OLGU SUNUMU CASE REPORT

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Rescue Surgical Embolectomy in Acute Massive Pulmonary Embolism Presenting with Supraventricular Tachycardia

Supraventriküler Taşikardi ile Prezente Olan Akut Masif Pulmoner Embolizmde Kurtarıcı Cerrahi Embolektomi

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ABSTRACT Acute massive pulmonary embolism (PE) has a high mortality rate despite the advances in the diagnosis and therapy. Patients with PE need rapid diagnosis, risk stratification and an appropriate management for reducing mortality and morbidity. Patients with massive PE could be admitted to the emergency room presenting with not only dyspnea but also with predominant supraventricular tachycardia (SVT). In such case, heart rate control with drugs may be more difficult, and may lead to hemodynamic instability, in addition to the overloaded right heart depends on PE. A rapid computed tomography pulmonary angiography is demanded to confirm PE. Transthoracic echocardiography may play an important role for risk stratification of patients with PE, in order to show dilated right chambers, paradoxical movement of interventricular septum, and increased pulmonary arterial pressures presenting with the overloaded right heart. Although life-saving treatment, thrombolytics has potential bleeding risk, especially intracranial hemorrhagia. Rescue surgical pulmonary embolectomy may be a life-saving altenative therapy in patients with massive PE who have not responded to thrombolysis. Hereby, we report a case with acute massive PE presenting with SVT, rescued via surgical embolectomy.

Keywords: Pulmonary embolism; thrombolytic therapy; embolectomy; echocardiography; electrocardiography

ÖZET Akut masif pulmoner embolizm (PE), tanı ve tadavideki ilerlemelere karşın, yüksek mortaliteye sahiptir. Mortalite ile morbiditenin azaltılması için PE hastaları hızlı tanı, risk sınıflaması ve uygun müdahaleye gereksinim duyarlar. Masif PE hastaları, acil servise sadece dispne ile değil, daha belirgin olarak supraventriküler taşikardi (SVT) ile de kabul edilmiş olabilirler. Bu durum, hastaların ilaçlarla kalp hızı kontrollerini daha güç kılabilir ve PE'ye bağlı sağ kalp yüklenmesine ilaveten, hemodinamik bozukluğa yol açabilir. PE'nin doğrulanması, hızlı bir bilgisayarlı tomografik pulmoner anjiyografi yapılmasına bağlıdır. Transtorasik ekokardiyografi, PE hastalarının risk sınıflamasında, aşırı yüklenmiş sağ kalbin göstergeleri olan sağ boşlukların genişlemesinin, septumun paradoksal hareketinin ve artmış pulmoner arter basıncının gösterilmesi için önemli bir rol oynayabilir. Trombolitikler (TL) hayat kurtarıcı olmalarına karşın, özellikle kafa içi olmak üzere potansiyel kanama riskine sahiptirler. Kurtarıcı cerrahi pulmoner embolektomi, trombolizize yanıt vermeyen masif PE hastalarında hayat kurtarıcı alternatif bir tedavi olabilir. Burada SVT ile prezente olan ve cerrahi embolektomi ile kurtarılan masif bir PE hastasını sunuyoruz.

Anahtar Kelimeler: Pulmoner emboli; trombolitik terapi; embolektomi; ekokardiyografi; elektrokardiyografi

Acute massive pulmonary embolism (PE) has a high mortality rate despite advances in the diagnosis and therapy.[1] Patients with PE need rapid diagnosis, risk stratification and an appropriate management to reduce mortality and morbidity.[2] Tachycardia and hypotension are signs of hemodynamic instability in those patients. In patients with sus-

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pected PE, a rapid computed tomography pulmonary angiography (CTPA) should be performed to confirm PE.[3] Also transthoracic echocardiography (TTE) may play an important role for risk stratification of patients with PE to show dilated right chambers, paradoxical movement of interventricular septum (IVS), and increased pulmonary arterial pressures (PAP) presenting with the overloaded right heart. If it has no contraindication, the first management procedure is thrombolytic therapy (TT) currently. Although lifesaving treatment, thrombolytics has potential bleeding risk, especially intracranial hemorrhagia. Rescue surgical embolectomy may lead to a better in-hospital course when compared with repeat thrombolysis in patients with massive PE who have not responded to thrombolysis.[4]

Hereby, we report a case with acute massive PE presenting with supraventricular tachycardia (SVT), rescued via surgical embolectomy.

