CASE REPORT

Percutaneous Rheolytic Embolectomy for Massive Pulmonary Embolism

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SUMMARY

Pulmonary embolism (PE) is a frequent cardiovascular disease with an incidence of 1/1000 in the United States and a mortality rate of 15% within three months after its diagnosis. This mortality increases five times in patients that develop shock. Despite its high incidence and morbimortality, the regular treatment has not substantially varied in the last years, and although the advances in therapies with thrombolytic agents or surgical endarterectomy, the mortality rate remains high in patients with massive pulmonary embolism.
Recently, percutaneous thrombectomy therapies have begun to be used. These ones open a new therapeutic option that should be considered if necessary resources are available.
Two cases of massive pulmonary embolism treated with rheolytic thrombectomy are described in this work.

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Key words > Percutaneous rheolytic thrombectomy - Massive Pulmonary Embolism

Abbreviations >

ECG	Electrocardiogram	**PE**	Pulmonary embolism
SBP	Systolic blood pressure	**t-PA**	Tissue plasminogen activator

BACKGROUND

Pulmonary embolism (PE) is a frequent cardiovascular disease; its incidence in the United States is of 1/1000, with a mortality rate of 15% within three months after its diagnosis. Mortality is five times greater in patients that develop shock. Although its high incidence and morbimortality, the regular treatment has not substantially varied in the last years and despite the advances in therapies with thrombolytic agents or surgical endarterectomy, the mortality rate remains high in patients with massive PE. (1-3)

Recently, percutaneous thrombectomy therapies have begun to be used. These ones open a new therapeutic option.

Two cases of massive pulmonary embolism treated with rheolytic thrombectomy are described in this work.

CLINICAL CASE 1

29-year-old female patient with history of ulcerative colitis diagnosed when she was 18 years of age, free of symptoms since she was 23 (with no treatment), two pregnancies and two normal births.

Her third pregnancy was free of complications; 16 hours after a normal birth she presented perspiration and dizziness after the realization of the Valsalva maneuver, situation that was quickly solved. 4 hours later, the patient suddenly presented palpitations and dyspnea at rest. Hypotension (80/40 mm Hg), tachycardia (150 beats/min.) and tachypnea (36 breaths/min.), with preserved oxygen saturation were verified in the physical examination. Jugular ingurgitation with hepatojugular reflux, with a good bilateral air entry and appropriate peripheral perfusion were observed.

Considering the clinical suspicion of PE, a 64-detector multislice CT, which showed an image compatible with thrombus at the level of the trunk and main branches of the pulmonary artery, with marked decrease of the peripheral pulmonary vasculature, was performed. (Figure 1).

The patient was referred to the Coronary Unit where she received crystalloid expansions and a dopamine infusion was begun. The acid-base status presented metabolic acidosis and lactacidemia with base excess -9.4 and bicarbonate 13.7.

The color Doppler echocardiography showed preserved diameters and left ventricular systolic function, with moderate dilation of the right ventricle and free-wall hypokinesis. Mild tricuspid regurgitation with systolic blood pressure of the pulmonary artery (32 mm Hg) was detected.

Considering the diagnosis of massive PE, thrombolitic agents (t-PA) were administrated. The patient responsed with hemodynamic improvement at the beginning of the infusion, but before finishing it, she presented hemodynamic decompensation with desaturation and hypotension again. In view of refractoriness when facing the medical treatment with expansions and inotropes, the patient was derived to the Hemodynamic Service for the realization of a thrombectomy. The pulmonary angiography

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showed a filling defect in the trunk, main branches and even peripheral branches of both pulmonary arteries. *Mechanical aspiration followed by rheolythic thrombectomy from the pulmonary artery and its branches using an AngioJet (POSSIS Inc.) rheolytic thrombectomy device was performed.*

A transitory inferior vena cava filter was placed in the young patient who has just given birth and with her own life in danger.

She remained stable; after 12 days, the filter was removed and a small thrombus was observed.

15 days after the childbirth, the patient was discharged from the Hemodynamic Service under anticoagulation with acenocoumarol. In the remote monitoring, pulmonary pressures measured by echocardiography were normal.

CLINICAL CASE 2

62-year-old female patient with history of hypertension, tobacco smoking, dyslipidemia, non-surgical abdominal aortic aneurysm and treatment with metallic stent in the middle third of the right coronary artery (year 2002). She presented oppressive precordial pain associated with three-week evolution of progressive dyspnea. At the moment of her admission to the Coronary Unit, she had no symptom. The ECG presented negative T waves in DII, DIII, aVF and V1-V4 and it was interpreted as medium-risk unstable angina, therefore a treatment with aspirin, beta-blockers, angiotensin-converting enzyme inhibitors, statines and anticoagulation was begun.

Fig. 1. Multislice CT with a thrombus image in the trunk and main branches of the pulmonary artery.

A cine-coronarography, in which a sub-occlusive lesion in the branch origin of the circumflex artery and a severe lesion in the distal third of the right coronary artery in the atrioventricular and posterior-descending junction, was carried out; since the patient still had dyspnea and an episode of refractory angina. An angioplasty with a stent in the branch and two stents in the right coronary artery bifurcation was performed.

Abnormal movement of the *septum*, severe dilation of the right ventricle, and moderate tricuspid regurgitation with systolic blood pressure of the pulmonary artery (51 mm Hg) was shown in the echocardiography.

