PEF is measured to the patient.

ACKNOWLEDGMENT: We thank Dr. Nizar Jarjour for access to the patient’s medical records.

REFERENCES


Table 2—Pulmonary Function Measured at Baseline, 5 min, 10 min, and 20 min after the 90% and 100% Peak 

<table>
<thead>
<tr>
<th>Variables</th>
<th>Baseline</th>
<th>5-min</th>
<th>10-min</th>
<th>20-min</th>
</tr>
</thead>
<tbody>
<tr>
<td>FVC, L</td>
<td>4.52</td>
<td>4.42</td>
<td>4.5</td>
<td>4.47</td>
</tr>
<tr>
<td>90% peak Vo2</td>
<td>4.58</td>
<td>4.42</td>
<td>4.5</td>
<td>4.47</td>
</tr>
<tr>
<td>100% peak Vo2</td>
<td>(116%)</td>
<td>4.33</td>
<td>4.31</td>
<td></td>
</tr>
<tr>
<td>PEF, L/s</td>
<td>7.57</td>
<td>7.59</td>
<td>7.33</td>
<td>7.68</td>
</tr>
<tr>
<td>90% peak Vo2</td>
<td>7.57</td>
<td>7.59</td>
<td>7.33</td>
<td>7.68</td>
</tr>
<tr>
<td>100% peak Vo2</td>
<td>(103%)</td>
<td>7.59</td>
<td>7.24</td>
<td></td>
</tr>
<tr>
<td>FEV1, L/s</td>
<td>3.60</td>
<td>3.59</td>
<td>3.59</td>
<td>3.6</td>
</tr>
<tr>
<td>90% peak Vo2</td>
<td>3.60</td>
<td>3.59</td>
<td>3.59</td>
<td>3.6</td>
</tr>
<tr>
<td>100% peak Vo2</td>
<td>(104%)</td>
<td>3.57</td>
<td>3.45</td>
<td></td>
</tr>
<tr>
<td>FEF25–75, L/s</td>
<td>2.86</td>
<td>3.12</td>
<td>2.98</td>
<td>3.07</td>
</tr>
<tr>
<td>90% peak Vo2</td>
<td>2.86</td>
<td>3.12</td>
<td>2.98</td>
<td>3.07</td>
</tr>
<tr>
<td>100% peak Vo2</td>
<td>(72%)</td>
<td>3.17</td>
<td>2.96</td>
<td></td>
</tr>
</tbody>
</table>

*PEF = peak expiratory flow; FEF25–75 = average flow over the middle 50% of FVC.

habitually active endurance athletes. It normally occurs immediately at the onset of heavy exercise and persists throughout the exercise session. EIAH is attributed primarily to a widened alveolar-to-arterial Po2 difference in combination with a limited hyperventilatory response, which is due, at least in part, to expiratory flow limitation.10 This case report suggests that upper airway dysfunction also should be considered as a potential cause of ventilatory constraint contributing to EIAH.

ACKNOWLEDGMENT: We thank Dr. Nizar Jarjour for access to the patient’s medical records.

High Dose Rate Brachytherapy for Nonmalignant Airway Obstruction*

New Treatment Option

Baruch Brenner, MD; Mordechai R. Kraner, MD, FCCP; Alan Katz, MD; Rafael Feinmesser, MD; Alina Brenner-Weissmann, MD; Aaron Sulkes, MD; and Eyal Fenig, MD

Study objectives: High dose rate (HDR) endobronchial brachytherapy is widely used as a palliative treatment for symptomatic airway obstruction by primary or secondary malignant tumors. We report on a successful use of HDR brachytherapy in patients with nonmalignant airway obstruction.

Design: Case series.

Patients: Six patients received HDR brachytherapy for airway obstruction caused by granulation tissue around a metal stent placed for restoration of the airway patency for nonmalignant causes. In four patients, brachytherapy was performed following recurrent occlusion of the airway by granulation tissue formation; in two patients, it was done as a prophylactic procedure.

Intervention: HDR brachytherapy catheters were passed through the metal stents under direct fluoroscopic guidance. Simulation and computerized treatment planning were done, and a single dose of 10 Gy was administered using a brachytherapy remote afterloader with a 192Ir source. The dose was prescribed to a distance of 1 cm from the center of the source, with a margin of 1 cm from the proximal and distal ends of the stent.

