Institutional report - Thoracic non-oncologic
Surgery for aspergilloma: time trend towards improved results?

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Abstract
Surgery of aspergilloma has been renowned to be technically challenging and has a high complication rate. We have already demonstrated an improved outcome as a result of a reduction in complex cases related to history of tuberculosis. In this paper we will evaluate whether this time trend has continued during recent years. Initial presentation and postoperative outcome of 33 patients who underwent surgical treatment between 1998 and 2009 were reviewed and compared with two previous reports (group 1: 55 patients from 1974 to 1991; group 2: 12 patients from 1992 to 1997). Underlying disease was tuberculosis in 15% of patients (57% in group 1, 17% in group 2), and 12% of patients had complex aspergillomas (80% in group 1, 41% in group 2). Postoperatively, there was no mortality (5% in group 1, 0% in group 2). Morbidity decreased progressively in terms of bleeding (44% in group 1, 9% in group 2, and 6% in recently, accrued patients), of pleural space problems (47%, 18% and 12%, respectively), and of prolonged hospital stay (32%, 8% and 6%, respectively). With a decreased postoperative complications rate after resection, contemporary surgery of aspergilloma is safe and offers satisfactory early and long-term results.

Keywords: Aspergillus; Complications

1. Introduction
Surgery of aspergilloma has been renowned to be a technical challenge because of its high intra- and postoperative complication rate. The operation may be technically difficult due to pleural adhesions and inflammatory changes in the hilum, and postoperative outcome is classically known to have a high morbidity and mortality rate.

In a previous report [1], we wanted to define high-risk and low-risk subgroups of patients. We demonstrated that operative risk was low in asymptomatic patients, whereas the risk of evolving complications is real, and such patients should undergo primarily lobar resection. In symptomatic patients, as well as in presence of pleural sequelae, the operative risk is high, but surgery is advised as the symptomatic manifestations may become life-threatening, especially to prevent massive fatal hemoptysis [2, 3]. Choice of the most appropriate procedure depends on the compliance of the residual lung tissue [4, 5]; when resection is not feasible, removal of the fungus ball and thoracoplasty may be an alternative [1].

In a second report [6], we observed that most aspergillomas that accrued during the recent time period had developed in patients without history of tuberculosis. We demonstrated that postoperative outcome improved due to a decreased incidence of aspergilloma growing in tuberculosis cavitations.

The purpose of the present study is to evaluate both clinical spectrum and postoperative outcome of aspergilloma in our recent experience since 1998. We have already demonstrated an improved outcome after surgery due to a reduction in complex cases related to history of tuberculosis, but we intend to evaluate whether this time trend has continued during recent years.

2. Materials and methods
2.1. Patients
From January 1998 to December 2009, 33 patients were operated on for pulmonary aspergilloma. There were 24 male and nine female patients, with a mean age of 48 years (range, 22–74 years).

2.2. Methods
We applied a methodology similar to our previous studies [1, 6]. For each patient, we noted underlying disease, clinical presentation, operative procedure, and outcome. Patients were classified as having simple or complex...
aspergilloma, according to Daly et al. [7] and Belcher and Plummer [8] on the basis of medical imaging; simple aspergilloma was defined as a thin-walled cavitation occurring in an otherwise healthy lung, while definition of complex aspergilloma required either a thick-walled cavitation or the presence of underlying parenchymal and pleural sequelae, or both. Postoperative outcome was reviewed for mortality and morbidity. Operative mortality was defined as any death occurring during the first 30-day period or during the initial hospital stay. Morbidity was defined as excessive bleeding (intraoperative bleeding plus postoperative drainage in the first 24 h exceeding 1500 ml), pleural space problems (air leaks prolonged beyond 10 days, secondary pneumothorax, or empyema), or postoperative hospital stay exceeding 30 days.

Clinical data and postoperative outcome were compared with the previously published results [1, 6]. Comparisons were made with the \( \chi^2 \)-test. Statistical significance was obtained for any value of \( P < 0.05 \).

