CASE REPORT

Successful treatment of mobile right atrial thrombus and acute pulmonary embolism with intravenous tissue plasminogen activator

R Bajaj,¹ Ajay Ramanakumar,¹ Suresh Mamidala,² Deepti Kumar¹

¹Division of Cardiology, Saint Vincent Hospital, University of Massachusetts Medical School, Worcester, Massachusetts, USA

²Department of Internal Medicine, University of Massachusetts Medical School, Saint Vincent Hospital, Worcester, Massachusetts, USA.

Correspondence to

Dr Rishi Bajaj,
tellrishi@gmail.com

SUMMARY

An 89-year-old woman came with symptoms of progressively worsening dyspnoea at rest over the preceding week. She was normotensive, had elevated jugular venous pressure and clear lungs. ECG revealed atrial fibrillation with the rapid ventricular rate. Labs were significant for markedly elevated pro-brain natriuretic peptide of 43 000 pg/mL and troponin-T of 1 ng/mL. An urgent 2D echocardiogram was obtained, which revealed the severely dilated right atrium and a large linear mobile mass in the right atrium consistent with a thrombus. An emergent CT scan revealed multiple bilateral pulmonary emboli. She received intravenous tissue plasminogen activator. Repeat echocardiogram performed 6 h later showed no evidence of the right atrial thrombus. She was subsequently maintained on intravenous heparin and transitioned to Coumadin. Early recognition of this rare but potentially fatal complication is important as prompt treatment measures can help in preventing life-threatening complications of the right atrial thrombus.

BACKGROUND

Mobile large right atrial thrombus associated with pulmonary embolism is a rare occurrence and its association with acute cor pulmonale is even rarer with potentially fatal consequences. A systematic

review of the literature suggests that optimal treatment of this complication is still unknown and some case studies have shown improved survival rate with thrombolytic therapy versus surgical therapy or anticoagulation treatment.¹ Other case reports have reported thrombectomy to be associated with lower mortality compared with conservative management, with anticoagulation and antibiotics; however, this may reflect selection bias, with more stable patients undergoing surgery.² We report a case of large mobile serpiginous right atrial thrombus diagnosed by 2D echocardiogram and associated with pulmonary embolism precipitating acute cor pulmonale which was successfully treated with thrombolytic therapy. To our knowledge, no case of right atrial thrombi complicated with acute cor pulmonale treated with thrombolytic agent has been reported.

CASE PRESENTATION

A 89-year-old woman who was brought into the hospital by her family with symptoms of generalised weakness, failure to thrive and progressively worsening dyspnoea at rest over the preceding week. She was recuperating from knee arthritis and pneumonia and was recently discharged from rehabilitation. Her medical history was significant for hypertension and knee replacement surgery performed many years ago. On examination, she was

Figure 1 Subcostal view showing serpiginous thrombus in the right atrium.

To cite: Bajaj R, Ramanakumar A, Mamidala S, et al. *BMJ Case Rep* Published online: [please include Day Month Year] doi:10.1136/bcr-2013-010255

Video 1 Echocardiography showing evidence of large mobile serpiginous thrombus in the right atrium.

normotensive, had elevated jugular venous pressure, S3 gallop, clear lungs and cold extremities. ECG revealed newly diagnosed atrial fibrillation with rapid ventricular rate and right bundle branch block. Labs showed markedly elevated pro-brain natriuretic peptide (BNP) of 43 000 pg/mL and troponin-T of 1 ng/mL but creatine kinase was normal. An urgent 2D echocardiogram (figure 1 and video 1) was obtained which revealed severely reduced biventricular systolic function, mild to moderate right ventricular dilation, flattened interventricular septum suggestive of right ventricular overload, biatrial enlargement and a large mobile serpiginous mass in the right atrium consistent with a thrombus. A prior 2D echo performed 2 years ago showed normal biventricular systolic function. An urgent CT scan was obtained, which revealed multiple pulmonary emboli. Given the above findings she was treated with intravenous tissue plasminogen activator. Repeat echocardiogram performed 6 h after t-plasminogen activator (PA) administration demonstrated that the right atrium thrombus was no longer present (video 2). Pulmonary artery pressure was 52 mm Hg which improved to 37 mm Hg on repeat 2D echo after thrombolysis. Doppler ultrasound scan of the lower extremities confirmed the presence of deep vein thrombosis and she underwent inferior vena cava filter placement given the large thrombus burden. She was started on intravenous unfractionated heparin and subsequently transitioned to Coumadin. No major haemorrhagic complications were observed. The aetiology of her left ventricular systolic dysfunction was unclear but the patient and her family refused further work-up for the same. Her rest of hospital stay was uneventful and was transferred to acute rehabilitation facility in stable condition.

Video 2 Echocardiography post thrombolysis showing no evidence of thrombus.

Table 1 Description of methods of thrombolysis

Route	Agent	Dose
Systemic	t-PA	10 mg bolus followed by 90 mg over 2 h
Catheter directed	t-PA	50 mg over 2 h. Can use another 50 mg over 5 h if no evidence of lysis of thrombus
t-PA, tissue plasminogen activator.		

