

Massive Right Ventricular and Pulmonary Artery Emboli In-Transit after Cardiac Surgery: Consideration of Non-Surgical Treatment

Shervin Ziabakhsh Tabary¹, Alireza Sanei Motlagh^{2*}

¹Professor of cardiac surgery, faculty of medicine, Cardiovascular Research Center of Mazandaran Heart Center, Mazandaran University of medical sciences, Sari, Iran

²Cardiovascular Research Center of Mazandaran Heart Center, Mazandaran University of medical sciences, Sari, Iran

*Corresponding Author: Alireza Sanei Motlagh. Cardiovascular Research Center of Mazandaran Heart Center, Mazandaran University of medical sciences, Sari, Iran.

Received date: April 20, 2022; Accepted date: May 24, 2022; Published date: July 04, 2022.

Citation: Shervin Ziabakhsh Tabary, Alireza Sanei Motlagh. (2022). Massive right ventricular and pulmonary artery emboli in-transit after cardiac surgery: consideration of non-surgical treatment, J.Thoracic Disease and Cardiothoracic Surgery, 3(2) DOI:10.31579/2693-2156/039

Copyright: © 2022 Alireza Sanei Motlagh. This is an open-access article distributed under the terms of The Creative Commons Attribution License, which permits unrestricted use, distribution, and reproduction in any medium, provided the original author and source are credited.

Abstract

Background: Pulmonary embolism (PE) is a complication of open-heart surgery that accounts for 0.6% of all cases and its mortality rate varies from 50% to 100%. Here, we describe a case of right ventricular and pulmonary artery emboli in-transit.

Case report: A 56-year-old female presented with complain of dyspnea and palpitation and history of recent coronary artery bypass graft (CABG) surgery. Edema of the right leg was noted. Trans-esophageal echocardiography (TEE) performed and revealed severe tricuspid regurgitation due to sticking clot in tricuspid valve. A large clot in right ventricle (RV) and right ventricle outflow tract (RVOT) with the size of 55 × 13mm was noted. There was also a clot with the size of 22 × 10mm in right pulmonary artery (RPA). Early in the ICU, patient received 10 units (18mg) of reteplase (IV) over 2 minutes and then 10 units was given with the rate of 1mg/hour after the first dose, with 30 minutes intervals. IV Heparin (18mg/Kg/h) was also co-administered with reteplase. There was no visible clot in RV and pulmonary artery in follow-up echocardiography. Patient transferred to CCU with stable hemodynamics and finally discharged with normal condition.

Discussion: Surgery is an alternative in patients with massive PE but our patient had a prior cardiac surgery which re-operation had a high risk for her. Due to massive in-transient emboli of right heart and PA in our patient, we decided to proceed the treatment with reteplase. The patient was monitored carefully for hemodynamics and coagulation parameters and she was discharged without any systemic complication.

Keywords: pulmonary embolism; in-transient emboli; deep vein thrombosis; cabg

Background

Pulmonary embolism (PE) is referred to occlusion of pulmonary arteries with dislodged thrombus usually from deep veins of the lower limbs, pelvis, or arms. The first successful pulmonary embolectomy by means of cardiopulmonary bypass (CPB) was reported by Cooley and colleagues in 1961 [1]. PE is a life-threatening complication of post-operation venous thromboembolism (VTE) which accounts for 0.6% after cardiac surgery and its mortality rate varies from 50% to 100% based on hemodynamics disturbance [2, 3]. The clinical findings of PE are similar to heart failure or acute coronary syndrome, including pleuritic chest pain, dyspnea, tachypnea, hemoptysis, and electrocardiographic alterations. ECG alterations like T waves changes in V₁ through V₄, ST-segment shift over

V₁ through V₄, and S1Q3T3 are associated with worse short-term prognosis [4-7]. The assessment of the severity and risk of PE helps to choose the appropriate treatments including oral anticoagulants, low molecular weight heparin, thrombolysis, or surgical intervention in cases of mobile thrombus in heart chambers [8]. Here, we describe a case of in-transient massive right heart and pulmonary artery emboli which diagnosed with trans-esophageal echocardiography and managed with thrombolytic agent, reteplase. The course of ICU admission was uneventful and patient was discharged without any complications.

