A CASE REPORT
SUCCESSFUL THROMBOLYSIS FOR MASSIVE PULMONARY EMBOLISM: RAPID LOW-DOSE INTRA-EMBOLIC THERAPY

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Abstract

Management of postoperative acute massive pulmonary embolism (PE) presents a dilemma because recent surgical procedure is usually considered an absolute contraindication for thrombolysis. In these patients, catheter or surgical embolectomy are helpful for rapidly reversing right ventricular failure. However, pulmonary embolectomy itself has a high mortality and may not always be available. We report the successful use of low-dose intra-embolic thrombolysis for acute massive PE after abdominal total hysterectomy. The infusion of low-dose urokinase produced an immediate improvement in the patient’s hemodynamic state. The patient tolerated the thrombolytic therapy well, without hemorrhage or other complications and made a successful recovery.

Key Words: Pulmonary embolism, Thrombolysis, Embolectomy, Intra-embolism

Introduction

Massive pulmonary embolism (PE) is a life-threatening condition with a high early mortality rate due to acute right ventricular failure and cardiogenic shock. \(^1\,^2\) As soon as the diagnosis is suspected, an intra-venous bolus of unfractionated heparin should be administered. \(^3\) In addition to anticoagulation, rapid initiation of systemic thrombolysis is potentially life-saving and therefore is standard therapy. \(^4\,^5\) Many patients with massive PE cannot receive thrombolysis because of an increased bleeding risk, such as prior surgery, trauma, or cancer. In this condition, catheter or surgical embolectomy are helpful for rapidly reversing right ventricular failure. \(^6\,^7\) However, pulmonary embolectomy may not always be available or the patient has contraindications to surgery. We report the direct intra-embolic thrombolytic infusion may be life-saving for acute massive PE.

Case Presentation

A 39-year-old woman (52 kg, 158 cm and ASA II) was scheduled for the abdominal total hysterectomy (ATH). Anesthesia was induced with fentanyl 100 ug, propofol 120mg and rocuronium 50 mg intravenously, and maintained with sevoflurane. Vital signs were acceptable (blood pressure = 110/80 mmHg, heart rate = 80-90 beats/min, SpO\(_2\) = 100%, end-tidal carbon dioxide partial pressure=38 mmHg) and the peak airway pressure was about 22 mmHg under volume control ventilation (10 ml/kg). The operation
and anesthesia were performed smoothly. But near complete of the surgery, the patient's arterial pressure suddenly decreased to 60/30 mm Hg and the ECG showed sinus tachycardia rhythm at a rate of 130 beats min\(^{-1}\). And the end-tidal carbon dioxide partial pressure was noted to decrease to 26 mmHg. Vigorous volume resuscitation with intravenous fluids and vasopressors was required. A high-dose epinephrine infusion was required to maintain systemic pressure, and arterial hypoxemia persisted despite mechanical ventilation with 100% oxygen. Arterial blood gas analysis (fraction of inspired oxygen 100%) revealed a base deficit of 11 mmol/L (pH 7.091, partial pressure of carbon dioxide in arterial gas 66 mm Hg, partial pressure of arterial oxygen 60 mm Hg).

However, despite all efforts, no major improvement in her condition was observed. Transesophageal echocardiography revealed a massive PE over the right pulmonary artery and right ventricular dilation and hypokinesis (Fig. 1). Because the patient was contraindicated for systemic thrombolysis and surgical embolectomy was not available, thereupon invasive hemodynamic monitoring and low-dose intraembolic thrombolysis were chosen with a Swan-Ganz catheter. The tip of the Swan-Ganz catheter was confirmed intraembolismly under transesophageal echocardiography, and initially presenting with pulmonary artery pressure of 47 mmHg. After surgery, this patient was transfer to the intensive care unit (ICU) for further evaluation and treatment. A computed tomography angiography of the chest was requested showing filling defects in right pulmonary arteries and their segmentary branches, related to a massive PE (Fig. 2).

The patient was treated with low-dose intraembolic thrombolysis 1 hour after the onset of the PE. A contine infusion of urokinase (50000 U/hr) was given over 24 hours into the huge PE. There was a quite hemodynamic response to thrombolysis, with a gradual reduction in the inotropic requirement and a steady improvement in gas exchange. An intravenous heparin infusion (500 U/hr) was started on completion of thrombolysis for 5 days with control of activated partial thromboplastin time (APTT) between 1.5-2.0 times the normal values.

