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Ekosonic Endovascular System (EKOS) in a trauma patient with intracranial bleed, recent major surgery, and massive pulmonary embolus: A case report

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ABSTRACT

Pulmonary embolism is a life-threatening condition treated with anticoagulation and systemic thrombolysis when appropriate. In patients with contraindications to thrombolysis, catheter-directed thrombolysis may be considered. Here, we present a patient with massive pulmonary embolus and 3 contraindications to systemic thrombolysis who was successfully treated with pharmacomechanical thrombolysis using the Ekosonic Endovascular System.

Introduction

Pulmonary embolism (PE) is a life-threatening complication of trauma and surgical patients. Systemic anticoagulation with heparin bridged to coumadin is the initial treatment of choice. The additional use of systemic thrombolysis has been shown to reduce pulmonary hypertension and improve cardiac output in patients without contraindications. In those with contraindications, or who have failed thrombolysis, surgical thrombectomy or catheter-directed thrombolysis (CDT) may be considered. Ekosonic Endovascular System (EKOS), a form of catheter-directed pharmacomechanical thrombolysis, has been used to treat submassive and massive pulmonary emboli. It utilizes high-frequency ultrasound to enhance penetration of thrombolytic into selective targets and like CDT lowers the overall systemic dose of the thrombolytic agent, theoretically reducing the risk of bleeding complications. Recently, studies have suggested that the presence of massive pulmonary embolus and a major contraindication to thrombolytics are associated with catheter-directed intervention failure. Here, we present the successful use of EKOS on a trauma patient who presented with intracranial hemorrhage and, following major orthopedic surgery, experienced cardiovascular collapse secondary to a massive saddle embolus.

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Case report

A 24-year-old woman, pedestrian vs motor vehicle, with a left T-type acetabular fracture and Morel-Lavallee degloving lesion of the right thigh and buttock presented to our facility from an outside hospital. Additional injuries included right occipital condyle and right temporal bone fractures with left parietal-occipital intraparenchymal and subarachnoid hemorrhage identified on outside hospital report. On presentation to our facility, the patient was hemodynamically stable with a glasgow coma scale of 14-15 and was admitted to the intensive care unit (ICU) for further observation and management.

On hospital day 1, she was taken to the operating room for orthopedic fixation of the 2-column acetabular fracture which was complicated by 3 L of blood loss requiring transfusion of 5 units of packed red blood cells, 1-unit fresh frozen plasma, and 1-unit platelets. On return to the ICU, her clinical examination showed tachycardia with heart rate in the 170s with stable blood pressures and a metabolic acidosis. An electrocardiogram showed supraventricular tachycardia and she was treated twice with adenosine with brief return to baseline heart rate only to return to the 170s. She then experienced sudden cardiovascular collapse with emergent cardiopulmonary resuscitation lasting 1-2 minutes. On return of spontaneous circulation, her heart rate continued in the 170s and she was now hypotensive and requiring vasopressor support. Due to high suspicion for pulmonary embolus, a bedside echocardiogram was performed, showing significant enlargement of the right ventricle with flattening of the interventricular septum concerning for pulmonary embolus (data not shown). Systemic anticoagulation was initiated with 5000 units of heparin.

To confirm the presence of pulmonary embolus and to plan further intervention a computed tomography pulmonary arteriogram (CTPA) was performed. A repeat head CT was also performed to verify findings of intracranial hemorrhage. The CTPA showed a massive saddle pulmonary embolus with right ventricular diameter-left ventricular diameter ratio of 2.5 confirming right heart strain (see Fig. 1A). Extension of the embolus into the distal pulmonary arteries was also demonstrated. The repeat head CT confirmed mild left parietal-occipital intraparenchymal and subarachnoid hemorrhage (see Fig. 1B).

Neurosurgery was consulted for evaluation of intracranial hemorrhage and occipital condyle fractures with recommendations to maintain patient in C-collar for possible fixation at later date. Q1 hour neuro checks were also advised, given the presence of intracranial hemorrhage. The choice of treating with anticoagulation was deferred to the primary trauma team. Cardiothoracic surgery and interventional radiology were also consulted for possible intervention. Relevant laboratories for therapeutic consideration included an international normalized ratio (INR) of 1.8, platelets of 89,000, and troponin leak of 0.75 ng/L. Central venous pressures were 22-25 cm H_2O and

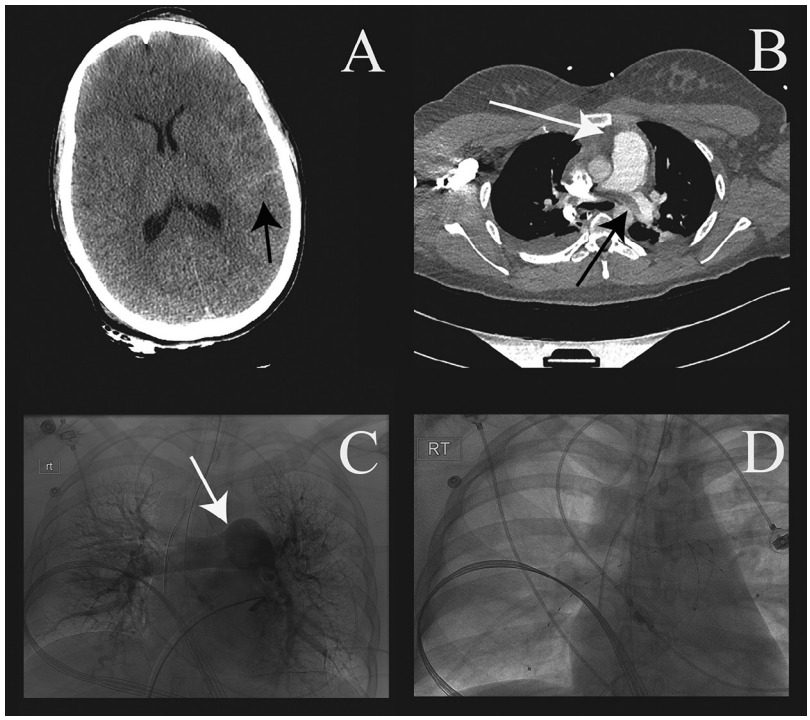

Fig. 1 – (A) Head CT showing left parietal-occipital intraparenchymal and left frontal-parietal subarachnoid hemorrhage. (B) Contrast-enhanced CTA of the chest showing large saddle embolus, RV/LV diameter ratio > 0.9, and enlargement of the main pulmonary artery. (C) Pulmonary angiogram showing large saddle embolus prior to EKOS catheter placement. (D) Fluoroscopic image showing placement of EKOS catheters in the bilateral pulmonary arteries. These were left in place for 12 hours infusing tPA at a rate of 0.5 mg/h in each catheter for a total dose of 12 mg/12 h. CT, computed tomography; CTA, computed tomography angiography; EKOS, Ekosonic Endovascular System; LV, left ventricular; RV, right ventricular; tPA, tissue plasminogen activator.