

Brief Communication

Surgical treatment of pulmonary aspergilloma*

Tratamento cirúrgico de aspergiloma pulmonar

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Abstract

The objective of this study was to analyze the outcome of surgical treatment of pulmonary aspergilloma. To that end, we evaluated 14 adult patients so treated between 1981 and 2009 at the Botucatu School of Medicine University Hospital, in the city of Botucatu, Brazil. Data were collected from the medical records of the patients. Ten patients (71%) presented with simple pulmonary aspergilloma, and 4 (29%) presented with complex pulmonary aspergilloma. Hemoptysis was the most common symptom, and tuberculosis was the most prevalent preexisting lung disease. Two patients (14%) underwent surgery on more than one occasion. There were no intraoperative deaths. Half of the patients developed postoperative complications, prolonged air leak and empyema being the most common.

Keywords: Pulmonary aspergillosis; Tuberculosis, pulmonary; Thoracic surgery.

Resumo

O objetivo deste estudo foi analisar o resultado do tratamento cirúrgico de aspergiloma pulmonar. Para tanto, foram avaliados 14 pacientes adultos (7 homens e 7 mulheres) e tratados no Hospital Universitário da Faculdade de Medicina de Botucatu, em Botucatu (SP), entre 1981 e 2009. Dados foram coletados dos registros médicos dos pacientes. Dez pacientes (71%) apresentaram aspergiloma pulmonar simples, e 4 (29%) apresentaram aspergiloma pulmonar complexo. O sintoma mais frequente foi hemoptise, e a pneumopatia preexistente mais prevalente foi tuberculose. Dois pacientes (14%) foram submetidos a mais de um procedimento cirúrgico. Não houve mortalidade operatória. Metade dos pacientes apresentou complicações pós-operatórias, sendo fuga aérea prolongada e empiema as mais frequentes.

Descritores: Aspergilose pulmonar; Tuberculose pulmonar; Cirurgia torácica.

Pulmonary aspergilloma is a clinical manifestation that can be resolved through surgery. In Brazil, pulmonary aspergilloma is a common and serious problem. Also known as intracavitary mycetoma or fungus ball, pulmonary aspergilloma is related to previous lung disease, which promotes the formation of parenchymal cavities that are colonized by the fungus.⁽¹⁻⁵⁾ Various diseases, such as lung cancer, cystic fibrosis, abscesses, bullous emphysema, cysts, and, mainly, tuberculosis, are known to cause lung cavities.⁽⁴⁻⁷⁾ Pulmonary aspergilloma is represented by a mass consisting of viable or dead fungal elements, mucus, blood, cell remnants, and inflammatory cells partially occupying a cavity⁽³⁾ in communication with the airway or in ectatic bronchi.^(1,7)

Most patients have productive cough with discharge of mucus, pus, and blood.⁽⁴⁾ The activity of fungal endotoxins, as well as the friction between the fungal mass and the walls of the cavities, causes vascular erosions leading to hemoptysis that is sometimes severe and fatal. Dyspnea results from the previous lung disease.

After a fungus ball has formed, antifungal treatment is inefficient,^(5,8) and a cure can be achieved only through surgical treatment.^(5,8) The benefits of surgical treatment include prevention of hemoptysis and of growth of the pulmonary aspergilloma, preservation of the lung parenchyma; and eradication of the pyogenic component, possibly resulting in greater life expectancy.⁽⁹⁾

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Pulmonary aspergilloma is classified as simple pulmonary aspergilloma (SPA) and complex pulmonary aspergilloma (CPA), based on the radiological aspect, which reveals the nature and extent of the pulmonary impairment caused by the preexisting disease.^(3,10,11) The characteristics of SPA include well-localized lesion, thin-walled cavities, and little or no change in the adjacent lung tissue. In CPA, the lesions are disseminated, have thick walls, and are surrounded by parenchymal sequelae resulting from the previous lung disease—in most cases, tuberculosis.^(3,5,9,10-12)

Surgical mortality and morbidity are related to the type of pulmonary aspergilloma.^(2,3) Because individuals with CPA more often have postoperative complications, such as prolonged air leak, empyema, and bleeding, mortality is higher in CPA than in SPA.^(3,5,9,10)

Because of the impaired immunity of patients undergoing chemotherapy, patients on corticosteroid therapy, diabetic patients, AIDS patients, and transplant recipients, as well as the high mortality associated with pulmonary mycoses, clinicians and surgeons should focus on the diagnosis and management of complications in pulmonary aspergilloma and in other pulmonary mycoses.^(9,13,14)

Our objective in this study was to analyze the outcome of the surgical treatment of patients with pulmonary aspergilloma treated at a university hospital.