Results: At a median follow-up of 15 months, moderate-to-severe granulation tissue formation was observed in only one patient; in four others, it was categorized as minimal, 5 to 30 months from the procedure. Restoration of the lumen was complete in four patients, near complete in one patient, and partial in one patient. In one patient, previously treated by external radiotherapy, local tissue necrosis was evident.

Conclusion: HDR brachytherapy can be used safely for nonmalignant airway obstruction. Further studies including more patients and longer follow-up are needed.

Key words: airway stenting, high dose rate brachytherapy; nonmalignant airway obstruction; radiation therapy

Abbreviation: HDR = high dose rate
High dose rate (HDR) brachytherapy is a radiotherapeutic technique wherein high-dose radiation is delivered from a source located inside the patient’s body, using a rapid flux of ionizing particles. This enables the application of very accurately localized treatment, and thereby a higher therapeutic index, than that documented for the more frequently used external radiotherapy.\(^1\) HDR endobronchial brachytherapy is widely used as a palliative measure to overcome mechanical obstruction of major airways caused by either primary or secondary malignant tumors.\(^2\)\(^-\)\(^6\) It allows the delivery of a high dose of radiation over a short period of time to the obstructed area, and at the same time reducing the risk of undesired side effects to adjacent structures.

Radiation therapy, including brachytherapy, is also used to treat a wide range of nonmalignant conditions, such as pterygium, exophthalmus, plantar warts, and parotitis, as well as benign tumors.\(^4\)\(^-\)\(^6\) Brachytherapy has been shown to reduce intimal hyperplasia and prevent restenosis following angioplasty and stenting of the coronary arteries.\(^7\) Bronchial stents, just like their coronary artery counterparts, can cause a proliferative reaction manifested by massive formation of granulation tissue, leading to obstruction of the stented airway. The first report on the use of radiation therapy for this condition was done by Kennedy et al.,\(^8\) who treated two patients who underwent lung transplantation and shortly after had bronchial obstruction in the anastomotic area. Soon thereafter, we reported the use of HDR brachytherapy in a patient with an airway obstruction caused by granulation tissue formed around a bronchial stent.\(^9\) We hereby present our successful experience using this technique in six patients with nonmalignant airway obstruction.

**Materials and Methods**

From March 1999 to August 2001, six patients with nonmalignant airway obstruction were treated by HDR brachytherapy at the Radiotherapy Unit of the Rabin Medical Center. Initially, all patients were referred to the Pulmonary Institute for evaluation of dyspnea.Bronchoscopic examination revealed mechanical major airway obstruction, secondary to trauma, either iatrogenic or not, in all cases. Repeated Nd-YAG laser treatment was then applied, with temporary reopening of the involved airways in most cases. Pathologic examination of tissue samples obtained from the area of obstruction showed a uniform pattern of hyperplastic mucosa with granulation tissue. The presence of malignant cells was ruled out. Eventually, all patients underwent an insertion of a metal Wallstent (Boston Scientific; Watertown, MA) for restoration of the airway patency; however, in four of these patients (patients 1, 2, 3, and 5, Table 1), granulation tissue formed in and around the stents at some stage, occluding the airway. Patient 1 and patient 5 were treated initially by repeated laser interventions, and patient 2 and patient 3 were referred immediately to the Radiotherapy Unit for HDR brachytherapy.

Due to the novelty of the procedure, the first patient had to undergo eight laser interventions before he was offered the option of brachytherapy. All the procedures were conducted following the primary approval of the local Helsinki Committee, requiring a detailed explanation and a signed informed consent. The procedures were performed under sedation in the ambulatory bronchoscopy unit, according to a modification of the protocol in use for malignant diseases. We used an Olympus F20 bronchoscope (Olympus; Tokyo, Japan) to visualize the airway, and positioned it just above the stent. Nd-YAG laser was then applied when needed in order to clear the granulation tissue. Under direct fluoroscopic guidance, HDR brachytherapy catheters were passed through the metal stents and secured externally to the patient’s nose. At this stage, the bronchoscopes were removed and the patients were transferred to the Radiation Therapy Unit. On simulation, a single dose of 10 Gy was prescribed to a distance of 1 cm from the center of the source, with a margin of 1 cm from the proximal and distal ends of the stent. Treatment planning was performed with the CadPlan BT brachytherapy planning system (Varian Medical Systems, Palo Alto, CA). Radiation was delivered with the Varisource HDR brachytherapy remote afterloader with an \(^{192}\)Ir source (10 Ci nominal activity) [Varian Medical Systems].