Follow-up transthoracic echocardiography 72 hours later demonstrated a relief of the right ventricular overload with a pulmonary artery pressure of 30 mmHg. Her condition improved rapidly. The patient tolerated the low-dose intraembolic thrombolysis well, with no signs of hemorrhage or other complications. She did not present neurological deficits and was discharged from the ICU and later from the hospital.
Discussion

PE is a severe complication affecting about 2.5% of hospitalized patients, with a mortality of over 30% in cases of massive PE. However, an accurate diagnosis followed by effective therapy improves survival among patients with symptomatic PE. Thus, it is important that effective therapy should be instituted as quickly as possible.

The standard therapy for PE remains anticoagulation, initially with an intravenous bolus of 5000 IU of unfractionated heparin followed by an infusion to maintain the APTT at 1.5-2.5 times the control value until adequate replacement by oral warfarin, aiming for a target INR of 2-3 for 6-12 weeks. Barritt et al first reported on the mortality benefit of anticoagulation in PE. They observed no deaths in 54 patients treated with anticoagulants (i.v. heparin over 36 h and nicoumalone for 14 days) while there were five deaths in 19 control patients who did not receive anticoagulants.

However, thrombolytic therapy is most often utilized with massive PE, and in such instances, rapid early thrombolysis is important. Many studies confirm that thrombolytic therapy leads to rapid improvement in hemodynamic aberrations associated with PE than standard anticoagulation, and this approach to massive PE with cardiogenic shock is a guideline-based practice. The American Heart Association suggests that thrombolytic therapy should be considered in patients who present in shock because the mortality rate in this group is as high as 30%. A recent article confirmed that cardiogenic shock is still the most widely accepted indication for thrombolysis, even if recent small studies have shown some benefit of thrombolysis for patients with a sub-massive PE.

Many patients with massive PE cannot receive systemic thrombolysis because of an increased bleeding risk, such as prior surgery and trauma. Catheter and surgical embolectomy are helpful for rapidly reversing right ventricular failure. However, pulmonary embolectomy may not always be available or the patient has contra-indications to surgery. In this condition, the direct intra-embolic thrombolytic infusion may be life-saving for acute massive PE.

In experimental models of PE, direct intra-embolic infusion of thrombolytics has enhanced thrombolysis. Tapson et al describe six cases (five with contra-indications to systemic thrombolysis) who improved dramatically on receiving intra-embolic thrombolysis, with no haemorrhagic complications. Fava et al report using intra-embolic infusion combined with mechanical fragmentation of the thrombus (using angiographic catheters or angioplasty balloons) in sixteen patients. There was dramatic improvement in most, and fourteen patients recovered completely. Other studies suggest that infusion of thrombolitics directly into the thrombus is effective and safe. The most promising agents appear to be urokinase or rTPA. Dramatic improvement has been noted following doses of 10 to 20 mg of rTPA, or 250 000 to 500 000 units of urokinase (about 10% to 20% of conventional doses). Such studies have spearheaded the drive to use this approach clinically, especially where there is a relative contra-indication to the use of systemic high-dose thrombolitics.

Our patient had massive PE and right ventricle dysfunction. Because she was at recent post-operative period from ATH, there was a contra-indication for use of a systemic thrombolytic. Nevertheless, because she was hemodynamically unstable, intra-embolic thrombolysis was chosen, with rigorous observation of the clinical parameters essentially related to possible hemorrhagic complications. Her condition improved rapidly. The patient tolerated the thrombolytic therapy well, with no signs of hemorrhage or other complications.

In conclusion, intra-embolic thrombolysis can be used in massive PE with right heart failure when there are contra-indications for systemic thrombolytic therapy and may be life-saving.

References

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快速以低劑量的血栓溶解劑直接注入肺栓塞治療獲得成功之病例報告

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摘要

術後發生大量的肺栓塞的病人，因爲考量術後有出血的傾向，而無法採用傳統的血栓溶解治療。針對這類大量血栓造成右心衰竭的危急病患，可採導管或外科手術直接剝離血栓。但是這類手術通常有很高的風險，而且也不是每家醫院都能立即施行。我們報告一個入院實行子宮切除手術的病患，不幸術後發生大量肺栓塞並造成右心衰竭。儘速以低劑量的血栓溶解劑直接注入肺栓塞處治療，能快速改善病患的血行動力，最後成功恢復且無併發症。

關鍵詞：肺栓塞，血栓溶解，剝離血栓，血栓內

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