3. Results

3.1. Underlying disease

Underlying disease was tuberculosis in five patients (15%). Various diseases were observed in 20 patients (60%): six bullous emphysema (18%), five radiation pneumonitis (15%), three pulmonary infarction (9%), four lung abscess (12%), and two bronchiectasies (6%). Eight patients (25%) presented a bronchial aspergilloma without any additional underlying disease.

3.2. Clinical presentation

Twelve patients (36%) were free of symptoms. On initial presentation, 18 patients (55%) were complaining of hemoptysis, and three patients (9%) had chronic cough. According to the criteria of Daly et al. [7] and Belcher and Plummer [8], four patients (12%) had complex aspergilloma while 29 patients (88%) had simple aspergilloma.

3.3. Surgical procedure

Twenty-nine patients (88%) underwent a lobectomy through a muscle-sparing posterolateral or lateral thoracotomy: there were 17 right upper lobectomies, nine left upper lobectomies, two right lower lobectomies, and one left lower lobectomy. A single patient (3%) underwent multiple wedge excisions, performed through a posterolateral thoracotomy. One patient (3%) underwent a pneumonectomy, performed through a posterolateral thoracotomy. Two patients (6%) were managed by thoracoplasty with a removal of the fungus ball, because they had disabling pulmonary function that precluded a larger resection.

3.4. Outcome

There were no operative deaths. Total perioperative blood loss in the first 24 hours averaged 750 ml (range, 300–1900 ml). Total blood loss exceeded 1500 ml in two patients (6%). Pleural space problems occurred in four patients (12%): three patients (9%) had prolonged air leaks and one patient (3%) had empyema. Postoperative recovery was uneventful in 29 patients (88%). Postoperative hospital stay exceeded 30 days for two patients (6%), mean hospital stay averaged 17 days (range, 7–55 days).

3.5. Comparison with previously published series

In our most recent report, 12 patients (36%) were asymptomatic (50% in the first group, 25% in the second group). For 18 patients (56%), the predominant symptom was hemoptysis (26% in the first group, 41% in the second group). For five patients (15%), underlying disease was tuberculosis (57% in the first group, 17% in the second group). As a consequence, the prevalence of complex aspergilloma decreased to 12% (80% in the first group, 41% in the second group). Need for thoracoplasty was 6% (20% in the first group, 8% in the second group). Morbidity decreased progressively in terms of bleeding (44% in the first group, 9% in the second group, and 6% in recently, accrued patients), of pleural space problems (47%, 18% and 12%, respectively), and of prolonged hospital stay (32%, 8% and 6%, respectively) (Table 2).

4. Discussion

In the present report, 36% of patients were asymptomatic. This is in opposition to most of the published series, because all major series are composed of symptomatic patients [4, 9–14]. This might be explained by our resolute surgical approach: our opinion is that effective treatment of aspergilloma is necessarily surgical, especially when patients are asymptomatic, because surgical risk is minimal in asymptomatic patients. Recent studies [11, 14] conclude that surgical resection should be considered for all patients with pulmonary aspergilloma who have acceptable pulmonary reserve, because surgical treatment is helpful not only to reduce symptoms but also to prolong the survival of patients, even in asymptomatic patients. In fact, aspergilloma may grow over time and cause symptoms, and it can interfere with immunosuppression of various origins.

**Table 1. Initial presentation**

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<tbody>
<tr>
<td>Mean age</td>
<td>49</td>
<td>46</td>
<td>48</td>
<td>–</td>
</tr>
<tr>
<td>Asymptomatic patients</td>
<td>24/50</td>
<td>3/12</td>
<td>12/33</td>
<td>–</td>
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<tr>
<td>Hemoptysis</td>
<td>13/50</td>
<td>5/12</td>
<td>18/33</td>
<td>–</td>
</tr>
<tr>
<td>Prevalence of tuberculosis</td>
<td>35/61</td>
<td>2/12</td>
<td>5/33</td>
<td>(&lt;0.001)</td>
</tr>
<tr>
<td>Complex aspergilloma</td>
<td>40/50</td>
<td>5/12</td>
<td>4/33</td>
<td>(&lt;0.001)</td>
</tr>
</tbody>
</table>

*11 patients were managed without operation.