CASE REPORT

A 55 year–old woman with symptoms of palpitation, dizziness and nausea, admitted to the emergency room (ER). Her arteriel blood pressure (BP) and heart rate (HR) were 95/65 mmHg and 150 beats per minute (bpm) respectively. Her electrocardiogram (ECG) showed atrioventricular nodal reentry tachycardia as a type of SVT (Figure 1). After verapamil was given via i.v to the patient, ECG showed sinus tachycardia (116 bpm). However, the patient did not relieve completely, and suffered progressively increasing dyspnea and tachypnea. So, her arterial blood gas analysis revealed hypocapnia and hypoxemia (pH:7,54; PCO_2: 25 mmHg; PO_2: 54 mmHg; $SatO_2$: 80%). Transthoracic echocardiography revealed dilated right chambers, paradoxical movement of IVS and increased mean PAP with 48 mmHg. Also, CTPA represented massive thrombus into the main pulmonary artery and its segmental branches, enlargement of pulmonary truncus (30 mm), and dilated right chambers presenting the overloaded right heart (Figure 2).

The patient was diagnosed as acute massive PE, and immediately a TT protocol was applied. Tissue plasminogen activator (rt-PA) 100 mg was given to the patient intravenously in 2 hours. However, patient did not relieve completely after TT, and her symptoms persisted. Additionally, TTE showed the continuation of right heart overloading, and also CTPA revealed the persistant thrombus into the main pulmonary artery and its segmental branches. Then the patient was undergone to rescue surgical embolectomy in 24 hours, because of the unsuccessful thrombolysis. There was no complication of the surgery, and she was relieved. According to the acute pulmonary embolism guidelines,[3] surgical embolectomy or catheter guided embolectomy should be planned for patients with acute massive PE in whom thrombolytic treatment was failed, and also there is not any consensus on thrombolytic repetition in the same patient. At discharge, her BP and HR were

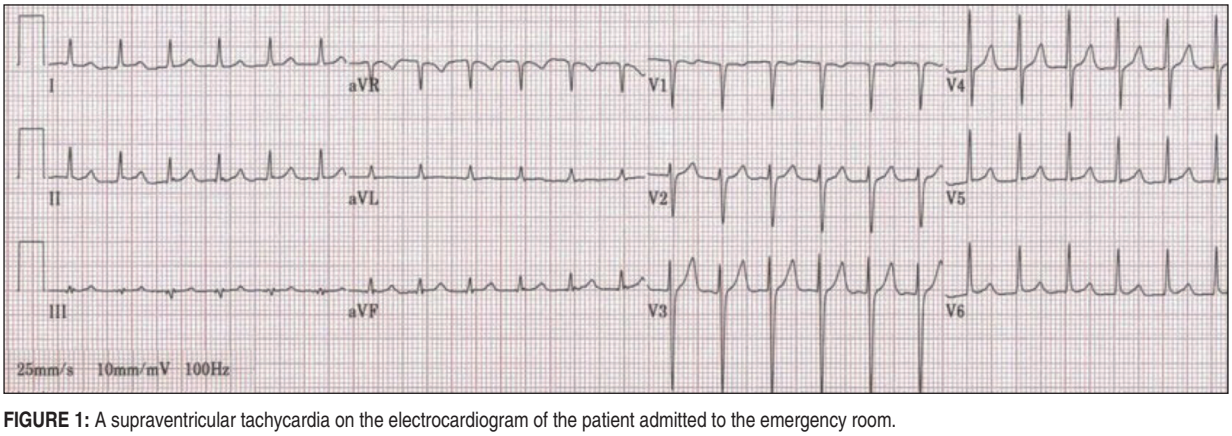

FIGURE 1: A supraventricular tachycardia on the electrocardiogram of the patient admitted to the emergency room.