Following the procedure, repeated bronchoscopies were performed at 3-month intervals in the first half year and every 6 months thereafter, or as clinically required. Pulmonary function tests were routinely done before and after the procedure, as well as chest radiography.

**Case 1**

A 19-year-old man presented in November 1997 with atelectasis of the right lung. Four months earlier, he had sustained multitrauma injuries, including chest contusion in a motor vehicle accident. He was initially treated in an ICU in another hospital and received mechanical ventilation for 4 weeks. Bronchoscopy performed at our pulmonary institute revealed complete obstruction of the right main bronchus by membranous fibrotic tissue. We suspected that the tissue was secondary to a bronchial tear, which was probably located at the area of the right upper lobe bronchus take off and therefore caused a complete atelectasis of the right lung. Despite an initial complete reopening of the bronchus by laser treatment, subsequent bronchoscopies revealed recurrent obstruction of the bronchus. A metal Wallstent (20/10 mm) was placed, and patency of the airway was restored; however, several weeks later, the patient presented again with dyspnea, and bronchoscopy showed an occluding granulation tissue formation around the stent. Over a 3-month period, multiple laser applications (eight sessions) were performed, with alternating clinical improvement and worsening. Pulmonary function testing showed mixed obstruction and restriction with vital capacity of 50 to 60% predicted. At that time, the therapeutic options available for this condition were surgical bronchoplasty or a trial of stent removal and exchange; both were considered unsatisfactory by us, as well as by the patient, who had just recovered from prolonged hospitalization and refused these invasive interventions.

Following the approval of the local Helsinki Committee and planning of a modification in the frequently used protocol for malignant conditions, the patient underwent HDR brachytherapy in March 1999. The procedure was performed without any complication and the patient was discharged on the same day.
Follow-up bronchoscopies revealed a patent airway, with relatively smooth mucosa in and around the stent. No granulation tissue formation was observed. At 2.5 years of follow-up, the patient was asymptomatic except for a mild occasional cough. Recent pulmonary function test results showed only mild restriction.

Case 2

A 72-year-old man was treated by different services in our hospital since April 1996 because of a papillary carcinoma of the thyroid. The patient underwent through total thyroidectomy, causing a permanent single vocal cord paralysis, followed by $^{131}$I ablation. Eight months later, he underwent radical neck dissection and another course of $^{131}$I ablation, due to involved cervical lymph nodes. Two years later, a large paratracheal mass, invading and partially occluding the trachea, was documented. During the next half year, three laser treatments were applied, with short lasting respiratory relief. Eventually, an intratracheal metal Wallstent (14/40 mm) was inserted. The patient was then treated by combined chemotherapy (weekly doxorubicin, 20 mg/m$^2$) and external radiation (5,000 cGy in daily fractions of 200 cGy each) with complete resolution of the tumor; however, shortly thereafter, dyspnea and productive cough recurred, and hyperplastic epithelization and granulation tissue were observed by bronchoscopy. Recurrent biopsy findings were all negative for tumor cells. On January 2000, the patient received HDR brachytherapy, without any complications. In spite of a temporary stabilization, manifested by clinical improvement and patent trachea in two consecutive bronchoscopies, 6 months later the respiratory complaints reappeared and another bronchoscopy was performed. This time, diffuse necrotic tissue was observed and laser treatment and bronchial toilet was done. Subsequently, the patient’s condition required several toilet bronchoscopies, at 2- to 3-month intervals. While early procedures documented obstruction caused by necrotic tissue, the more recent procedures identified minimal granulation tissue formation as well. Twenty months after brachytherapy, the patient’s condition is stable, with no evidence of malignancy on systemic workup and several tracheal biopsies.