Large mobile right atrial thrombus associated with pulmonary embolism causing acute cor pulmonale is rare. We hereby report a case of large mobile right atrial thrombus precipitating acute cor pulmonale which was successfully treated with systemic thrombolysis.

DIFFERENTIAL DIAGNOSIS

- ▶ Acute coronary syndrome
- ▶ Acute aortic dissection
- ▶ Acute congestive heart failure decompensation
- ▶ Pulmonary embolism
- ▶ Anxiety attack

OUTCOME AND FOLLOW-UP

Patient's symptoms improved with resolution of thrombus and her rest of hospital stay was uneventful. She was transferred to acute rehabilitation facility in stable condition. She did well during the follow visit at 6 weeks.

DISCUSSION

Right atrial thrombi are infrequent but when present are associated with significant morbidity and mortality due to massive pulmonary embolism or paradoxical embolism.³ The differential diagnosis of right atrial masses include tumours, cyst, tricuspid abnormalities and right heart catheters.⁴ Most of the cases reported of right atrial thrombus are associated with complications of venous catheter or congenital malformation.⁵⁻⁷ Right atrial thrombi usually result from two different pathophysiological mechanisms: developing in situ, either on a foreign body or secondary to reduced cardiac output, or as a result of an embolus from systemic vein thrombosis.³ Mobile thrombus in the right atrium when present along with pulmonary embolism is associated with increased mortality of more than 40%.⁸ The workup of pulmonary embolism requires systematic echocardiography, one of the objectives of which is to search for right-sided thrombi and echocardiography is a useful non-invasive, readily available test to diagnose right-sided thrombus.⁹ Current therapeutic options for treatment of right atrial thrombi include thrombolysis, surgical embolectomy or percutaneous embolectomy; however, the most effective therapy remains unknown. Rose *et al*¹ in a retrospective review of 177 patients detected that administration of systemic thrombolysis was an independent variable that protected against mortality. Options available for thrombolysis include systemic and catheter directed. In a study conducted by Verstraete *et al*¹⁰ it was demonstrated that intrapulmonary administration of tissue plasminogen activator (t-PA) does not offer significant benefit over intravenous route. Table 1 illustrates the dose and method of t-PA used via each route. Although some case reports describe the benefit of surgical option for treatment of right atrial thrombus in the setting of cardiogenic shock,¹¹ the best treatment option still remains unknown. Table 2 list shows various cases/reports of right atrial thrombus that have been reported in literature. It summarises the therapies used and outcomes via each approach. In our case, intravenous thrombolysis was chosen instead of surgery in lieu of

Table 2 Review of literature summarising various treatment option and clinical outcome

Case series/report of right atrial thrombus	Treated with heparin (N)	Treated with systemic thrombolysis (N)	Surgical thrombectomy (N)	No treatment could be given (N)
Chapoutot <i>et al</i> ⁸		3	8	1
Outcome: SH		2	7	0
Shah <i>et al</i> ¹²	3	1	1	1
Outcome: SH	2	0	1	0
Pierre-Justin <i>et al</i> ¹³		10	2	
Outcome: SH		10	2	
Hung <i>et al</i> ¹⁴		1	1	
Outcome: SH		1	0	
Fournier <i>et al</i> ¹⁵	2	4	1	
Outcome: SH	2	3	1	
Leclercq <i>et al</i> ¹⁶	1	4	1	
Outcome: SH	0	4	0	
Cracowski <i>et al</i> ¹⁷		3		
Outcome: SH		3		
Mezzani <i>et al</i> ¹⁸		3		
Outcome: SH		3		
Cessaro <i>et al</i> ¹⁹		1		
Outcome: SH		1		
Mathur <i>et al</i> ²⁰		1		
Outcome: SH		1		

N, number of patients; SH, survived hospitalisation.

her advanced age and wishes. Based on our case described in the present report, treatment of right atrial thrombi with thrombolytic therapy is a reasonable option especially in high-risk patients given the high morbidity and mortality associated with surgery. Further studies are necessary to determine the best treatment approach in such scenarios.

Learning points

- ▶ Right atrial thrombi are infrequent but when present are associated with significant morbidity and mortality due to massive pulmonary embolism or paradoxical embolism.
- ▶ Mobile thrombus in the right atrium when present along with pulmonary embolism is associated with increased mortality of more than 40%.
- ▶ Early recognition of right atrial thrombus is important due to extreme instability of this type of thrombus and prompt treatment measures can prevent life-threatening complications.
- ▶ Right atrial thrombus in high-risk patients can be treated with thrombolytic therapy versus surgical management.

Contributors RB was involved in case report and introduction. DK prepared the imaging and videos SM did proof reading and wrote the discussion AR was also part of writing the discussion.

Competing interests None.

Patient consent Obtained.

Provenance and peer review Not commissioned; externally peer reviewed.

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