Case report

A 56-year-old female presented to the heart center with complain of dyspnea and palpitation. Past medical history of recent coronary artery

bypass graft (CABG) surgery (just a week ago), hypothyroidism, hypertension, dyslipidemia, and kidney stone were noted for her. She was medically managed with levothyroxine, propranolol, aspirin, and rosuvastatin. She had no history of diabetes mellitus. The patient had tachypnea and diaphoresis at the arrival. On physical examination, edema of the right leg was noted. The finding of skin, musculoskeletal, and

neurological examinations were normal. Pulse rate was 110 beats/min, blood pressure was 110/60 mmHg, respiratory rate was 26 breaths/min, and the patient's axillary temperature was 37.1°C. The patient had tachycardia and tachycardia. T-wave inversion in leads I, II, aVL, and upright T wave in lead aVR were noted on ECG [figure 1].

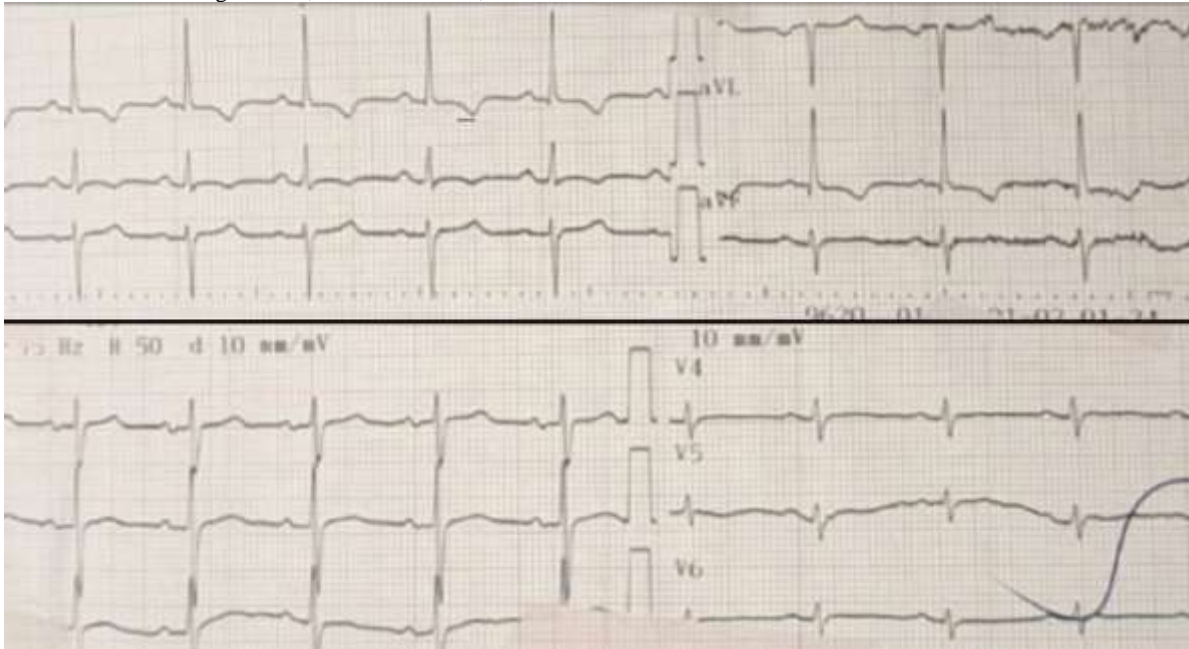


Figure 1: Electrocardiogram of the patient at the arrival showed T-wave inversion in leads I, II, and aVL, and also upright T wave in lead aVR

Chest x-ray findings indicated a mild cardiomegaly, blunted right pleural border, and patchy nodularity in right paracardiac border with the decreased filling in right lung [figure 2].



Figure 2: Chest radiograph showed decreased blood filling in right lung

With the suspicion of a clot in the heart, trans-esophageal echocardiography (TEE) performed and revealed an ejection fraction of 55%, severe tricuspid regurgitation due to sticking clot in tricuspid valve, very large clot in right atrium (RA), right ventricle (RV), and right ventricle outflow tract (RVOT) with the size of 55 × 13mm. There was also a clot with the size of 22 × 10mm in right pulmonary artery (RPA) [figure 3].

