Paradoxical embolus illustrating speed of action of recombinant tissue plasminogen activator in massive pulmonary embolism

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A case of a patient who presented with massive pulmonary embolism (PE) requiring thrombolysis with alteplase is reported. The subsequent presence of a patent foramen ovale and paradoxical embolism clinically demonstrated the speed of action of the recombinant tissue plasminogen activator. The advantage of this class of medication when considering the treatment options for a PE in an acute setting is highlighted.

In January 2006, a 40-year-old woman was admitted with a 1-month history of progressive shortness of breath. Before the day of admission, she had been confined to her bed as a result of her symptoms and had noticed that she was becoming cyanosed, with intermittent sharp stabbing pains between her shoulder blades, 7 out of 10 in intensity. She denied any other symptoms except for the shortness of breath and the interscapular pain. Her only risk factor for pulmonary embolism (PE) was the combined oral contraceptive pill.

On examination, she was found to be in respiratory distress with symptoms consistent with a significant PE. She had tachycardia with a pulse of 110 bpm, hypotension at 93/71 mm Hg and tachypnoea (respiratory rate 36 bpm), with an oxygen saturation of 84% in air, improving to 97% with 10 l of oxygen. Her jugular venous pressure was raised and there was marked ankle oedema. Notably, there were equal bilateral pulses femorally. Chest examination and chest radiography were unremarkable except for moderate right-sided upper lobe diversion. Arterial blood gas investigation showed a partial pressure of oxygen of 4.5 kPa and a partial pressure of carbon dioxide of 4.29 kPa, which improved to 6.7 and 3.26 kPa, respectively, with 10 l of oxygen. Laboratory blood investigations were unremarkable except for a raised C reactive protein concentration of 133 mg/l. An ECG showed the classic S1 Q3 T3 pattern consistent with significant PE. Transthoracic echocardiography (ECHO) showed a dilated inferior vena cava and right ventricle with

paradoxical septal motion. Adequate left ventricular function was observed, with an ejection fraction of 60%.

The clinical features, together with the ECHO and ECG findings, led to a diagnosis of massive PE and the patient was given a bolus of 40 mg of alteplase (Actilyse) with a 60 mg infusion intended for the following hour.

Within approximately 20 s of completing the 40 mg bolus, the patient became acutely distressed and complained of a severe sharp pain in the left lower quadrant, 10 out of 10 in intensity. On examination, there was marked tenderness in the left lower quadrant. Vaginal examination showed left-sided tenderness. The left femoral and lower leg pulses were absent.

Urgent contrast CT scanning showed bilateral pulmonary emboli, dilated right cardiac chambers and a suggestion of patent foramen ovale (PFO; fig 1A,B).

There was a significant thrombus almost completely occluding the left common iliac and femoral arteries. The 60 mg alteplase infusion was started, followed by a dramatic improvement of her respiratory function within 2 h. She underwent femoral embolectomy that evening, with immediate post-operative recovery of the femoral circulation.

Transoesophageal echocardiography confirmed the presence of a PFO, showing significant intra-atrial septum flow with a right-to-left shunt. The foramen was subsequently closed percutaneously.

DISCUSSION

This case is of interest for two reasons: firstly, as a demonstration of the rapidity of action

of thrombolysis when given in this dose for PE; and secondly, as to the provenance of the clot in the femoral artery, which one can only assume to have originated from a pre-existing thrombus in the veins of the calf.

An ECHO performed shortly before thrombolysis confirmed that there was no clot in any of the chambers of the heart. The sudden pain occurring within 30 s of the bolus administration of alteplase suggests that the fragment had broken off from a pre-existing thrombus, which one must assume had been present in the calf veins, passing rapidly through to the arterial circulation via the PFO, which allowed easy passage of the clot owing to the greatly increased right-sided pressure.

Paradoxical embolism and its management has been well described in the literature and is increasingly recognised as a cause of strokes in the young.^{1,2} As illustrated in this case, prerequisites for paradoxical embolism are the presence of a deep venous thrombosis or PE with significantly increased right-sided pressure, an intracardiac communication—for example, PFO with a right-to-left shunt—and subsequent arterial embolism. Clinical presentation can be varied and dependent on the site of travel of the emboli and the distal organ affected. A high index of clinical suspicion is required for a diagnosis to be made.³ More recent guidelines recommend bolus-dose alteplase for treating massive PE. However, the safest and most effective treatment is not yet known.⁴

CONCLUSION

This case clinically illustrates the speed of fibrinolytic action and highlights the advantage of this class of drugs when considering the treatment options for a massive PE.

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Figure 1 (A) CT contrast scan showing a thrombus occluding the pulmonary artery (white arrow). (B) CT contrast scan showing patent foramen ovale (black arrow).