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Research Article

Experience of the Nsc Fpa Clinic: Pneumonectomy for Pulmonary Aspergillosis

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Abstract

Over the past 18 years, we have observed 30 patients with aspergillosis of the lungs and pleura who were operated on. Among them, 5 patients underwent pneumonectomy (pleuropneumonectomy), which was 16.6%. The average age of the operated patients was 34.6 years. In 3 (60.0%) cases, aspergillosis infection was manifested by recurrent hemoptysis and pulmonary hemorrhages. The background for the occurrence of aspergilloma in all patients (100%) was pulmonary tuberculosis or post-tuberculosis changes. Complicated aspergilloma was diagnosed in all patients, in one in combination with aspergillosis empyema. All patients had an ASA 3 surgical risk.

Introduction

Over the past 18 years, we have observed 30 patients with aspergillosis of the lungs and pleura who were operated on. Among them, 5 patients underwent pneumonectomy (pleuropneumonectomy), which was 16.6%. The average age of the operated patients was 34.6 years. In 3 (60.0%) cases, aspergillosis infection was manifested by recurrent hemoptysis and pulmonary hemorrhages. The background for the occurrence of aspergilloma in all patients (100%) was pulmonary tuberculosis or post-tuberculosis changes. Complicated aspergilloma was diagnosed in all patients, in one in combination with aspergillosis empyema. All patients had an ASA 3 surgical risk. The duration of the underlying disease before surgery was 48.8 months (from 4 to 108 months). Two patients were diagnosed with severe COPD (40%), one with Bechterew's disease with hepatitis C, and the other with chronic alcoholism. All patients diagnosed with disseminated aspergillosis received specific antifungal therapy

before and after surgery. The average duration of the patient's stay in the department in the postoperative period was 30.4 days. In 2 (40.0%) cases, the patient underwent pleuropulmonectomy in the clinic. In 3 cases, pneumonectomy (60%), with 2 cases undergoing video-assisted surgery. The average duration of the operation was 308 min, and the average intraoperative blood loss was 408.0 ml. Among intraoperative complications, the damage to the left subclavian artery in a patient with Bekhterev's disease, who underwent left-sided pleuropulmonectomy for aspergilloma of the upper lobe of the left lung, complicated by recurrent hemoptysis) and chronic empyema of the left pleura, is noteworthy. In this patient, the postoperative period was complicated by intrapleural bleeding, the development of empyema of the left pleural cavity with bronchial fistula and infection of the postoperative wound. In another 2 patients (40%) in the early postoperative period, intrapleural bleeding was observed, which required increased hemostatic therapy and which was managed to be eliminated by purely conservative means. Thus, intrapleural bleeding in the postoperative period was observed in 3 out of 5 patients. All patients were discharged in satisfactory condition. During long-term follow-up (from 1 to 11 years), all patients are alive, and no recurrence of aspergillosis was noted.

State Institution "National Scientific Center of Phthisiology, Pulmonology"

and Allergology named after F. G. Yanovsky of the National Academy of Medical Sciences of Ukraine"

The causative agent of pulmonary aspergillosis is fungi of the genus Aspergillus fumigatus. They are able to colonize lung tissue, causing a specific pathological process. This species is widely distributed in the environment, and spores present in the air can inseminate the mucous membrane of the respiratory tract, paranasal sinuses and, due to their small size, reach the alveoli. Despite the ubiquitous presence of aspergillus, immunocompetent individuals do not get sick. For the development of the pathological process, a combination of a complex of conditions and causes is necessary: a high infectious dose, asymptomatic carriage, decreased immunity due to antibacterial or immunosuppressive therapy, the presence of long-existing decay cavities in the lungs, etc. [1, 2, 3, 4, 5].

There are four clinical forms of pulmonary aspergillosis - chronic necrotizing aspergillosis, allergic bronchopulmonary aspergillosis, invasive aspergillosis and aspergilloma. The first two forms of aspergillosis are a therapeutic problem and are not of interest from a surgical point of view. Sometimes, with difficult diagnostic search, it is necessary to perform a lung biopsy with subsequent microbiological and histological studies to establish an accurate diagnosis [4, 7, 8]. When the pathological process spreads to the pleural cavity, specific aspergillosis occurs with pleural empyema with the formation of mycotic nodules [4, 10, 12, 13].