The patient progressed with hypotension and requirement of inotropes, dyspnea, jugular ingurgitation with hepatojugular reflux and oliguria.

Considering the suspicion of PE, a 64-detector multislice CT, which showed an image compatible with thrombus at the level of the trunk and both branches, was performed.

Once the diagnosis of PE was confirmed, the patient was derived to the Hemodynamics Service to perform an angiography and a percutaneous thrombectomy. Before the rheolytic treatment, any complication of the previous angioplasty procedure was discarded through a coronary angiography.

A thrombectomy with AngioJet device (POSSIS Inc.) in the main pulmonary artery and its branches, with an immediate improvement of the symptoms, was carried out (Figure 2).

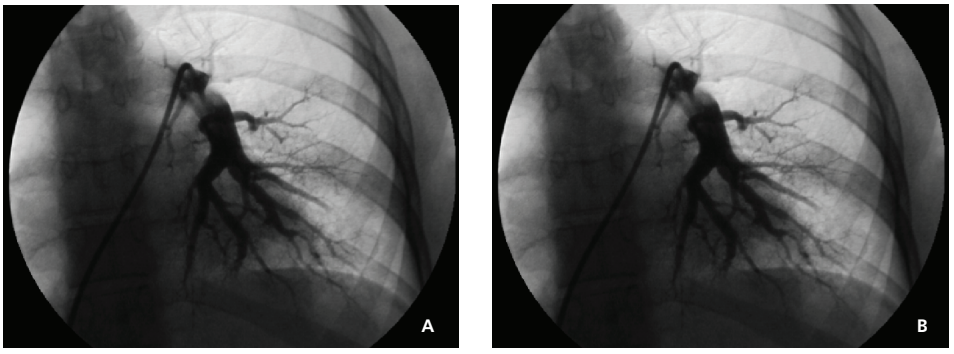
The patient was hemodynamically stable. She was discharged from the Hemodynamic Service under anticoagulation with acenocoumarol. In the subsequent monitoring, pulmonary pressures measured by echocardiography were normal.

DISCUSION

The main criterion to consider PE as massive is hypotension, defined as a systolic blood pressure (SBP) under 90 mm Hg or a fall in the SBP over 40 mm HG for 15 minutes, followed by right ventricular dysfunction and cardiogenic shock. (4) The International Cooperative Pulmonary Embolism Registry (ICOPER) (5) gathered 2454 consecutive patients from seven countries, 4.3% of them pesented massive PE and mortality was 17.4%. The embolus size, comorbilities and underlying cardiopulmonary function determine the mortality rate in these patients.

Embolectomy should be considered when the patient has indication of thrombolysis, when it does not work or when it is contraindicated. There are different techniques of percutaneous embolectomy which may be divided into three big groups: a) through

Fig. 2. A. Arteriography of the pulmonary artery. **B.** Pulmonary artery after aspiration.



the thrombus fragmentation in a mechanic way, (6) which is manually performed with a conventional multipurpose catheter, b) extraction with a *cup* or *basket* device and c) with a rheolytic thrombectomy catheter (AngioJet). The last one consists in an aspiration system that uses Bernoulli phenomenon where a retrograde *jet* of high speed of saline solution generates a zone of low pressure around the catheter. This produces the thrombus rupture and its aspiration. (7-9)

The patient from clinical case 1 was initially treated with systemic thrombolytic agents. It was the routine procedure carried out in our service up to the presentation of this patient. Considering the recurrence of hemodynamic deterioration, the percutaneous treatment was performed. This was combined with the use of intra-arterial thrombolytic agents, mechanical fragmentation and thrombus aspiration with a multipurpose catheter and rheolytic thrombectomy for thrombus in the pulmonary vasculature. The result was successful and the patient never show hemodynamic instability again.

CONCLUSIONS

Percutneous embolectomy constitutes a new tool for the treatment of massive and submassive PE. When it is available and, in experienced hands, it is a safe and effective technique that should be considered in patients with thrombolysis criteria and mainly in those in which this has failed or in those in which it is contraindicated. In this presentation, both cases are the first ones in which this method was used in Latin America.

RESUMEN

Embolectomía percutánea reolítica en la tromboembolia pulmonar masiva

La tromboembolia de pulmón es una patología cardiovascular frecuente, con una incidencia de 1/1.000 en los Estados Unidos y una mortalidad que alcanza el 15% en los tres meses siguien¬tes a su diagnóstico. Esta mortalidad aumenta cinco veces en los pacientes que desarrollan shock. A pesar de su incidencia y morbimortalidad elevadas, el tratamiento habitual no ha variado sustancialmente en los últimos años y aun a pesar de los avances en las terapias con trombolíticos o la endarterectomía quirúrgica, la tasa de mortalidad se mantiene muy elevada en los pacientes con tromboembolia pulmonar masiva.

Recientemente se ha comenzado a utilizar terapias de trombectomía percutánea, que abren una nueva opción terapéutica que debe considerarse si se dispone de los medios necesarios.

En esta presentación se describen dos casos de tromboembolia pulmonar masiva tratados con trombectomía reolítica.

Palabras clave > Embolectomía percutánea reolítica - Tromboembolia pulmonar masiva

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