Case of intersurgical acute massive pulmonary embolism with successful thrombolysis therapy

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Abstract

A 56-year-old man underwent surgery to repair an open left tibial fracture. At the end of the surgery, he exhibited haemodynamic instability requiring an increased epinephrine dose. The situation was life-threatening, and the patient was at risk for pulmonary thromboembolism. Although surgery is a contraindication to thrombolysis, we performed intravenous thrombolysis with alteplase and used a femoral tourniquet to decrease blood loss. Once the patient was haemodynamically stable, he was taken to the intensive care unit. The patient recovered and was discharged with a long-term anticoagulation plan.

In conclusion, thrombolysis can successfully treat life-threatening pulmonary thromboembolism during the early postoperative period.

INTRODUCTION

Surgery is a potential cause of pulmonary thromboembolism, but unfortunately, surgery is also one of the contraindications for thrombolysis [1]. For the case described below, we performed thrombolysis during a locked nailing procedure to repair a broken tibia, despite its contraindication, due to the high risk of death from pulmonary thromboembolism. We used a femoral tourniquet to exclude the thrombolytic drug from the surgical site (i.e. tibia) and to decrease blood loss.

CASE REPORT

A 56-year-old man presented to the emergency department with an open fracture of the left tibia. After 4 days, he was scheduled for surgery. An anaesthesiologist’s investigation detected no significant co-morbidities, according to the American Society of Anaesthesiologists physical status—II; therefore, spinal anaesthesia was arranged. One day later, he presented to the operating room for locked nailing. Spinal anaesthesia was administered without any peculiarities (2 ml 0.5% isobaric bupivacaine), standard monitoring was initiated, oxygen was supplemented by a facemask, 5 mg of midazolam was given for sedation and Ringer’s solution was administered intravenously. For the first 40 min, the patient was stable, with a blood pressure (BP) of 120–130/60–65 mmHg, a sinus rhythm on electrocardiogram (ECG), a heart rate (HR) of 50–57 bpm and a SpO2 percentage of 99% with a sufficient spinal block. During the final stage of the surgery (setting of the distal screw), the patient became unconscious with bradycardia at 35–40 bpm and haemodynamic depression (BP of 40/15 mmHg). He was started on mechanical ventilation (mask) with 100% oxygen; 1 mg of atropine and 1 mg of epinephrine were administrated intravenously. Conscious and spontaneous breathing recovered, but his haemodynamics were unstable, requiring epinephrine (titrated dose 0.02–0.03 µg/kg/min); the ECG showed atrial fibrillation, an HR
Figure 1 (A) ECG before the surgery. (B) ECG during the PE episode. (C) ECG after the surgery and thrombolysis.
of 140–160 bpm and a right bundle branch block. His SpO2 percentage was 92–96%, so oxygen was administered at 7–8 l/min by mask. The patient complained of chest discomfort, pain and paraesthesia in the upper extremities. The differential diagnosis included pulmonary embolism (PE; thrombi or fat), high spinal block and acute myocardial infarction (Fig. 1).

During the next 30 min, haemodynamics were unstable, requiring an increased dose of epinephrine (total dose = 15 mg), and two more episodes of bradycardia required boluses of atropine and epinephrine. There was apparent face and neck cyanosis with neck vein dilatation. Central venous catheterization via the right internal jugular vein was performed to administer the drugs and for haemodynamic monitoring. The central venous pressure was 35 mmHg. All symptoms are believed to be risk factors for pulmonary thromboembolism. The situation was considered life-threatening, and a consultation on further treatment was initiated. Due to the high risk of death, thrombolysis was performed, despite its contraindication for operation. Alteplase was the drug of choice due to its pharmacokinetics (short half-life elimination). Blood transfusion service was warned about the need for a possible massive transfusion. A femoral tourniquet was used for 1 h to decrease blood loss. Thrombolysis was initiated via a central venous catheter using a bolus of 10 mg alteplase and subsequent drip infusion (in accordance with instructions); the recommended total dose is 100 mg. After 30 min, the patient stabilized haemodynamically, and the ECG showed a normal sinus rhythm (atrial fibrillation was resolved). Only one-half of the total dose (50 mg) of alteplase had been administered by this time, and the infusion was stopped due to the high risk of bleeding and improved haemodynamic status. After the surgery, the patient was taken to the intensive care unit, and intravenous unfractionated heparin was begun with partial thromboplastin time control (500–1000 U/h). After 1 h, the tourniquet was removed, and bleeding commenced from the surgical site (dressings soaked in blood). To control the bleeding, the tourniquet was replaced with supplemental IV opioids for analgesia (the spinal block was resolved by this time). After another 40 min, the tourniquet was removed without any further bleeding. Total blood loss was 300 ml. Echocardiography showed dilatation of the right chambers and elevated pulmonary arterial pressure with positive haemodynamics 1 day later. A Doppler ultrasound of the lower extremities was performed, which showed a free-floating thrombus in the left anterior tibial vein. A vascular surgeon consulted with the patient, and the patient was transferred to the vascular surgery department from the intensive care unit. Ligation of the left anterior tibial vein was performed. The patient was continued on enoxaparin and warfarin. Within 1 week, the patient recovered completely and was discharged with a plan for long-term anticoagulation: warfarin for a 3-month period, according to the vascular surgeon’s recommendation (based on the Russian Phlebological Association’s recommendation and current international protocols [1]). At 36 months after the surgery, the patient presently shows no signs of chronic heart failure or chronic pulmonary hypertension and does not have any restrictions on physical activity.

DISCUSSION

Acute pulmonary thromboembolism is a postoperative complication that is particularly common in orthopaedic surgery [2, 3]. The frequency of PE in orthopaedic surgery is 0.04–1.2% and depends on the type of surgery performed [4, 5]. For example, the frequency of PE after internal fixation of a tibia fracture is 0.6–1.1% [4].

Currently, patients with high-risk PE accompanied by shock and hypotension are candidates for treatment with immediate intravenous heparin and thrombolytic therapy or surgical embolectomy [6, 7]. However, thrombolytic therapy is the main treatment option in hospitals lacking a cardiac surgery department. Unfortunately, surgery is a contraindication for thrombolysis because of the high risk of massive bleeding [6]. In most cases, a diagnosis of high-risk PE during the postoperative period means that doctors can only provide supportive therapy by increasing the dose of adrenoagonists; however, the final outcome is usually death.

Utilizing thrombolysis means possible further complications will be encountered. Nevertheless, in life-threatening situations, thrombolytic therapy is a potential life-saving strategy, even during the postoperative period [6–10]. Fortunately, in our case, it was possible to exclude alteplase from circulation at the operation site through use of a femoral tourniquet. Therefore, we minimized thrombolysis in the operation site and prevented severe blood loss. Because alteplase has a very short half-life, we predicted that the drug would no longer be active 1 h after the initial treatment, at which time the femur tourniquet was removed. Our treatment strategy was a success, allowing us to recommend the described scheme for similar cases. To quote from the Guidelines on the Diagnosis and Management of Acute Pulmonary Embolism of the European Society of Cardiology: ‘Hence, contraindications to thrombolysis that are considered absolute in acute myocardial infarction, e.g. surgery within the preceding 3 weeks or gastrointestinal bleeding within the last month might become relative in a patient with immediately life-threatening, high-risk PE’ [6].

CONFLICTS OF INTEREST

None declared.

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ETHICAL APPROVAL

No ethical approval is required.

CONSENT

The patient reviewed the case report and provided written permission for the authors to publish the report.

GUARANTOR

I.V.K is the guarantor of this study.

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