The main methods for diagnosing aspergillosis are: high-resolution computed tomography (CT) of the chest cavity, serological diagnostics - detection of galactomannan antigen in bronchoalveolar lavage, blood serum or biopsy material; microscopy and culture of sputum or biopsy material [4, 5, 7, 8]. In our country, due to the significant prevalence of tuberculosis, Aspergillus fumigatus quite often colonizes tuberculous decay cavities, which leads to the formation of aspergilloma. Aspergilloma can also form in bronchiectasis of non-tuberculous etiology, chronic abscesses, cysts, bullae, in a tumor node with decay [5, 7, 10-12]. On computed tomography scans, aspergilloma has the appearance of a rounded ball inside the cavity. Since its bulk is usually separated from the contours of the cavity by an air space, the so-called “air crescent” symptom is formed [4, 5, 6, 7, 13].

The main manifestation of the disease is recurrent hemoptysis (diagnosed in 70–80% of cases). In 20–25% of cases, hemoptysis threatens the patient's life due to the transition to pulmonary hemorrhage. The fungus, during growth, secretes a toxin that erodes the walls of the cavity and adjacent structures (including vessels) [4]. There is a division of aspergillomas into simple and complex. In complex aspergillomas, pronounced clinical symptoms are noted, significant pericavitary infiltrates are recorded radiographically, new or old cavities of destruction develop or enlarge. Simple aspergillomas are characterized by an asymptomatic course [4, 5, 6, 7, 13]. Due to uncertainty in the methods and timing of treatment of patients with pulmonary aspergillosis, based on foreign recommendations and our own studies, the article presents the experience of surgical treatment of this disease in our clinic

Pneumonectomy (complete removal of a lung) for aspergillosis is a radical surgical intervention that is usually considered a "last line" treatment due to its high trauma and risk of complications.

Main indications for performing pneumonectomy for pulmonary aspergillosis (as of 2026) [4, 5, 6, 7, 9, 13]:

1. Surgical intervention is indicated when conservative antifungal therapy is ineffective or the patient's condition is life-threatening:

2. Massive or recurrent bleeding: Life-threatening hemoptysis is the most common reason for emergency surgery.

3. Disseminated lesion: When aspergilloma or invasive process covers the entire lung, making organ-sparing surgery (lobectomy) impossible.

4. Chronic cavitary aspergillosis: The presence of large cavities that are not amenable to medical treatment and are a source of persistent infection.

5. Comorbidity: For example, the combination of aspergillosis with lung cancer, where pneumonectomy allows the removal of both foci at the same time.

Risks and complications

Pneumonectomy for aspergillosis is considered technically more difficult due to the pronounced ulcerative process and tissue inflammation, the complication rate is from 22% to 56%.

Typical problems: Postoperative pleural empyema (purulent inflammation), bronchopleural fistulas (non-healing of the bronchial stump) and massive intraoperative bleeding.

Lethality:

According to current data, it is about 2.2%–4.5%, which is significantly lower than in the past, due to better preoperative preparation.

Modern approach to treatment

1. Preoperative preparation: Includes intensive antifungal therapy, correction of anemia, and nutritional support of the patient.

2. Multidisciplinary team: The decision on the scope of the operation is made jointly by surgeons, infectious disease specialists, and pulmonologists to assess cardiorespiratory reserve.

3. Alternatives: Doctors always aim to preserve part of the lung (lobectomy, segmentectomy), if the condition of the tissues allows, corrective thoracoplasty

Materials and methods

Over the past 18 years, the Department of Thoracic Surgery and Invasive Diagnostic Methods of the State Institution "National Institute of Phthisiology and Pulmonology named after F. G. Yanovsky of the National Academy of Medical Sciences of Ukraine" has treated 30 patients with pulmonary and pleural aspergillosis who underwent surgery. Among them, 5 patients underwent pneumonectomy (pleuropneumonectomy), which amounted to 16.6%.

In the group of operated patients, men predominated – 4 (80%), women made up one observation (20%) (Table 1).

No.	Characteristics of observations					
	Sex	Age of the child	Hemoptysis or bleeding	Background for the occurrence of aspergillosis	Duration of illness, months	Comorbidity
1	M	53	Yes	TB	108	Ankylosing spondylitis, genitourinary tract infection, pleural empyema
2	F	18	No	TB	4	–
3	M	32	Yes	TB	48	COPD
4	M	34	No	TB	36	chronic alcoholism
5	M	35	Yes	TB	48	COPD

Table 1: Characteristics of patients.

The average age of the operated patients was 34.6 years. In 3 (60.0%) cases, aspergillosis infection was manifested by recurrent hemoptysis and pulmonary hemorrhages, which was the main reason for surgical treatment. The background for the occurrence of aspergilloma in all patients (100%) was pulmonary tuberculosis or post-tuberculosis changes.