Between 1981 and 2009, 19 patients with pulmonary aspergilloma (age, 20–80 years; mean, 47.8 ± 14.5 years) were admitted to and treated at the São Paulo State University Botucatu School of Medicine *Hospital das Clínicas*, located in the city of Botucatu, Brazil. Of those 19 patients, 11 were female and 8 were male. One patient died from massive hemoptysis followed by hypovolemic shock before pulmonary resection, 3 refused surgical treatment, and 1 could not undergo surgical treatment due to poor clinical status. Therefore, 14 patients (7 males and 7 females) with pulmonary aspergilloma (age, 20–63 years; mean, 44.2 ± 12.9 years) underwent surgical treatment. Of those 14 patients, 10 had SPA and 4 had CPA.

The medical records of the patients were reviewed for signs and symptoms, preexisting lung diseases, conditions favoring immunosuppression, pulmonary aspergilloma location, type of

pulmonary resection performed, intraoperative deaths, postoperative complications, and survival. This retrospective descriptive study was approved by the institutional research ethics committee (registration no. OF 172/2007).

Table 1 shows the principal signs and symptoms, the most common being hemoptysis (in 87.7%), dyspnea (in 50%), and cough (in 50%). Among the 14 patients, 2 (14.3%) had conditions favoring immunosuppression (1 had diabetes and 1 was undergoing corticosteroid therapy). Tuberculosis was the most prevalent preexisting lung disease, occurring in 13 patients (93%). The duration of the radiological progression of the disease ranged from 1 to 30 years.

We performed 17 pulmonary resections (Table 2). Of the patients with CPA, 1 underwent right upper lobectomy, 2 underwent left upper lobectomy, and 4 underwent anatomic segmentectomy. Two patients with CPA underwent resection on more than one occasion: 1 patient underwent one left upper lobectomy and two anatomic segmentectomies; and 1 underwent two anatomic segmentectomies. Of the patients with SPA, 4 underwent right upper lobectomy, 1 underwent left upper lobectomy, 2 underwent right lower lobectomy, 2 underwent extra-anatomic segmentectomy, and 1 underwent anatomic segmentectomy. There were no intraoperative deaths.

Half of the patients had postoperative complications, such as prolonged air leak (defined as air leak through the chest tube for more than seven days), empyema, and hemothorax. Among the patients with SPA, 2 had empyema and 1 had prolonged air leak. All of the patients with CPA had complications: 2 had prolonged air leak; 1 had empyema; and 1 had hemothorax.

Table 1 – Signs and symptoms observed in the patients diagnosed with pulmonary aspergilloma.

Signs and symptoms	SPA	CPA
	(n = 10)	(n = 4)
Hemoptysis	8	4
Dyspnea	3	4
Cough	5	2
Weight loss	2	3
Chest pain	0	3
Fever	1	1

SPA: simple pulmonary aspergilloma; and CPA: complex pulmonary aspergilloma.

Table 2 – Types of surgical procedures performed in the patients with pulmonary aspergilloma.

Type of procedure	SPA	CPA	Total
	(n = 10)	(n = 4)	(n = 14)
Right upper lobectomy	4	1	5
Right lower lobectomy	2	0	2
Left upper lobectomy	1	2	3
Anatomic segmentectomy	1	4	5
Extra-anatomic segmentectomy	2	0	2
Total number of procedures	10	7	17

SPA: simple pulmonary aspergilloma; and CPA: complex pulmonary aspergilloma.

