

Pulmonary Embolectomy: Should It Be Offered Earlier Rather Than Later?

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Deep venous thrombosis and pulmonary embolism are associated with approximately 250,000 hospitalizations each year. Nearly seventy percent of patients who die of a pulmonary embolism do so within the first hour after onset of symptoms, so prompt and appropriate treatment is needed. Pulmonary embolectomy is a viable alternative for massive and submassive pulmonary embolism. We report 3 cases of successful pulmonary embolectomy. *Key words: deep venous thrombosis, pulmonary embolism.* [Respir Care 2009;54(3):390–392. © 2009 Daedalus Enterprises]

Introduction

Deep venous thrombosis and pulmonary embolism cause approximately 250,000 hospitalizations each year, and as many as 50,000 deaths in the United States. The mortality rate at 3 months in patients with massive pulmonary embolism and a systolic blood pressure of < 90 mm Hg is about 50%.¹ Approximately 70% of patients who die of a pulmonary embolism die within the first hour after onset of symptoms, so prompt appropriate treatment is needed.² We report 3 patients with submassive to massive pulmonary embolism and who had successful embolectomy.

Patient 1

A 64-year-old male with a history of a previous cerebral vascular accident, and was on warfarin, presented with left-side weakness. Suspicion that he had had another cerebral vascular accident led to a magnetic resonance imaging of the head, which showed focal bilateral watershed infarcts. Because the infarcts were believed to be thromboembolic, a transesophageal echocardiogram was ordered, which revealed a 0.7×5.6 -cm clot in the right pulmonary artery, but with no right-ventricular heart strain. A computed tomography (CT) angiogram of the chest confirmed a pulmonary embolus straddling the main pulmonary artery bifurcation, with extension bilaterally into the pulmo-

nary arteries of the lower lobes. Although he was hemodynamically stable, the size of the clot, in our opinion, warranted aggressive treatment. Since there was a contraindication to thrombolytic, he underwent pulmonary embolectomy. The embolus measured 1.8×34.5 -cm and had numerous branches (Fig. 1).

Patient 2

A 77-year-old male was found unresponsive in a public park. He was hemodynamically stable on arrival and was intubated for airway protection. He had suffered an ischemic stroke 2 weeks earlier. A CT of the head was negative for cerebral vascular accident. A CT angiogram of the chest revealed a massive saddle pulmonary embolus. He became hemodynamically unstable within 2 hours of presentation, but thrombolytic therapy was contraindicated because of his recent cerebral vascular accident. Embolectomy (Fig. 2) was successful and he survived.

Patient 3

A 57-year-old male presented with shortness of breath, fever, and chills of 2 weeks duration, which was initially diagnosed as pneumonia. After failing out-patient therapy for community-acquired pneumonia, CT angiogram of the chest revealed multiple bilateral pulmonary emboli. Suspicion of underlying pulmonary hypertension led to a transthoracic echocardiogram, which showed a 1.9×4.0 -cm pedunculated clot with a narrow stalk at the base, in the right ventricle. Although he was hemodynamically stable, we considered thrombolytic therapy because of the large intraventricular clot. However, we were concerned that

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Fig. 1. Embolus from patient 1.



Fig. 2. Embolus from patient 2.

thrombolytic therapy could dislodge the clot and completely occlude the ventricular outflow tract. Embolectomy was successful (Fig. 3).

Discussion

Massive pulmonary embolism is defined as a pulmonary embolus associated with hypotension, respiratory failure, or right-ventricular dysfunction.³ However, in the absence of hemodynamic instability, other signs that suggest submassive to massive pulmonary embolism include the clot burden in the pulmonary vasculature, evidence of right-ventricular strain on echocardiogram, and elevated cardiac-injury biomarkers such as troponin I and troponin T.³

Anticoagulation and thrombolysis are the standard treatment for acute massive pulmonary embolism, but roughly one third of these patients are not eligible for thrombolysis because of contraindications such as prior surgery, trauma,