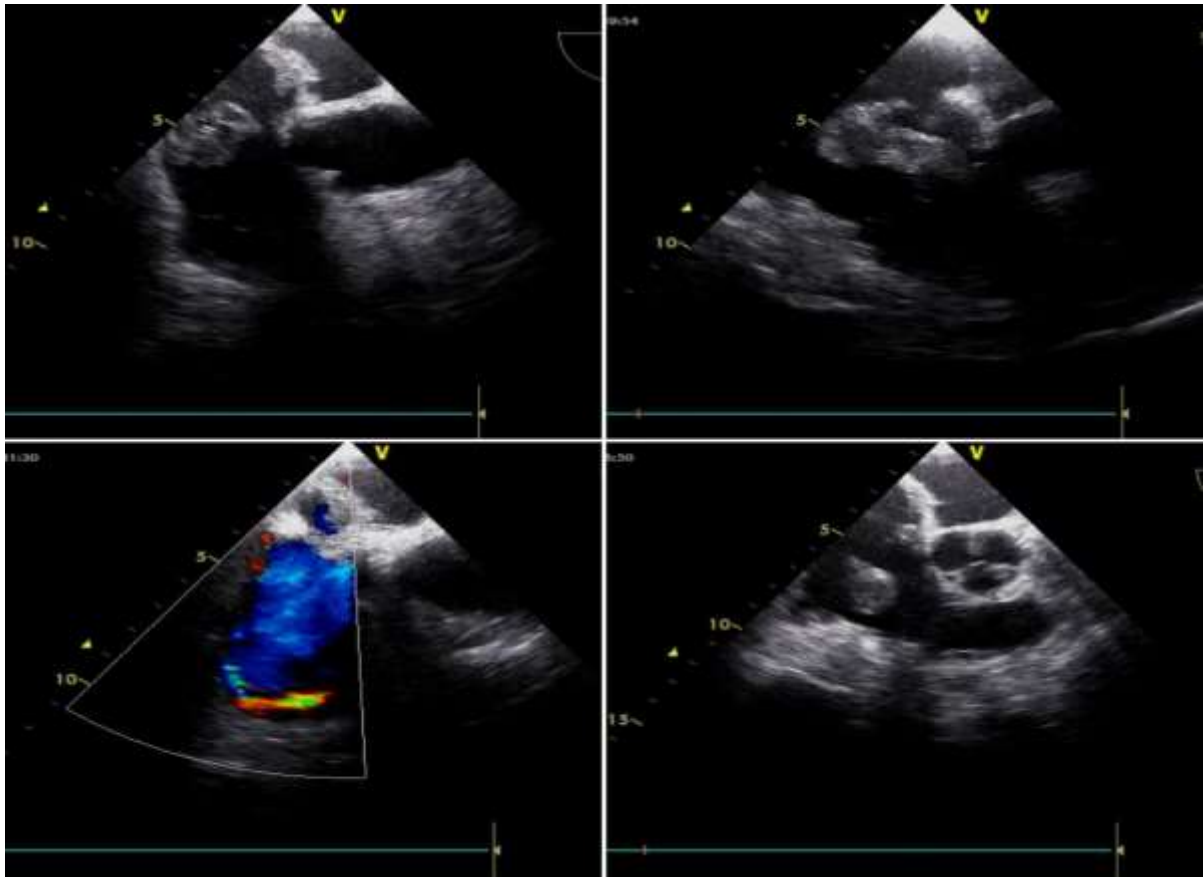


Figure 3: Trans-esophageal echocardiography (TEE) showed a massive in-transient emboli of RA, RV, and RVOT

Also, a mild RV enlargement and pulmonary artery pressure (PAP) of 55mmHg was noted. There wasn't any flow in popliteal veins (in neither of two directions) on color-Doppler ultrasonography of lower limbs. These evidences support the deep vein thrombosis (DVT) of both legs. All the external iliac arteries, femoral arteries (superficial and deep), popliteal arteries, tibialis arteries (anterior and posterior), and dorsalis pedis arteries were patent based on the report of color-Doppler and gray-scale ultrasonography. The patient was referred to intensive care unit (ICU). Nasogastric tube was inserted for parenteral nutrition. Also, triple-lumen central venous catheterization (CVC) of right subclavian vein performed by local anesthesia. Initial laboratory study showed a plasma pH of 7.13, platelet of $50 \times 10^9/L$, and hemoglobin of 8.3g/dL. Early in the ICU admission, patient received 10 units (18mg) of reteplase (IV) over 2 minutes and then 10 units were given with the rate of 1mg/hour after the first dose, with 30 minutes intervals. Heparin was also administered with the infusion rate of 18mg/Kg/h. At 3:00 a.m. the next day, bradycardia was developed which followed by cardiopulmonary arrest. Cardiopulmonary resuscitation (CPR) performed by chest compression, infusion of dobutamine and high dose epinephrine. Endotracheal intubation was accomplished during CPR. After that, the normal sinus rhythm was established but the patient had anuria. Laboratory results reported a high serum creatinine (2.8 mg/dL) and blood urea nitrogen (BUN) of 45 mg/dL which indicated acute renal failure. Thrombocytopenia with platelet count of $20 \times 10^9/L$, potassium level of 3.3mmol/L, partial thromboplastin time (PTT) of 41, and international normalized ratio (INR) of 1.70 was also noted on laboratory studies. Heparin was discontinued due to decrease in platelet count. Medical treatment continued with rivaroxaban (xalereban) 15mg po twice daily, aspirin 80mg po per day, and propranolol 10mg po twice daily. Potassium

chloride was also administered due to hypokalemia. 3 units of packed red cells (p.c) and 3 units of platelets transfused during this course.