**Table 2. Operative outcome**

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<tbody>
<tr>
<td>Need for thoracoplasty</td>
<td>10/50</td>
<td>1/12</td>
<td>2/12</td>
<td>–</td>
</tr>
<tr>
<td>Complications:</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Bleeding</td>
<td>15/34</td>
<td>1/12</td>
<td>2/33</td>
<td>(&lt;0.001)</td>
</tr>
<tr>
<td>Pleural space problems</td>
<td>16/34</td>
<td>2/12</td>
<td>4/33</td>
<td>(&lt;0.005)</td>
</tr>
<tr>
<td>Prolonged hospital stay</td>
<td>11/34</td>
<td>1/12</td>
<td>2/33</td>
<td>0.01</td>
</tr>
</tbody>
</table>
The predominant symptom in our reports was hemoptysis. The main reason for operative treatment of aspergilloma is the important risk of complications. Major, life-threatening hemoptysis is the most frequent accident and has been estimated to occur in 20% of patients [10]. Akbari et al. [12] and Okubo et al. [13] demonstrated that surgical resection of pulmonary aspergilloma prevents recurrence of hemoptysis: there was no recurrence of hemoptysis 10 years after surgery in their report.

In our report, surgical procedure consisted of 29 lobectomies, one segmental resection, one pneumonectomy, and two thoracoplasties. The single patient who underwent a pneumonectomy had a difficult postoperative course, with empyema. As formerly reported [1, 4, 6, 15], we support that pneumonectomy should be avoided whenever possible because of the major risk of empyema. Two patients were managed by thoracoplasty with removal of the fungus ball. Postoperative outcome was uneventful in these two patients. In our opinion, thoracoplasty remains a viable option for debilitated patients who are unlikely to undergo lobectomy. A particular subgroup are patients developing aspergilloma after lobectomy and radiation therapy for lung cancer, where completion pneumonectomy would be a maximal risk procedure.

Aspergilloma surgery is renowned to be technically hazardous and to have a complicated postoperative outcome. In our most recent report, there were no perioperative death. The observed mortality rate was 5% in our first report, 0% in the second report. This has to be compared with a range varying from 0% [14] to 4.3% [12] reported in the literature (Fig. 1). In fact, series are quite heterogenous, with series exclusively composed of symptomatic patients, whereas others include asymptomatic patients.

Our total morbidity rate (including bleeding, pleural space problems, and prolonged hospital stay) is 2.4%. This is comparable to the data of the literature, although published series are heterogenous (Fig. 2). In our experience, morbidity decreased in terms of bleeding (44% in the first group, 9% in the second group, and 6% in recently, accrued patients), of pleural space problems (47%, 18% and 12%, respectively), and of prolonged hospital stay (32%, 8% and 6%, respectively). Pleural space problems after lobectomy are a consequence of the loss of elasticity of the residual lung with fibrotic changes. Preventive immediate thoracoplasty has been recommended, but we prefer to do thoracoplasty as a second-choice procedure after lobectomy, in order to avoid unnecessary mutilation to some patients. In fact, in our most recent report, 12% of patients had troubles with pulmonary reexpansion, but none required a thoracoplasty.

In our successive reports, we observed an important decrease in postoperative mortality and morbidity, due to the less morbid profile of the patients. This is related to the regression of prevalence of severe long-term sequelae of pulmonary tuberculosis (P<0.001): 57% in the first group, 17% in the second group, and 15% in our most recent report. Statistical significance was not reached in our previous experience, but it is reached in our recent report, in terms of mortality (P<0.001), and of morbidity (bleeding P<0.001; pleural space problems P<0.005; prolonged hospital stay P=0.01).

In conclusion, because there is no effective alternative, surgical management remains the mainstay of treatment for aspergilloma. With the decline of tuberculosis, surgery is less challenging, and postoperative outcome has improved during the past three decades; postoperative mortality and morbidity rate after resection have significantly decreased. Contemporary surgery of aspergilloma may be considered to be safe and to offer satisfactory early and long-term results.

References


