Pulmonary Artery Pseudoaneurysm: Etiology, Presentation, Diagnosis, and Treatment

Vaishali Lafita, M.D.,¹ Marc A. Borge, M.D.,¹ and Terrence C. Demos, M.D.¹

ABSTRACT

Pulmonary artery pseudoaneurysms (PAPs) are uncommon but associated with high mortality. Left untreated, lesions can enlarge, rupture, and lead to exsanguination and death. Presentations range from life-threatening hemorrhage to silent lesions that enlarge for days, months, or years. Because abnormalities on imaging studies can lead to early diagnosis and treatment and embolization is the treatment of choice, the radiologist can contribute to both timely diagnosis and treatment of PAPs. Pseudoaneurysms due to penetrating trauma, blunt trauma, bacterial endocarditis, and complications related to pulmonary artery catheters and right heart catheterization are presented. Three were treated by embolization.

KEYWORDS: Pulmonary artery pseudoaneurysm

Objectives: Upon completion of this article, the reader should have better understanding of the etiologies, clinical presentations, imaging findings, and treatment options of pulmonary artery pseudoaneurysms.

Accreditation: Tufts University School of Medicine (TUSM) is accredited by the Accreditation Council for Continuing Medical Education to provide continuing medical education for physicians.

Credit: TUSM designates this educational activity for a maximum of 1 *AMA PRA Category 1 Credit*TM. Physicians should only claim credit commensurate with the extent of their participation in the activity.

Pulmonary artery pseudoaneurysms (PAPs) are uncommon and may be congenital or acquired. Most PAPs are acquired and associated with cardiovascular disease. Other acquired causes include infection, iatrogenic, trauma, and neoplasm. Iatrogenic PAP is most

common, followed by trauma. Hemoptysis is the most frequent presenting sign and ranges from acute severe hemorrhage to incidental findings on radiographs, computed tomography (CT), or magnetic resonance (MR) imaging. Abnormalities on imaging studies can lead to

¹Department of Radiology, Loyola University Medical Center, Maywood, Illinois.

Address for correspondence and reprint requests: Marc A. Borge, M.D., Department of Radiology, Loyola University Medical Center, 2160 S. First Avenue, Maywood, IL 60153.

Case-Based Interventional Radiology; Guest Editors, Ron C. Gaba,

M.D., Derek L. West, M.D., James T. Bui, M.D., Charles A. Owens, M.D.

Semin Intervent Radiol 2007;24:119–123. Copyright © 2007 by Thieme Medical Publishers, Inc., 333 Seventh Avenue, New York, NY 10001, USA. Tel: +1(212) 584-4662.

DOI 10.1055/s-2007-971202. ISSN 0739-9529.

Figure 1 Swan-Ganz catheter injury resulted in acute hemoptysis in 77-year-old man with bladder carcinoma hours after pulmonary artery catheter placement. (A) Chest radiograph reveals area of right upper lobe consolidation (asterisk). (B) Pulmonary artery angiogram shows pseudoaneurysm (arrow), which was successfully embolized with coils (C).

early diagnosis and treatment. Treatment of PAPs includes surgical ligation, wedge resection, lobectomy, angiographic embolization, endovascular stent graft placement, and watchful waiting.

Iatrogenic causes of PAP include complications of pulmonary artery catheters (Fig. 1), right cardiac catheterization (Fig. 2), chest tube insertion, and biopsies.¹⁻⁴ A 0.2% incidence of pulmonary artery rupture due to pulmonary artery catheters is reported,⁵ with mortality as high as 50%.^{2,4} Acute hemorrhage occurred within 3 days of catheter placement in 90% of patients in one series.⁵ PAPs may be

silent and regress without treatment but may also continue to hemorrhage for days or months despite removal of an inciting catheter.⁵ One of our patients had massive hemoptysis during cardiac catheterization (Fig. 2).

