Ten-Year Experience with Mycetomas in Patients with Pulmonary Tuberculosis*

Ralph O. Butz, M.D., F.C.C.P.; James R. Zvetina, M.D., F.C.C.P.; and Bernard J. Leininger, M.D., F.C.C.P.

We studied 33 consecutive patients with tuberculous pulmonary cavities complicated by fungus balls to evaluate their treatment. Nineteen had surgical resection for massive or recurrent bleeding or possibility of tumor. One patient died of postpneumonectomy empyema (30-day surgical mortality, 5 percent). Fourteen had no surgery. No patient died of hemoptysis. Respiratory failure contributed most often to death. Hepatic complications and other problems of alcoholism were also prominent. Good results can be obtained by resection in these severely ill patients if care is taken to preserve functioning pulmonary tissue and to avoid complications of alcoholic hepatic disease. Within these constraints, tuberculous cavities complicated by mycetomas should be resected for massive or recurrent hemoptysis.

Pulmonary mycetomas appear in preexisting cavities, cysts, or spaces as saprophytic infections. Previous reports have considered all fungus balls together, even though some have observed that the course depends upon the underlying disease. Eastridge et al\(^1\) described a cavitary pulmonary infarct which healed as a solid scar in spite of a mycetoma complicating the cavitary phase. In contrast, tuberculous bronchiectatic spaces remain open even without fungous contamination. Also, mycetomas can spontaneously resolve without closure of the space, and this may be related to other organisms infecting the cavity.\(^2\) The treatment of mycetomas, therefore, should be directed to the specific pulmonary disease complicated by the mycetoma. Pulmonary tuberculosis complicated by a fungus ball is such a clinical entity, sufficiently common in our experience to evaluate plans of treatment, complications, and results. To this end, we have reviewed our cases over a ten-year period.

**MATERIALS AND METHODS**

During the years 1974 through 1983, the Hines Veterans Administration Hospital admitted 35 patients with pulmonary mycetomas. All had underlying tuberculous lesions except two patients, one with sarcoidosis and one with nontuberculous lower lobar bronchiectasis. Atypical organisms accounted for four of the tuberculous infections (one Battey bacilli, two Mycobacterium kansasi, and one unspecified). Twenty-one patients carried a clinical diagnosis of alcoholism, and most of the others were heavy drinkers. Associated pulmonary diseases included one case of silicosis and one case of asbestosis.

Patients who underwent resection anytime during the ten-year interval are designated "surgical cases" (12 patients underwent surgery from 1974 through 1978 and seven from 1979 through 1983). Fourteen have not had surgical treatment since the development of mycetomas and are designated "medical cases." All medical cases had x-ray films diagnostic of mycetoma. The surgical cases had either an x-ray film diagnostic of mycetoma or an x-ray film suggestive of mycetoma but also compatible with tumor. Mycetomas were found in all of the resected specimens.

Pseudosтратified columnar or metaplastic squamous epithelium partially lined 16 of the 19 resected cavities. In three specimens the cavities had unlined necrotic walls (of these, one case also had silicosis, and another had asbestosis). None of these three had tuberculous organisms or caseating granulomas. Four specimens had caseating granulomas, two with acid-fast organisms in spite of negative studies of sputum.

In two cases, special studies showed the fungus to be other than Aspergillus, (one Mucorales species and one Allescheria boydii). In 15 cases the fungus was identified only by microscopic morphology. It is possible that some of the 17 cases diagnosed as Aspergillus might have been identified as other morphologically similar fungi by more detailed studies.

The following surgical procedures were performed: completion pneumonectomy, three; pneumonectomy, one; lobectomy, 11; apical posterior segmentectomy (left upper lobe), two; and superior segmentectomy (right lower lobe), two. All of the pneumonectomies were done in the first five-year period. All of the segmentectomies were done in the last five-year period. Eight patients had had lobectomies for tuberculosis prior to the diagnosis of a fungus ball in either the opposite apex or the superior segment of the residual lobe. Five of these were surgical cases (three completion pneumonectomies and two superior segmentectomies).

The indications for resection in this series were gross hemoptysis, recurrent hemoptysis, or inability to rule out tumor. Of the 14 medical cases, six had an indication for surgery. Five of these refused surgery, and one was judged to have inadequate pulmonary reserve. Two of those who refused would probably have been rejected on the basis of their hepatic disease.

**RESULTS**

Tables 1 and 2 show the deaths in the surgical and medical groups. The survivals are expressed as the time from diagnosis to death in the medical cases and as the time from surgery to death in the surgical cases. All surgical patients who have died except patient 2 underwent surgery in the first five-year period. All surgical cases have over one year of follow-up.