Patient's urine output was improved on the next days. According to the results of bed-side TEE, there was no visible clot in RA, RV, PA, and proximal of its right and left branches on the second day of ICU admission. The patient extubated on 5th day in the ICU, and blood oxygen saturation was acceptable. Patient's length of stay at the ICU was ten days. Laboratory results of the last day reported a hemoglobin value of 10.3g/dL, platelet count of $215 \times 10^9/L$, potassium level of 4.8mEq/L, BUN of 10 mg/dL, and creatinine of 0.94mg/dL. Coagulation study reported a PTT of 33 and INR value of 1.66. ECG showed a normal sinus rhythm but T-wave inversion on lead 1 was still noted. The patient transferred to the cardiac care unit (CCU) with stable hemodynamics. Total length of stay in the CCU was 7 days. It should be noted that despite the massive emboli in the right heart and pulmonary artery, redo cardiac surgery or inferior vena cava (IVC) filter insertion were not performed. The venous thromboembolism was managed by reteplase. Neurological examinations were normal. Patient was discharged with normal vital signs and referred to interventional cardiologist for further workup.

Discussion

The main presenting symptoms of pulmonary embolism (PE) are tachypnea, dyspnea, tachycardia, diaphoresis, and loss of consciousness [1]. Considering the history of cardiac surgery in our patient and hospitalization for some days, color-Doppler ultrasonography and TEE performed to determine whether an embolus is responsible for her sign and symptoms. According to 2014 ESC Guidelines on the diagnosis and management of acute pulmonary embolism, treatment of acute phase of PE is supported by hemodynamics and respiratory monitoring,

administration of inotropes to improve RV function, anticoagulant agents, thrombolytic agents, percutaneous catheter-directed treatment for patients with absolute contraindications to thrombolysis, supra- or infrarenal placement of IVC filter, and surgical embolectomy [9]. Reports of surgical embolectomy indicate that early mortality rate has ranged from 4.4% to 21% [1]. Post-surgical complications included stroke, acute renal failure, lower respiratory tract infection, right ventricular dysfunction, wound infection, and sepsis [10-12]. Despite the risk of bleeding, thrombolysis can improve right-ventricular wall motion, and pulmonary perfusion which results in lower rates of death and recurrent PE [13]. In a randomized controlled trial (RCT) of Meyer *et al.* with 506 cases of intervention, the mortality rate related to administration of fibrinolytic agent tenecteplase was reported 1.2% compared with 1.8 % in control group (*p-value*= 0.42). Fibrinolysis was associated with major extracranial hemorrhage by 6.3% and hemorrhagic stroke by 2.0%, but the rate of recurrent PE was lower (0.2 in tenecteplase group vs. 1.0 in placebo group, *P*<0.001) [14]. A systematic review of RCTs comparing the risks and benefits of thrombolytic therapy indicated that the overall mortality rates and recurrence of acute PE were significantly reduced by thrombolytic therapy. 30 days mortality rates and the incidence of fatal intracranial hemorrhage were reported 2.3% and 1.7%, respectively [15]. A Cochrane meta-analysis of thrombolytic therapy in patients with acute PE showed that co-administration of thrombolytics and heparin can reduce the rates of death and recurrences of PE compared with heparin alone. It was showed that thrombolysis may improve hemodynamics, clinical outcomes, and survival than heparin alone [16].

Due to massive in-transient emboli of right heart and PA in our patient, we decided to proceed the treatment with reteplase. Heparin was co-administered but by the fall in platelet count, it was discontinued and anticoagulant therapy was continued with rivaroxaban. Routine follow-ups are indicated in patients who were bedridden for long times after major surgery due to the risk for venous thromboembolism. Surgery is an alternative in patients with massive PE but our patient had a prior cardiac surgery which re-operation had a high risk for her. The problem with treatment by thrombolytic agents is the incidence of intracranial hemorrhage which can result in functional complications or death. Our patient was monitored carefully for hemodynamics and coagulation parameters and she was discharged without any systemic complication.

Conflicts of Interest: The authors declare that they have no conflicts of interests.