Complicated aspergilloma was diagnosed in all patients, in one in combination with aspergillosis empyema. All patients had an ASA surgical risk of 3. The duration of the underlying disease before surgery was 48.8 months (from 4 to 108 months). 2 patients were diagnosed with severe COPD (40%), one with ankylosing spondylitis with hepatitis C, and the other with chronic alcoholism.

Results

All patients diagnosed with disseminated aspergillosis received specific antifungal therapy before and after surgery. The duration of such treatment at the preoperative stage depended on radiological data and clinical manifestations of the disease, and the main task was to stabilize the infectious process.

The average duration of the patient's stay in the department in the postoperative period was 30.4 days (Table 2).

No.	Indicators						
	Volume and side of the operation	Duration of operation, min	Blood loss, ml	Intraoperative complications	Postoperative complications	Duration of the postoperative period, days	Duration of observation, years
1	Left-sided pleuropneumonectomy	320	1100	Damage to the left subclavian artery	Intrapleural bleeding Empyema with bronchial fistula Postoperative wound infection	43	11, alive
2	VATSright-sided pneumonectomy	300	150	-	-	28	7, alive
3	right-sided pneumonectomy	320	340	-	-	30	10, alive
4	Left-sided pleuropneumonectomy	180	200	-	Intrapleural bleeding	30	5, alive
5	VATS right pneumonectomy	420	250	-	Intrapleural bleeding	28	1, alive

Table 2: Results of pneumonectomy

In 2 (40.0%) cases, the patient underwent pleuropulmonectomy in the clinic. In 3 cases, pneumonectomy (60%), and in 2 cases, the operation was performed video-assisted. The average duration of the operation was 308 min, and the average intraoperative blood loss was 408.0 ml. During the operation, we performed multiple sanitation of the pleural cavity with a solution of decasan to prevent pleural empyema.

Among the intraoperative complications, the damage to the left subclavian artery in a patient with Bekhterev's disease, who underwent left-sided pleuropulmonectomy for aspergilloma of the upper lobe of the left lung, complicated by recurrent hemoptysis) and chronic empyema of the left pleura, is noteworthy. As a result of empyema, the patient had a pronounced ulcerative process and significant thickening of the pleural sheets with elements of their calcification, which significantly complicated pneumolysis. The defect of the damaged artery was eliminated using a vascular suture. In this patient, the postoperative period was complicated by intrapleural bleeding, the development of empyema of the left pleural cavity with bronchial fistula and infection of the postoperative wound. In this regard, bronchoblockade of the stump of the left main bronchus was performed.

Another 2 patients (40%) had intrapleural bleeding in the early postoperative period, which required increased hemostatic therapy and which was managed to be eliminated by purely conservative means. Thus, intrapleural bleeding in the postoperative period was observed in 3 out of 5 patients.

All patients were discharged in satisfactory condition (Figures 1 and 2). At long-term follow-up (1 to 11 years), all patients are alive, and no recurrence of aspergillosis was noted (Figure 3).

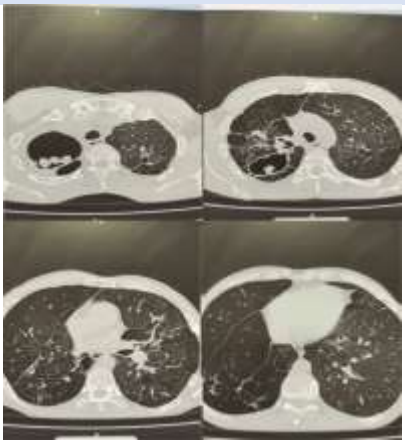

Figure 1: Observation No. 5 before surgery.

Figure 2: Observation No. 5 one year after surgery.

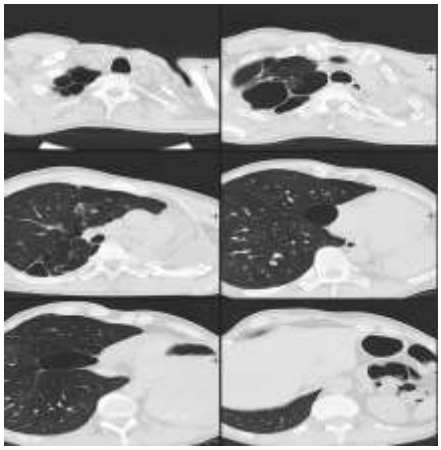

Figure 3: Observation No. 3, 10 years after surgery.