The following complications were encountered:
The patient with silicosis had a five-rib thoracoplasty closed the space. Two of the three residual air spaces absorbed during the year following surgery without any symptoms or bronchopleural fistula and empyema developed. Antibiotics, bronchodilators, postural drainage, and bleeding. Our patients with mild-to-moderate hemoptysis and renal failure, 3. The three residual air spaces absorbed during the year following surgery without any symptoms or further treatment. The patient with silicosis had a residual air space after a left upper lobe resection. A bronchopleural fistula and empyema developed. Drainage of the space yielded Aspergillus organisms. A five-rib thoracoplasty closed the space. Two of the empyemas contributed to the patient's death.

Eleven cases had massive hemoptysis (400 to 500 ml/24 hr, equivalent to one unit of blood), which stopped with medical measures. Seven of these then underwent surgery; four remained in our medical group. No resections were done during active heavy bleeding. Our patients with mild-to-moderate hemoptysis had the condition controlled with bed rest, antibiotics, bronchodilators, postural drainage, and sleeping on the side of the involved lung. Vigorous endotracheal suctioning protected the patients with massive bleeding from "drowning" of aspiration. Patients with hepatic diseases received parenteral vitamin K. Although four of the six patients with hemoptysis who never underwent resection had massive bleeding and five have had recurrent bleeding, there have been no deaths from hemoptysis. Among the four massive bleedings, one patient has had no further bleeding in three years, two have had only minor hemoptysis, and only one has had a significant (although less than massive) recurrent bleeding.

### Table 1—Summary of Deaths in Surgical Cases

<table>
<thead>
<tr>
<th>Case</th>
<th>Age at Death, yr</th>
<th>Cause of Death</th>
<th>Time after Surgery, mo</th>
<th>Surgical Procedures*</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>52</td>
<td>Pneumonia</td>
<td>5</td>
<td>Rt pn</td>
</tr>
<tr>
<td>2</td>
<td>63</td>
<td>Cancer</td>
<td>42</td>
<td>LUL</td>
</tr>
<tr>
<td>3</td>
<td>55</td>
<td>Pneumonia and renal failure</td>
<td>66</td>
<td>Rt pn</td>
</tr>
<tr>
<td>4</td>
<td>49</td>
<td>Alcoholic encephalopathy</td>
<td>16</td>
<td>RUL and RML</td>
</tr>
<tr>
<td>5</td>
<td>55</td>
<td>Respiratory failure</td>
<td>9</td>
<td>Lt pn</td>
</tr>
<tr>
<td>6</td>
<td>53</td>
<td>Cancer of esophagus</td>
<td>10</td>
<td>RUL</td>
</tr>
<tr>
<td>7</td>
<td>56</td>
<td>Sudden death at home</td>
<td>1</td>
<td>LUL</td>
</tr>
<tr>
<td>8</td>
<td>36</td>
<td>Fatty liver; hepatic failure</td>
<td>4</td>
<td>LUL</td>
</tr>
<tr>
<td>9</td>
<td>51</td>
<td>Empyema</td>
<td>1</td>
<td>LUL</td>
</tr>
</tbody>
</table>

*Rt pn, right completion pneumonectomy; LUL, left upper lobar resection; RUL, right upper lobar resection; RML, right middle lobar resection; Lt pn, left completion pneumonectomy; and T rt pn, right three-lobe pneumonectomy.

### Table 2—Summary of Deaths in Medical Cases

<table>
<thead>
<tr>
<th>Case</th>
<th>Age at Death, yr</th>
<th>Cause of Death</th>
<th>Time after Fungus Diagnosis, mo</th>
</tr>
</thead>
<tbody>
<tr>
<td>10</td>
<td>58</td>
<td>Unattended death</td>
<td>55</td>
</tr>
<tr>
<td>11</td>
<td>53</td>
<td>Respiratory failure</td>
<td>9</td>
</tr>
<tr>
<td>12</td>
<td>54</td>
<td>Unattended death</td>
<td>39</td>
</tr>
<tr>
<td>13</td>
<td>54</td>
<td>Pancreatic pseudocyst; hepatic abscess; respiratory failure</td>
<td>2</td>
</tr>
</tbody>
</table>