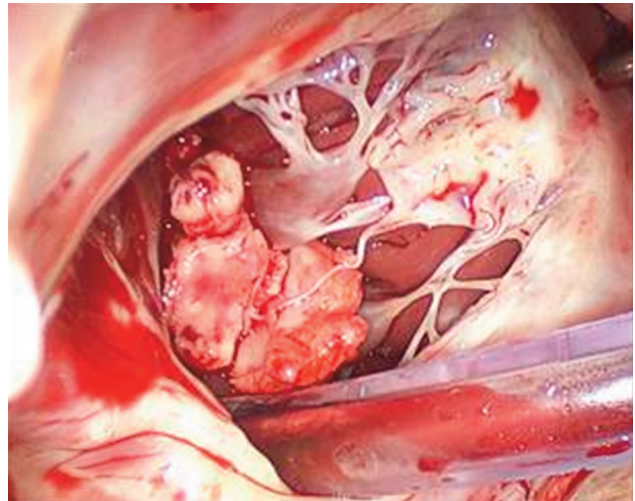


Fig. 3. Embolectomy in patient 3.

stroke, or advanced cancer.³ Thrombolytic therapy can have serious adverse effects. Among the 304 patients in the International Cooperative Pulmonary Embolism Registry who received pulmonary embolism thrombolysis, 66 (22%) experienced major bleeding and 9 (3%) had intracranial bleeding.¹

Embolectomy is indicated in patients who have contraindications to thrombolytic therapy, persistence of thrombi in the right heart or pulmonary arteries after pulmonary embolism, or severe hemodynamic compromise with cardiovascular collapse. Overall mortality after pulmonary embolectomy has ranged from 16% to 46% (mean 26%) in the reported series.⁴ Although Patient 1 and Patient 2 were referred for embolectomy because they had contraindications to thrombolytic therapy, we pursued an aggressive treatment plan because of the size of the clot.

Pulmonary embolectomy has been considered a treatment of last resort, but recent studies suggest that it can be effective when performed early, with lower morbidity and mortality.⁵ In the 1960s and 1970s pulmonary embolectomy was performed as a closed cardiac procedure. However, it is now performed during cardiopulmonary bypass, and the clots are extracted from the opened pulmonary artery under direct vision. Contemporary series have had mortality rates below 10%,³ and one case series of 29 patients reported a survival rate of 89%.⁵ The high survival is attributed to improved surgical technique, rapid diagnosis and triage, and careful patient selection. Mortality risk is low if the surgery is performed prior to irreversible right-ventricular dysfunction or protracted cardiogenic shock. Patients who are hemodynamically stable can quickly decompensate, so aggressive therapy should always be considered, as in our patient 2. Emergency embolectomy should also be considered in hemodynamically unstable patients who are clinically suspected of having a

massive pulmonary embolism, as described in 2 other case reports.^{6,7}

Our cases highlight the emerging use and potential benefits of pulmonary embolectomy. Massive pulmonary embolism is catastrophic and usually requires thrombolytic therapy, but if there are contraindications to thrombolytic therapy, surgical intervention should be considered early in the course of evaluation and management.

REFERENCES

1. Goldhaber SZ, Visani L, De Rosa M. Acute pulmonary embolism: clinical outcomes in the International Cooperative Pulmonary Embolism Registry. *Lancet* 1999;353(9162):1386-1389.
2. Kucher N, Rossi E, De Rosa M, Goldhaber SZ. Massive pulmonary embolism. *Circulation* 2006;113(4):577-582.
3. Konstantinides SV. Management of acute pulmonary embolism. *Humana Press*; 2007:69-147.
4. Ullmann M, Hemmer W, Hannekum A. The urgent pulmonary embolectomy: mechanical resuscitation in the operating theatre determines the outcome. *Thorac Cardiovasc Surg* 1999;47(7):5-8.
5. Aklog L, Williams CS, Byrne JG, Goldhaber SZ. Acute pulmonary embolectomy: a contemporary approach. *Circulation* 2002;105(12):1416-1419.
6. Brevetti GR, O'Brien B, Coomer CL, Hall TS, Brevetti LS, Jablons DM. Emergent surgery for massive pulmonary embolism: on the basis of clinical diagnosis. *Tex Heart Inst J* 2003;30(2):149-151.
7. Sadeghi A, Brevetti GR, Kim S, Burack JH, Genovese MH, Distant DA, et al. Acute massive pulmonary embolism: role of the cardiac surgeon. *Tex Heart Inst J* 2005;32(3):430-433.



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