Hemoptysis, which is seen in the majority of patients with pulmonary aspergilloma,^(12,15,16) has been cited as the indication for surgical treatment in many studies.^(4-6,9,10,17,18) In our sample, hemoptysis was mild and recurrent, was not massive, and did not require control through endoscopic procedures, arterial embolization,⁽¹⁵⁾ or resection. In the literature, cases that are more severe, with massive bleeding, have been described as occurring in only a minority of patients,^(5,17) although some cases have required urgent intervention^(5,10)

In our sample, dyspnea was common, as it has been in other studies,^(4,6,11,15) being related to the preexisting lung disease.⁽⁶⁾

Fungus balls usually develop in lung cavities caused by a previous chronic disease. Most of these cavities are attributable to tuberculosis, especially in developing countries, such as Brazil, where it is the most commonly diagnosed previous disease in patients with pulmonary aspergilloma. Some authors have failed to identify any preexisting diseases.^(9,10)

In most of the patients in our sample, the previous lung disease was tuberculosis, with up to 30 years of radiological progression. In 1 patient, an acquired cyst was occupied by the fungal mass. The prevalence of other lung diseases associated with pulmonary aspergilloma was similar to that reported in other studies.^(6,9,10,16,19)

In patients with pulmonary aspergilloma, the efficiency of clinical treatment is limited, because the drugs are not able to reach the fungi inside the cavity. The definitive treatment is partial or total surgical resection of the affected lung.^(4,5,9,16)

Among patients with mild or no hemoptysis, the five-year survival rate is 10% lower for those submitted to clinical treatment than for those

submitted to surgical treatment.^(9,17) Among patients with recurrent hemoptysis and a single episode of massive bleeding, the five-year survival rate is 40% lower for those submitted to clinical treatment.^(9,17)

Before pulmonary resection to treat pulmonary aspergilloma is performed, the disease-related risk and the surgical risk should be taken into consideration. Although the risk of hemoptysis is always present, the surgical risk can be greater, especially due to the preexisting pulmonary involvement. Patients at high surgical risk (with lesions in both lungs and impaired lung function) can be treated with less aggressive procedures, such as cavernostomy, transthoracic instillation of antifungal agents directly to the fungus ball, and arterial embolization for the control of hemoptysis.^(5,9,18,20)

One patient undergoing prolonged corticosteroid therapy for the treatment of rheumatic disease died from sepsis 35 days after the operation. Two patients died years after the operation, one from acute myocardial infarction and one from complications caused by the previous lung disease, namely tuberculosis.

More than half of our patients underwent lobectomy for the treatment of pulmonary aspergilloma, as has also been reported in other studies.^(3,5,10,12,16,19) Because of tuberculosis, the upper lobes were the most affected, which is in agreement with the literature.^(4,5,9,10,12,16,17)

When CPA affects all of the lung lobes, pneumonectomy is the surgical procedure recommended for the eradication of the disease,^(5,9) assuming that the other lung can maintain function sufficient to provide the patient with an acceptable quality of life. None of the 4 patients with CPA underwent pneumonectomy.

Techniques such as segmentectomy and extra-anatomic segmentectomy are used for the eradication of lesions that are more localized or are restricted to bronchial segments, or when more conservative resection is elected in an attempt to preserve the lung parenchyma and the lung function in patients with functional deficit,^[20] as well as to prevent the effects of the non-expansion of the remaining lung, which can be fibrotic due to the sequelae of the preexisting disease. The absence of lung expansion, caused by the previous lung disease, namely tuberculosis, makes it difficult to preserve the residual pleural space after resection.^[5,9,10]

Complications are attributable to the inflammatory process and to intraoperative findings such as dense fibrosis, which obliterates the pleural space and fissures,^[16] distorted hilar anatomy, with adherences to vessels,^[17] and the spread of the disease to the extrapleural space,^[6,9] making dissection difficult.^[9,16] Dissection of adherences between the lungs, pleura, diaphragm, and mediastinum causes excessive blood loss.^[9]

In the most common complications, such as prolonged air leak and residual pleural space,^[9] a surgical procedure for the obliteration of the pleural space can be considered concomitantly with resection, preventing the onset of pleural empyema.^[6] There have been various reports of techniques aimed at solving this problem, such techniques including pleural tent, pneumoperitoneum, decortication, myoplasty, omental transposition, and thoracoplasty.^[5,9,16] Because we did not use any of these techniques, our patients developed prolonged air leak and empyema that could have been avoided.

Pulmonary tuberculosis was the most prevalent preexisting disease. A total of 74% of the patients underwent surgery, and there were no intraoperative deaths. Prolonged air leak and empyema were the most common postoperative complications.

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