Case 3

A 75-year-old woman was referred to our Pulmonary Institute on July 1998 for evaluation of progressive dyspnea. One year earlier, she underwent total thyroidectomy for papillary carcinoma of the thyroid, complicated by the need of a tracheostomy and prolonged mechanical ventilation, in another hospital. A few months later, dyspnea developed, and subglottic stenosis was identified by bronchoscopic examination. During the next year and a half, the patient underwent multiple bronchoscopies, some including laser application, with varying degrees of clinical relief. In light of the recurrent narrowing, a metal Wallstent (12/38 mm) was inserted followed by marked clinical improvement lasting for several weeks. At this stage, bronchoscopic examination showed narrowing of the lumen by granulation tissue at the distal end of the stent, and laser treatment was applied. The patient was then transferred directly to the Radiotherapy Unit for HDR brachytherapy, which was performed without any complications, and the patient was discharged hours later. Follow-up bronchoscopies revealed a patent airway, with no granulation tissue formation. It was only 13 months later that minimal granulation tissue was observed and laser treatment was applied. With 20 months of follow-up, the patient is well and nearly asymptomatic.

### Table 1—Summary of Clinical Data

<table>
<thead>
<tr>
<th>Case No.</th>
<th>Age (yr)/Sex</th>
<th>Underlying Cause of Obstruction</th>
<th>Location of Obstruction</th>
<th>Time From Stent Insertion to HDR, mo</th>
<th>Indication for HDR</th>
<th>Toxicity of HDR</th>
<th>Time From HDR to Last Assessment of Success, mo</th>
<th>Post-HDR Duration of Follow-up, mo</th>
<th>Last Assessment of Success of HDR</th>
<th>Post-HDR Granulation Tissue Formation (Time, mo)</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>19/male</td>
<td>Multitrauma, bronchial tear</td>
<td>Right main bronchus</td>
<td>3</td>
<td>Recurrent obstruction</td>
<td>None</td>
<td>20</td>
<td>Complete</td>
<td>30</td>
<td>Complete</td>
</tr>
<tr>
<td>2</td>
<td>72/male</td>
<td>Radiation fibrosis—status post carcinoma of thyroid</td>
<td>Trachea</td>
<td>8</td>
<td>Recurrent obstruction</td>
<td>None</td>
<td>20</td>
<td>Complete</td>
<td>20</td>
<td>Moderate (12)</td>
</tr>
<tr>
<td>3</td>
<td>75/female</td>
<td>Tracheostomy status post radiation—subglottis</td>
<td>Subglottis</td>
<td>2</td>
<td>Recurrent obstruction</td>
<td>None</td>
<td>None</td>
<td>Complete</td>
<td>None</td>
<td>Minimal (13)</td>
</tr>
<tr>
<td>4</td>
<td>77/male</td>
<td>Tracheostomy, diphtheria—subglottis</td>
<td>Subglottis</td>
<td>1</td>
<td>Preventive</td>
<td>None</td>
<td>None</td>
<td>Complete</td>
<td>None</td>
<td>None</td>
</tr>
<tr>
<td>5</td>
<td>68/female</td>
<td>Prolonged ventilation—subglottis</td>
<td>Subglottis</td>
<td>0.5</td>
<td>Preventive</td>
<td>None</td>
<td>None</td>
<td>Complete</td>
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<td>None</td>
</tr>
<tr>
<td>6</td>
<td>63/female</td>
<td>Prolonged ventilation—subglottis</td>
<td>Subglottis</td>
<td>0.5</td>
<td>Preventive</td>
<td>None</td>
<td>None</td>
<td>Complete</td>
<td>None</td>
<td>None</td>
</tr>
</tbody>
</table>
Case 4

