Acute massive pulmonary embolism treated by thrombo-embolectomy using intermittent deep hypothermic circulatory arrest

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Abstract

Acute massive pulmonary embolism is a life threatening medical emergency resulting in a high mortality rate. Usually, urgent thrombo-embolectomy is performed using double venous cannulation without circulatory arrest. We describe a patient suffering from acute massive pulmonary embolism that was treated by emergency thrombo-embolectomy. Due to back-bleeding the view into the lobar and segmental pulmonary arteries was severely compromised. In order to achieve complete thrombo-embolectomy, intermittent deep hypothermic circulatory arrest was performed.

Keywords: Acute massive pulmonary embolism; Thrombo-embolectomy; Deep hypothermic circulatory arrest

1. Introduction

Acute massive pulmonary embolism is a life threatening medical emergency resulting in a high mortality rate of 15% [1]. Usually, urgent thrombo-embolectomy is performed using double venous cannulation without circulatory arrest [2]. In this report we describe the usage of intermittent deep hypothermic circulatory arrest for the treatment of pulmonary embolism.

2. Text

A 35-year-old woman was referred to our hospital with a history of deep venous thrombosis. She received no anticoagulation or platelet inhibition therapy.

On admission the patient complained about coughing, dyspnea and angina pectoris (both, NYHA-IV). Except for her poor clinical condition, physical examination was normal. Blood analysis showed an elevated D-dimer (1.4 ng/ml) and elevated liver enzymes (ASAT 459, ALAT 594, GGT 120, LD 1145). Negative T waves were present on electrocardiography. Echocardiography revealed a dilated right atrium and ventricle and concomitant tricuspid insufficiency.

During suspicion of pulmonary embolism, contrast enhanced CT-scan was performed showing massive thrombosis in the right atrium and the common pulmonary artery, the left and right pulmonary artery (Fig. 1a). Subsequently, an urgent thrombo-embolectomy was planned.

3. Discussion

Patients suffering from acute massive pulmonary embolism are in a detrimental clinical situation. The only chance
occlusion.

segmental arteries after an acute thrombogenic central
tomy. Usually, massive thrombus formation occurs in the
circulation often resulting in incomplete thrombo-embolec-
tomy due to retrograde bleeding from the bronchial
into the left and right lobar and segmental pulmonary
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suction and opening the pleural space to allow for massag-
corporeal circulation using Fogarty balloon catheters,
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necessitating immediate cardio-pulmonary bypass. Gener-
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[3]. This approach is characterised by a compromised view
into the left and right lobar and segmental pulmonary
arteries due to retrograde bleeding from the bronchial
circulation often resulting in incomplete thrombo-embolec-
tomy. Usually, massive thrombus formation occurs in the
segmental arteries after an acute thrombogenic central
occlusion.

Based on our excellent experience with thrombo-endar-
terectomy using intermittent deep hypothermic circulatory arrest in patients suffering from chronic pulmonary embolism, we performed the same technique in acute massive pulmonary embolism [4].

An optimal view deep into the segmental pulmonary arter-
ies is achieved allowing extensive thrombo-embolectomy on
both sides during a limited period of circulatory arrest.

In conclusion, we propose intermittent deep hypothermic
circulatory arrest as a new and more effective approach
for the treatment of acute massive pulmonary embolism in
cases in which complete embolectomy was felt to be
incomplete.

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eComment: Acute pulmonary embolism and surgical treatment

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I read with interest the article by Van Putte et al. [1] in which they
describe intermittent application of deep hypothermic circulatory arrest for
open pulmonary thrombo-embolectomy in acute massive embolism.

Massive pulmonary embolism is a life threatening condition and urgent
treatment is indicated immediately after confirmation of diagnosis. Open
pulmonary embolectomy is in most cases performed in patients with hemo-
dynamic instability or contraindications for thrombolytic or interventional
treatment and results are regarding the acceptable severity of illness.
Surgical techniques performed are still controversial.

I agree with the authors that deep hypothermic circulatory arrest is an
excellent technique in cases of chronic pulmonary embolism, but I think
that deep hypothermic circulatory arrest will not be needed in cases of
acute pulmonary embolism. Although longitudinal incision of pulmonary
artery is in many cases performed [2, 3], like in the present one, I would
suggest semicircular incision of the main pulmonary artery just before
pulmonary bifurcation. Through this incision and using rigid suction segmen-
tal pulmonary arteries can be viewed well, especially from the left side.
Viewing from the right side is often compromised and can be facilitated in
some cases with additional direct incision of right pulmonary artery at the
level of right pulmonary artery trifurcation after dissection of tissue between
ascending aorta and superior cava vein. I believe that use of Fogarty
catheters should be avoided, due to risk of perforation into fragile lung
tissue resulting in intrapulmonary bleeding. In addition, compression of lungs
very often reveals mobilized peripheral clots and should be performed
carefully.

Two other points of view are very important; first, bicaval cannulation
should be done making careful inspection of right atrium, interatrial septum,
and right ventricle possible and safe, avoiding recurrent embolism of clots
remaining in right heart, and second, reperfusion of the extremely dilated
and compromised right ventricle is essential. The technique described by
Van Putte and colleagues uses rewarming time for extensive reperfusion.

Fig. 1. (a) Preoperative contrast enhanced CT image of the central pulmo-
ary artery as well as the right and left pulmonary branches. The left pul-
monary artery was totally occluded by massive thrombus while the lumen of
the left pulmonary artery was severely compromised by thrombus. (b) Post-
operative contrast enhanced CT image showing a completely open pulmonary
circulation on both sides.
Anyway, I believe that application of deep hypothermic circulatory arrest during pulmonary embolectomy should be a good option in cases of recurrent pulmonary embolism with fresh and old clots in pulmonary artery tree.

References

