculosis (XDR TB) patients.

Among them 152 multi-drug-resistant tuberculosis patients (I group) received second-line anti-tuberculosis drugs, 65 multi-drug-resistant tuberculosis patients (II group) received second-line drugs.

29 extensively drug-resistant tuberculosis patients (III group) were treated with second- and third-line drugs.

Surgical procedures were divided into resection (segmental and combined resection, lobectomy, pneumonectomy) and collapse surgical (thoracomioplasty) methods.

Microscopic and bacteriological studies of patients' sputum to find mycobacteria of tuberculosis were conducted, first- and second-line anti-tuberculosis drug resistance was determined. X-ray examinations were made. Nonparametric methods were applied (SPSS v.16.0) for statistical processing of the results (6).

## RESULTS

At the same time, we analyzed the effectiveness of a given method in various forms of drug resistance (**Table 1**).

After resection procedures the post-surgical complications (development of an empyema, resection bronchial stump fistula, tuberculosis progression) were observed in 13 (8.5%) cases of the I group, in 13 (20%) cases of the II group, and in 7 (24.1%) cases of the III group. It should be noted that all post-resection complications occurred in patients after large surgeries: pneumonectomy and lobectomy.

After thoracomioplasty complications were not observed in all the groups.

Effectiveness of the surgical treatment was assessed as a favorable outcome in multi-drug-resistant tuberculosis patients taken by summing of the "cured" and "completed treatment" outcomes which were 98% in the I group ( $p < 0.001$ ), 55.3% in the II group; in the III group in extensively drug-resistant tuberculosis cases the orientation of favorable outcome constituted by the achieved conversion of the sputum smear which represented 65.5%.

A category of unfavorable outcome included "treatment failure" (continuing bacterioexcretion).

Criterion  $\chi^2$  showed that among the groups there were statistically significant differences as to a favorable outcome of surgical treatment when using the resection ( $\chi^2 = 80.885$ ;  $df = 2$ ;  $p < 0.001$ ) methods and collapse surgical ( $\chi^2 = 5.186$ ;  $df = 2$ ;  $p < 0.08$ ) treatment methods among the groups of studied patients.

In the II group of operated patients in cases of resection procedures a favorable outcome of treatment (44.7%) ( $p < 0.01$ ) occurred definitely more often as compared to an expected interval.

In the III group of operated multi-drug-resistant tuberculosis patients during the chemotherapy with second- and third-line drugs in cases of resection procedures a conversion of the sputum smear was achieved definitely less as compared to an expected interval (65.5%) (st.res. = -2.4;  $p < 0.05$ ).

In cases of resection procedures the odds ratio (OR) of multi-drug-resistant tuberculosis patients of the I group operated during the rational chemotherapy to multi-drug-resistant tuberculosis patients of the II group operated during the non-rational chemotherapy was 66.222 at lower limit of 7.826 and at upper limit of 560.382, i.e. a chance of favorable outcome in the I group patients was 66 times more than in the II group patients ( $p < 0.001$ ).

Criterion  $\chi^2$  also demonstrated statistically significant differences as to a favorable outcome of surgical treatment of extensively drug-resistant tuberculosis patients when using the collapse surgical and resection ( $\chi^2 = 10.774$ ;  $df = 1$ ;  $p < 0.01$ ) methods of treatment.

The odds ratio (OR) of the collapse surgical and resection procedures in the III group was 2.714 at the lower limit of 1.5 and at the upper limit of 4.8, i.e. when using collapse surgical treatment methods the extensively drug-resistant

tuberculosis patients had a chance of favorable outcome 2.7 times more than extensively drug-resistant tuberculosis patients operated with the use of resection method ( $p < 0.01$ ).

As for clinical forms, among all the studied groups the collapse surgical treatment methods were used definitely more in cases of infiltrative pulmonary tuberculosis (64.4%) and less in cases of fibrous-cavernous pulmonary tuberculosis (30.5%) ( $p < 0.01$ ).

As for clinical forms, among all the studied groups the resection procedures were used definitely less in cases of infiltrative pulmonary tuberculosis (2.1%) and more in cases of fibrous-cavernous pulmonary tuberculosis (77.2%) ( $p < 0.05$ ).

## CONCLUSION

Rational chemotherapy is essential for treatment of pulmonary tuberculosis.

Surgical treatment methods must be used under strict indications one of which represents available disease complications, presence of resistance to many present anti-tuberculosis drugs reducing efficiency of the conservative treatment. At the same time, the right choice of surgical treatment method (resection or thoracomyoplasty) may determine the treatment outcome.

Indications for resection procedures include irreversible organic changes in the lung parenchyma represented by fibrous-cavernous, cavernous tuberculosis, tuberculoma if there is sensitivity to second-line drugs enabling to achieve the effectiveness 66 times more.

Indications for collapse surgical treatment methods include largely infiltrative pulmonary tuberculosis in cases of various complications and fibrous-cavernous tuberculosis with extensive drug resistance.

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