A 77-year-old woman was referred to our Pulmonary Institute on July 2000 for evaluation of protracted respiratory complaints. Six months earlier, she was hospitalized for severe bilateral pneumonia, which was complicated by respiratory failure. The patient’s condition necessitated mechanical ventilation for 3 weeks, during which time two spontaneous extubations, followed by reintubations, occurred. Eventually, the patient overcame the acute illness, and was discharged for ambulatory care. The patient continued having moderate dyspnea and productive cough, and was treated with bronchodilators, steroids, and intermittent oxygen supplement. On evaluation in our Pulmonary Institute, the patient was found to have inspiratory stridor, which was later shown bronchoscopically to be related to severe fibrotic subglottic stenosis. The patient was then treated with four monthly laser applications, with only moderate improvement. At that point, as surgery was refused by the patient, a metal Wallstent (14/30 mm) was inserted followed by rapid clinical improvement. In light of the encouraging experience with the previous cases, the patient was treated with preventive single HDR brachytherapy. Notwithstanding the patient’s deteriorated general condition, the procedure was performed in an outpatient setting, with no complications. Follow-up bronchoscopy 1 week later revealed localized mucosal edema and moderate secretions. Ten months later, the patient’s condition is stable, with only minimal and nonsignificant granulation tissue formation.

Case 5

A 68-year-old man was referred to our Pulmonary Institute on August 2000 due to worsening dyspnea. At the age of 3 years, the patient had had severe diphtheria, complicated by respiratory insufficiency. The patient was therefore intubated and put on mechanical ventilation for 4 weeks. Subsequently, a subglottic obstruction developed that progressed and eventually required tracheostomy. Four years later, the tracheostomy was closed, but the patient continued to have chronic dyspnea. On hospital admission, the patient was found to be moderately dyspneic, with mild inspiratory stridor. Soon after, the patient’s condition rapidly deteriorated, necessitating urgent tracheostomy. Bronchoscopy revealed severe subglottic obstruction, and laser treatment was applied. During the next 3 months, the patient had several hospital admissions for laser applications. Eventually, a metal Wallstent (64/14 mm) was inserted, and decannulation was performed. Shortly thereafter, the respiratory complaints recurred. One month after the stent insertion, on November 2000, significant formation of granulation tissue along the inner surface of the stent was identified. Laser treatment was then applied, and the patient was transferred to the Radiotherapy Unit for HDR brachytherapy. The procedure was performed without any complications, and after a few hours the patient was discharged. It was only then that the patient’s condition stabilized. Almost a year later, the patient is still free of respiratory complaints, with only minimal granulation tissue formation observed in one of the subsequent bronchoscopies.

Case 6

A 63-year-old woman was known to our Pulmonary Institute since June 2001. Three months earlier, she was hospitalized for respiratory insufficiency secondary to severe chronic obstructive lung disease. On hospital admission, the patient was intubated and placed on mechanical ventilation for >1 month, during which time tracheostomy was done. After she recovered, several attempts for decannulation failed, due to what was later recognized as recurrent granulation tissue causing subglottic stenosis. Following four bronchoscopies and laser applications during a 2-month period, the patient was referred for stent insertion. In August 2001, a Wallstent (14/64 mm) was inserted and a successful decannulation was done. Ten days later, she received preventive HDR brachytherapy. The procedure was performed in an outpatient setting, without any complications. During the next 4 months, the respiratory condition was stable and two follow-up bronchoscopies revealed no granulation tissue formation.

Discussion

Our report describes the use of endobronchial HDR brachytherapy in six patients with nonmalignant airway obstruction (Table 1). At a certain stage in the clinical course, a metal Wallstent insertion was necessary in all cases. All patients but two, who were treated in a preventive manner, received HDR brachytherapy following occlusion of the treated airway by granulation tissue formation. Even though some patients were in a compromised general condition, the procedure was unexceptionally performed in an ambulatory setting and without any complications. With a median follow-up of 15 months (range, 4 to 30 months), moderate granulation tissue formation was observed in only one patient, and in four others it was categorized as minimal, 5 to 30 months from the procedure. As opposed to the pre-HDR period—characterized by frequent therapeutic bronchoscopies—in the post-HDR period all of the procedures, most of which were entirely diagnostic, were performed with 3- to 6-month intervals. Overall, HDR brachytherapy was considered a complete success in four patients, near complete in one patient, and partial in one patient. In this patient, necrosis of local tissues causing a temporary airflow disturbance was evident. This patient had received external radiotherapy, in addition to two 131I ablations and concomitant chemotherapy. All of the above-mentioned therapies would have a significant contribution to tissue damage that developed in this patient.