Discussion

There are many reports and guidelines on surgical treatment of pulmonary aspergillosis in foreign literature, but they are all based on a small number of observations. The most modern and evidence-based guide to treatment tactics for pulmonary aspergillosis is presented by the Infectious Diseases Society of America [9]. It suggests performing surgical interventions in cases of:

• lung damage in close proximity to large vessels and the pericardium; • pericardial infection;

• involvement of the chest in the infectious process;

• with aspergillosis empyema;
• with hemoptysis from a single lesion of lung tissue.

However, the decision about surgical treatment should be made individually for each patient, taking into account various factors, including the type and extent of resection (atypical or typical), concomitant pathology, and the general condition of the patient.

Shohei Minesakiet al. [8] report successful pneumonectomy in a patient with pulmonary aspergillosis and non-small cell lung cancer in the absence of postoperative complications and recurrence of aspergillosis.

Nicolas Beaufrere and co-authors [6] inform about pneumonectomy in a 38-year-old patient with pulmonary hemorrhage. CT scan revealed multiple aspergillosis of both lungs with aneurysm of the left pulmonary artery. After stopping the bleeding, a left-sided pneumonectomy was successfully performed. The period of stay in the intensive care unit was

5 days. The patient was alive for 90 days after the operation, but could not be discharged from the department.

The largest number of observations is reported by Yuji Shiraishi et al. [9]. They report 11 cases (9 men and 2 women). The average age of the patients was 63 years (36-71 years). The underlying cause of aspergillosis was pulmonary tuberculosis (6 cases) and postoperative destruction of the lung after lobectomy (5 patients). Hemoptysis was noted in 10 patients. To prevent the occurrence of bronchial fistula, they used myoplasty of the stump of the main bronchus with the latissimus dorsi muscle in all cases. 6 pneumonectomies (2 on the right and 4 on the left) and 5 final pneumonectomies (1 on the right and 4 on the left) were performed. The average duration of the operation was 432 min (361-781 min). The average operative blood loss was 1050 ml (200-2910 ml). In no case was there a thoracotomy to stop postoperative bleeding. Major postoperative complications were empyema caused by anaerobic flora (n = 1) and chylothorax (n = 1). Both complications were successfully resolved with conservative methods. No recurrence of aspergillosis was observed. The authors conclude that pneumonectomy for aspergillosis can be successfully performed with no mortality and low complication rate. To achieve good results of this surgical intervention, it is necessary to apply preventive measures.

Shakil Faridand co-authors [7] report on 30 patients who underwent surgery for pulmonary aspergillosis. Among them, 43% had hemoptysis. Background diseases were 20% tuberculosis, 26% asthma, 20% COPD. Pneumonectomy was performed in 3 (10%). There was no postoperative mortality. Postoperative complications: prolonged air leak – 23%, empyema – 20%, severe respiratory failure requiring intubation – 13%. Recurrence of aspergillosis was noted in 26%. The authors conclude that surgery in patients with chronic aspergillosis can be with a good outcome, with a moderate number of complications in difficult cases. Recurrence of the disease is a significant problem.

Mariusz Kasprzyk et al. [5] report on 49 patients operated on for pulmonary aspergillosis. Pneumonectomy was performed in 3 of them. The results of immunological examination for aspergillosis were positive in only 10%, although histopathological examination revealed signs of aspergillosis in 100%. Intraoperative blood loss ranged from 50 to 1500 ml (average 410 ml). There was no intraoperative mortality. The rate of postoperative complications was 63.3%. The most frequent postoperative complications were prolonged air leakage, residual pleural cavities and bleeding. Only one patient had a recurrence of aspergillosis. All post-pneumonectomy patients required prolonged intubation. Two post-pneumonectomy patients had intrapleural bleeding in the postoperative period. One patient after left-sided pneumonectomy had a retrothoracotomy on the 1st postoperative day due to bleeding, died on the 4th postoperative day due to respiratory failure and multiple organ failure. The second patient developed pleural empyema.

Jilbert Massard [2] reports that 4 out of 5 aspergillosis patients developed empyema in the postpneumonectomy space.

Conclusion

Surgical treatment of pulmonary and pleural aspergillosis is a rather complex task with many unresolved issues, however, the systematization of our own experience, combined with the achievements of other clinics, leads to improved care for this group of patients. Preoperative preparation should include intensive antifungal therapy, correction of anemia and nutritional support of the patient, and a multidisciplinary team (surgeons, infectious disease specialists and pulmonologists) should decide on the scope of the operation.

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