Consent: Written informed consent was not available because of the replacement of residence but oral agreement from the patient was obtained.

References

1. Kouchoukos NT, Blackstone EH, Hanley FL, Kirklin JK. (2013) Diseases of the pulmonary arteries. Kirklin/Barratt-Boyes Cardiac Surgery, 4th ed. Philadelphia: Elsevier 1025-1026.
2. Temgoua MN, Tochie JN, Noubiap JJ, Agbor VN, Danwang C, Endomba FTA, et al. (2017) Global incidence and case fatality rate of pulmonary embolism following major surgery: a protocol for a systematic review and meta-analysis of cohort studies. *Systematic Reviews*. 6:240.
3. Bottinor W, Turlington J, Raza S, Roberts CS, Malhotra R, Jovin IS, et al. (2014) Life-saving systemic thrombolysis in a patient with massive pulmonary embolism and a recent hemorrhagic cerebrovascular accident. *Texas Heart Institute journal*. 41(2):174-176.
4. Pulido T, Aranda A, Zevallos MA, Bautista E, Martínez-Guerra ML, Santos LE, Sandoval J. (2006) Pulmonary embolism as a cause of death in patients with heart failure. An autopsy study. *Chest*. 129:1282-1287.
5. Stein PD, Terrin ML, Hales CA, Palevsky HI, Saltzman HA, Thompson BT, Weg JG. (1991) Clinical, laboratory, roentgenographic and electrocardiographic findings in patients with acute pulmonary embolism and no pre-existing cardiac or pulmonary disease. *Chest*. 100:598-603.
6. Stein PD, Beemath A, Matta F, Weg JG, Yusen RD, et al, (2007) Wakefield TW, Woodard PK. Clinical characteristics of patients with acute pulmonary embolism: Data from PIOPEP II. *Am J Med*. 120:871-879.
7. Jaff MR, McMurtry MS, Archer SL, Cushman M, Goldenberg N, Goldhaber SZ, et al. (2011) Management of massive and submassive pulmonary embolism, iliofemoral deep vein thrombosis, and chronic thromboembolic pulmonary hypertension: a scientific statement from the American Heart Association. *Circulation*. 123(16):1788-1830.
8. Quadery R, Elliot CA, Hurdman J, Kiely DG, Maclean RM, Sabroe I, et al. (2015) Management of acute pulmonary embolism. *British journal of hospital medicine (London, England; 2005)*. 76(10):C150-5.
9. Konstantinides SV, Torbicki A, Agnelli G, Danchin N, Fitzmaurice D, Galie N, et al. 2014 ESC guidelines on the diagnosis and management of acute pulmonary embolism. *European heart journal*35(43):3033-3069, 69a-69k.
10. Vohra HA, Whistance RN, Mattam K, Kaarne M, Haw MP, Barlow CW, et al. (2010) Early and late clinical outcomes of pulmonary embolectomy for acute massive pulmonary embolism. *The Annals of thoracic surgery*. 90(6):1747-1752.
11. Takahashi H, Okada K, Matsumori M, Kano H, Kitagawa A, Okita Y. (2012) Aggressive surgical treatment of acute pulmonary embolism with circulatory collapse. *The Annals of thoracic surgery*. 94(3):785-791.
12. Pasrija C, Kronfli A, Rouse M, Raithel M, Bittle GJ, Pousatis S, et al. (2018) Outcomes after surgical pulmonary embolectomy for acute submassive and massive pulmonary embolism: A single-center experience. *The Journal of thoracic and cardiovascular surgery*. 155(3):1095-1106.e2.
13. Goldhaber SZ, Haire WD, Feldstein ML, Miller M, Toltzis R, Smith JL, et al. (1993) Alteplase versus heparin in acute pulmonary embolism: randomised trial assessing right-ventricular function and pulmonary perfusion. *Lancet (London, England)*. 341(8844):507-511.
14. Meyer G, Vicaut E, Danays T, Agnelli G, Becattini C, Beyer-Westendorf J, et al. (2014) Fibrinolysis for patients with intermediate-risk pulmonary embolism. *The New England journal of medicine*. 370(15):1402-1411.
15. Marti C, John G, Konstantinides S, Combescure C, Sanchez O, Lankeit M, et al. (2015) Systemic thrombolytic therapy for acute pulmonary embolism: a systematic review and meta-analysis. *European heart journal*. 36(10):605-614.
16. Hao Q, Dong BR, Yue J, Wu T, Liu GJ. (2011) Thrombolytic therapy for pulmonary embolism. *The Cochrane database of systematic reviews* (9):Cd004437.