The use of radiation therapy for the treatment of malignant tumors began soon after the discovery of radioactivity itself, almost a century ago. Moreover, it has been long recognized that irradiation can be an effective tool in treatment of various benign diseases too. Pathologic conditions characterized by excessive proliferation of normal tissues, such as keloids, gynecomastia, and pterygium, are especially amenable.4-6

Two of the unique characteristics of HDR brachytherapy support its inclusion in the treatment armamentarium of certain benign diseases. First, the volume treated and dose received outside this area are accurately defined in three dimensions by a computerized planning system. This allows a high therapeutic index, a major prerequisite for any medical treatment, especially in benign conditions. Second, the treatment can be delivered in a single application over a few minutes. This allows for high feasibility of the modality, minimal discomfort for the patient, and maximal assurance that the radiation program planned is the one actually delivered. The features described make HDR brachytherapy very suitable for medical conditions in which a very small lesion, surrounded by healthy vital tissues, is causing significant morbidity.10-11 Two years ago, following this concept, a group of cardiologists and
radiation oncologists reported the successful use of endovascular HDR brachytherapy to prevent restenosis of coronary arteries following stenting or angioplasty balloon dilatation. At the time this study was published, we were challenged by the recurrent bronchial obstructions in patient 1. Searching for treatment alternatives, we hypothesized that the basic pathogenesis of our patient's condition might just be equivalent to that suggested for the coronary arteries restenosis; we suspected that in both conditions a similar mechanism of response to injury, manifested by an exaggerated proliferation of either neointima or granulation tissue around the disrupted epithelium. Encouraged by the seemingly effective endovascular procedure, we offered the patient endobronchial HDR brachytherapy. Early reports of rapamycin-covered stents used in coronary revascularization are promising in preventing neointimal growth, and it will be most interesting to examine their use in endobronchial stents.

The first report on the use of endobronchial HDR brachytherapy for nonmalignant causes, still in press at the time the treatment of our first patient was tailored, was done by Kennedy et al. In this report, a similar approach was chosen in two patients with lung transplantation, in whom hyperplastic bronchial obstruction developed at the site of the anastomosis, and in whom balloon dilatation, laser application, and stent placement failed to restore protracted patency. This group used a lower dose (3 Gy) than we did, although in one patient two sessions were required. The authors described a significant clinical improvement and patent airways, 6 months and 7 months after the procedure, in both patients.

Both reports, that of Kennedy et al. and the present study, demonstrate the effectiveness of endobronchial HDR brachytherapy in preventing granulation tissue formation reactive to a bronchial stent. In spite of the impressive clinical results, data regarding the potential mechanism underlying these phenomena are still scarce. This is even more surprising considering the enthusiasm surrounding the congerent endovascular brachytherapy field, which has resulted in various clinical and laboratory studies. Indeed, clues regarding the biological effects of irradiation on the injured epithelium covering the bronchial wall emerge almost exclusively from the vascular model. From these, it seems that the stromal macrophages/monocytes play a key role both in the initiation of the hyperplastic response and in the way it is affected by irradiation. These cells dominate the early phase of the wound healing process, including the induction of the cytokine cascade. It is only then that the recruitment of the cells dominating the fibrogenic phase, the myofibroblasts, occurs. As the function of the exquisitely radiosensitive population of the mononuclear cells is inhibited, the entire machinery of the wound healing process is downregulated. This theory not only provides a functional explanation for the clinical observation, but it also emphasizes the importance of a minimal interval between the injury, i.e., the stent insertion, and the brachytherapy.

As more experience is gained with this approach, we believe that the use of endobronchial HDR brachytherapy will widely expand. The procedure is safe, particularly in elderly patients for whom surgical mortality is by far more harmful. In younger patients, however, a more cautious approach should be taken, as data on the long-term effect of this procedure are unavailable. We believe that this method should be used whenever a metal stent is complicated by granulation tissue growth, and it should be considered in conditions such as recurrent subglottic stenosis following repeated laser therapy.

Addendum

Since the initial submission of this article, we have treated six more patients with subglottic/tracheal stenosis requiring a metal stent with HDR brachytherapy with excellent results.