Infectious causes of PAP include tuberculosis, pyogenic infection, and mucormycosis. One of our patients had a mycotic pseudoaneurysm secondary to subacute bacterial endocarditis (Fig. 3). Hemoptysis from Rasmussen aneurysm complicating active tuberculosis is due to inflammatory destruction of the media in segmental pulmonary arteries.^{4,6} Chronic

Figure 2 Pulmonary artery aneurysm secondary to cardiac catheterization in a 79-year-old woman resulted in massive hemoptysis during the procedure. (A) Initial computed tomography (CT) scan demonstrates large right upper lobe pseudoaneurysm (arrow). Because patient was high-risk surgical candidate, conservative management with serial CT studies was elected. (B) Partial thrombosis and decrease in size of pseudoaneurysm (arrow) was seen on 5-month follow-up study.

inflammation due to Behçet's disease and Takayasu arteritis has also resulted in PAP.

Of 13 reported cases of traumatic PAP, 3 were from blunt and 10 from penetrating trauma^{1,7} (Figs. 4 and 5). Presentations included dyspnea, chest pain, and hypoxia with hemoptysis, which is most common. The time from injury to presentation ranged from few days to 30 years.⁷ Most patients had abnormal but nonspecific abnormalities on chest radiographs.

Chest radiographs may show nonspecific focal lung consolidation, a solitary pulmonary nodule, or early consolidation evolving to a nodule or mass.⁵ There may

be pleural fluid. CT is more definitive when there is central enhancement within a hematoma or lung consolidation. Other findings include an enhancing mass next to a pulmonary artery, thrombus within a dilated pulmonary artery, and an enhancing nodule with a low attenuation halo. Definitive diagnosis is usually made by angiography, which shows pathological anatomy and provides a road map for treatment by embolization. Percutaneous embolization is a minimally invasive alternative to surgical treatment.⁴ Transcatheter embolization with stainless steel coils, platinum coils, or detachable balloons is a practical, effective, and safe therapeutic option.

Figure 3 Mycotic pseudoaneurysm in 26-year-old heroin user. Patient had massive hemoptysis due to septic emboli to lungs after tricuspid valve replacement for subacute bacterial endocarditis. (A) Pulmonary angiogram reveals left upper lobe pseudoaneurysm (arrow). After embolotherapy (B), coils are seen in pseudoaneurysm and feeding artery (arrow).

Figure 4 Chronic pulmonary artery pseudoaneurysm from blunt trauma in 53-year-old man with remote history of motor vehicle accident. (A) Three-dimensional reconstruction from chest computed tomography angiogram shows large right lower lobe pseudoaneurysm (arrow) supplied by enlarged pulmonary artery branch (arrowhead). (B) Pulmonary angiogram demonstrates packing of coils into feeding artery (arrow).

Figure 5 Traumatic pseudoaneurysm in 38-year-old man with gunshot injury to left anterior chest wall. Pulmonary angiogram shows pulmonary artery pseudoaneurysm (arrow) involving origin of apical posterior segment of left pulmonary artery.

REFERENCES

1. Donaldson B, Ngo-Nonga B. Traumatic pseudoaneurysm of the pulmonary artery: case report and review of the literature. *Am Surg* 2002;68:414–416
2. Poplasky MR, Rozenblit G, Rundback JH, Crea G, Maddineni S, Leonardo R. Swan-Ganz catheter-induced pulmonary artery pseudoaneurysm formation: three case reports and a review of the literature. *Chest* 2001;120:2105–2111
3. Podbielski FJ, Wiesman IM, Yaghmai B, Owens CA, Benedetti E, Massad MG. Pulmonary artery pseudoaneurysm after tube thoracostomy. *Ann Thorac Surg* 1997;64:1478–1480
4. Pelage JP, El Hajjam M, Lagrange C, et al. Pulmonary artery interventions: an overview. *Radiographics* 2005;25:1653–1667
5. Abreu AR, Campos MA, Krieger BP. Pulmonary artery rupture induced by a pulmonary artery catheter: a case report and review of the literature. *J Intensive Care Med* 2004;19:291–296
6. Alkadhi H, Wildermuth S, Desbiolles L, et al. Vascular emergencies of the thorax after blunt and iatrogenic trauma: multi-detector row CT and three-dimensional imaging. *Radiographics* 2004;24:1239–1255
7. Savage C, Zwischenberger JB, Ventura KC, Wittich GR. Hemoptysis secondary to pulmonary pseudoaneurysm 30 years after a gunshot wound. *Ann Thorac Surg* 2001;71:1021–1023