DISCUSSION

Hemoptysis is the symptom most consistently associated with aspergillomas. The British survey of tuberculous cavities 2.5 cm or larger found 11 percent with definite aspergillomas. On resurvey three years later, of the 59 patients with aspergilloma, three (5 percent) had died with bleeding, and three more had required pulmonary resection. Seven others (12 percent) had died of other causes. Garvey et al. reported 11 resections for aspergilloma. Only five of these cases had tuberculous cavities, but they accounted for three of the four cases of massive hemoptysis encountered. Faulkner et al. did not separate their data on a basis of tuberculosis vs nontuberculosis, although they stated that tuberculous cavities were more apt to bleed and that the mortality in series with fewer cases of tuberculosis was significantly lower. Of their 42 cases, only 13 had severe hemoptysis, and ten of these had single episodes. Emergency resection in one of these ten accounted for the only death in the series due to hemoptysis. These authors controlled hemorrhage in 40 of 41 episodes of gross hemoptysis (24 patients) with bed rest, antibiotics, and postural drainage. Teklu and Felleke from Ethiopia report an experience with 74 patients with tuberculosis who had massive hemoptysis. Fatal hemoptysis occurred in 17 (23 percent). These startling results emphasize the potential hazard from hemoptysis and suggest that patients arriving from third-world countries may be different than our population.

Although hemoptysis poses a real hazard in patients with tuberculosis who have mycetomas (as it does in all cases of tuberculosis with cavities), we find, as have others, that it is not the most common cause of death. Respiratory failure, if not the immediate cause of death, is frequently contributory. Recurrent or massive hemoptysis remains an indication for resection, but we have developed a greater attention to preservation of pulmonary tissue. This is reflected in the choice of operations. In the more recent cases, we performed dorsal segmentectomies where completion pneumonectomies were done earlier. The overwhelming majority of our patients have diffuse fibrosis and emphysematous changes in the remaining lung. In this series, patients who underwent pneumonectomy, in retrospect, might have fared better with medical management. We adopted a more conservative approach in the last five years of this series and have had...
no death within a year of surgery.

Eastridge et al\(^\text{10}\) reported an aspergilloma appearing in a resectional space seven years after a lobectomy for tuberculosis. Kirschner\(^\text{4}\) reported two fungal balls in pleural spaces, and Solit et al\(^\text{10}\) (in meeting comments only) mentioned one case. Eight of our cases had prior upper lobe resection. Two of these cases had residual apical air spaces, but the fungus balls were in pulmonary cavities and not in the pleural space. Of these two, one patient had a segmentectomy, the basilar segments completely filling the chest after surgery. The other case had a pneumonectomy.

Resectional spaces as a complication of resection for aspergillomas are relatively common, especially in those cases with tuberculosis. Saab and Almond\(^\text{4}\) reported five of 21 resected cases with residual air spaces. Four of these persisted but required no further treatment. Kilman et al\(^\text{9}\) had five of 14 surgical patients with persistent spaces. All five underwent surgery (three thoracoplasties, one completion lobectomy, and one decortication). Bronchopleural fistulas with persistent air leaks have been reported by Belcher and Plummer\(^\text{10}\) and by Solit et al.\(^\text{2}\) Four of our cases had postoperative apical air spaces. Three showed resolution of the space within six months; the fourth, as described previously, went on to develop bronchopleural fistula and empyema with Aspergillus contamination. Treatment was directed to closure of the fistula and space, rather than the Aspergillus infection. Krakowka et al.,\(^\text{11}\) Irani et al.,\(^\text{12}\) and Skorodin et al\(^\text{10}\) have all reported Aspergillus infections in a pleural space treated with topical antifungal drugs. Only those which also had surgical treatment of the space resolved. The single case of right basilar pyopneumothorax with Aspergillus in a patient with tuberculosis reported by Herring and Pecora\(^\text{14}\) was handled without antifungal drugs. Surgical closure of the bronchopleural fistula and decortication cleared the infection, indicating that appropriate surgical treatment and not antifungal drugs account for the therapeutic successes. We consider pleural air spaces benign, requiring surgery only if empyema should develop.\(^\text{15}\)

The British Thoracic and Tuberculosis Association\(^\text{3}\) reports three cases in which fungus balls underwent spontaneous lysis during three years of observation. This study\(^\text{4}\) related lysis to associated pyogenic infection. We cannot make this correlation in our two patients who had lysis of their fungus balls.

**Conclusion**

The treatment of mycetomas in the patient with tuberculosis is the treatment of his tuberculosis. Fungus balls occur in the advanced stages of tuberculosis, stages that, in our experience, are associated with patients who are alcoholics suffering alcohol-related diseases. These patients are frequently more at risk from their impaired respiratory reserve and associated diseases than they are from hemoptysis. If the patient has massive or recurrent hemoptysis or if tumor cannot be excluded and if he has sufficient respiratory reserve and hepatic function, a resection of the destroyed lung should be undertaken with every effort to preserve pulmonary tissue.

**References**