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A Mycotic Pulmonary Artery Aneurysm Presenting as an Endobronchial Mass*

Mark T. Dransfield, MD; and James E. Johnson, MD, FCCP

We report the case of a 49-year-old woman who developed an endobronchial mycotic pulmonary artery aneurysm (PAA) as a complication of pneumonia. After presenting with patchy infiltrates, she developed right lung atelectasis. A noncontrast chest CT scan revealed a mass in the right hilum, and bronchoscopy identified an obstructing lesion in the right mainstem bronchus. Unfortunately, biopsy caused massive hemorrhage, and the patient died. An autopsy identified a mycotic PAA that had invaded the right mainstem. The case suggests that a contrasted CT scan should be included in the evaluation of endobronchial masses and that PAA should be included in the differential diagnosis of such lesions. (CHEST 2003; 124:1610–1612)

Key words: bronchoscopy; complications; pulmonary artery aneurysms

Abbreviation: PAA = pulmonary artery aneurysm

Pulmonary artery aneurysms (PAAs) occur rarely and are even less frequently clinically evident. They can be congenital or acquired in origin. Prior to the widespread availability of antibiotics, acquired PAAs were most often the result of tuberculosis or syphilis. More recently, other organisms have been identified as important causes of acquired PAAs. In the is article, we report the case of a patient with a mycotic PAA due to pneumonia that presented as an endobronchial mass. Unfortunately, this was not recognized, and the patient died as a result of an endobronchial biopsy.

CASE REPORT

The patient was a 49-year-old white women without a significant medical history who presented with a 5-day history of productive cough and chest pain. Her symptoms progressed despite therapy with prednisone and azithromycin. A chest radiograph revealed a right lower infiltrate, and the patient was admitted to the hospital. IV levofloxacin therapy was administered, and vancomycin and tobramycin were added to the regimen after 6 days. Eight days after hospital admission, a chest radiograph revealed total atelectasis of the right lung. On the ninth hospital day, a noncontrast chest CT scan revealed alveolar infiltrates throughout the right lung with multiple areas of cavitation. In addition, a right hilar mass 4 × 4 cm in size was identified (Fig 1). On day 10, she underwent bronchoscopy, and a mass was seen arising from the anterior aspect of the right mainstem bronchus. No biopsy specimens were obtained, but later that day the patient underwent a right thoracotomy with wedge resection of an area of cavitation as well as repeat bronchoscopy with endobronchial biopsy. Both procedures were complicated by hemorrhage, although the hemorrhage was eventually controlled. The open-lung biopsy revealed bronchopneumonia with cultures growing Streptococcus viridans. Endobronchial biopsy specimens revealed nonspecific inflammation. Therapy with antibiotics were continued for 10 more days, and the patient was transferred to our facility.

On hospital admission, the patient was afebrile with a heart rate of 113 beats/min and a BP of 107/66. Oxygen saturation was 97% on 6 L by nasal cannula. Her physical examination revealed decreased breath sounds over the right hemithorax but was otherwise normal. The initial results of laboratory work revealed a WBC count of 13,900 cells/μL with 90% neutrophils but was otherwise unremarkable, with normal hematocrit, platelet count, prothrombin and partial thromboplastin times, and serum chemistry levels. An HIV test obtained at the referring hospital was negative. A chest radiograph confirmed total opacification of the right hemithorax.

The day following transfer, the patient was taken to the operating room for rigid bronchoscopy. Again, a mass was identified in the right mainstem bronchus. Unfortunately, massive bleeding was noted after the first biopsy and, despite left mainstem intubation and fluid resuscitation, the patient became pulseless. She could not be revived despite aggressive transfusion and continued resuscitative efforts.

An autopsy confirmed the presence of extensive necrotizing pneumonia. Also noted was a mycotic aneurysm of the right pulmonary artery that extended into the wall of the right mainstem bronchus (Fig 2, 3).

DISCUSSION

It is difficult to establish an accurate estimate of the incidence of PAA as prior studies have used inconsistent

*From the University of Alabama at Birmingham, Birmingham, AL. Manuscript received December 9, 2002; revision accepted February 28, 2003. Reproduction of this article is prohibited without written permission from the American College of Chest Physicians (e-mail: permissions@chestnet.org).

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FIGURE 1. Noncontrast chest CT scan at the level of the right pulmonary artery showing a 4 × 4-cm mass in the right hilum. The lesion proved to be a mycotic PAA.