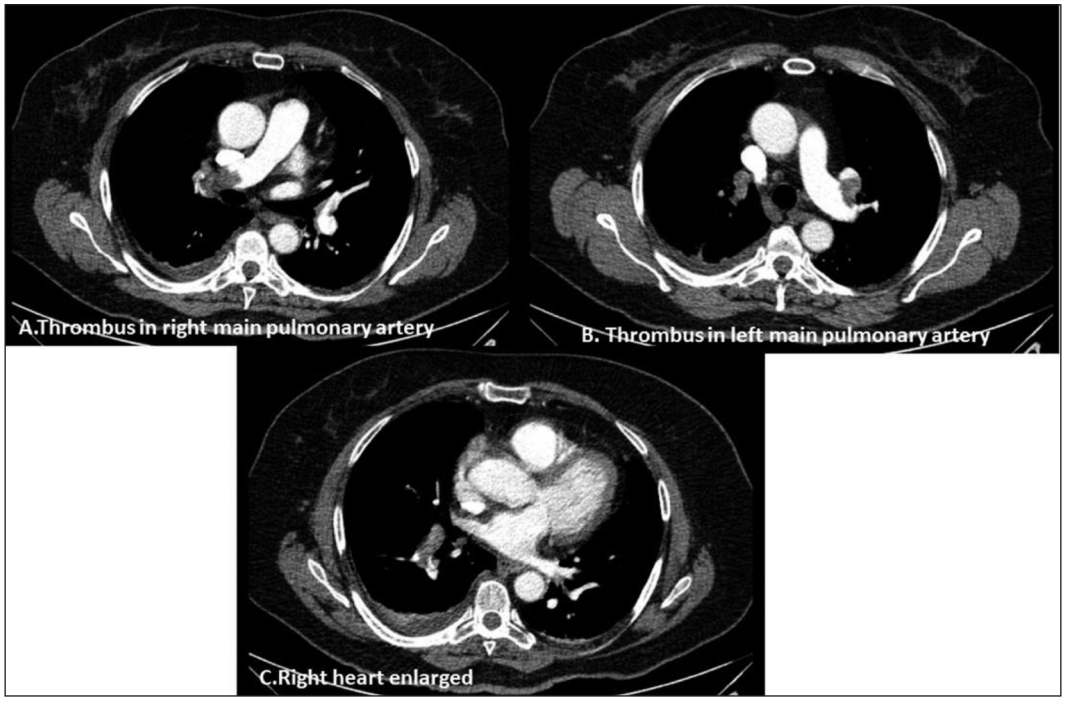

FIGURE 2: Computed tomography pulmonary angiography of the patient with massive pulmonary embolism. It was showing that massive thrombus into the left and right pulmonary arteries and dilated right ventricle presenting with the overloaded right heart.

100/75 mmHg and 92 bpm respectively; and her TTE revealed a reduction in mean PAP with 25 mmHg, and no sign of right heart overloading. Additionally, CTPA of the patient showed no thrombus into the main pulmonary artery and its segmental branches.

DISCUSSION

Patients with massive PE (such as in the present case) could be admitted to the ER presenting with not only dyspnea but also with predominant SVT (Figure 1). In such case, heart rate control with drugs may be more difficult, and may lead to hemodynamic instability, in addition to the overloaded right heart depends on PE. In our case, after the i.v. verapamil therapy, patient's ECG showed sinus tachycardia, but she did not relieve completely, and suffered progressively increasing dyspnea and tachypnea. So, her arterial blood gas analysis revealed hypocapnia and hypoxemia. On the other hand, we performed transthoracic echocardiography to show overloaded right heart with dilated right chambers, paradoxical movement of IVS and increased PAPs. Also, in order to confirm PE, CTPA was performed, and showed massive thrombus into the main pulmonary artery and its segmental branches, enlargement of pulmonary truncus, and dilated right chambers (Figure 2). Acute PE may result in early damage to the right ventricular myocardium. Right ventricular dysfunction (RVD) is an independent predictor of early mortality in PE, not only for patients presenting with arterial hypotension and cardiogenic shock; but also for normotensive patients.[5] Therefore, after having confirmed PE, TTE may play an important role for risk stratification of patients with acute PE.[6] Most of time as early as using TT may prevent severity of RVD, and be life-saving in acute PE. However, the management of patients with acute massive PE who do not respond to TT (unsuccessful thrombolysis) remains unclear. The present case points out the dramatically beneficial effects of rescue surgical embolectomy on symptoms, hemodynamic instability and echocardiographic RVD and PAPs of the patient with acute massive PE. On the other hand, there was no complication of the surgery, and CTPA of the patient showed no thrombus

into the main pulmonary artery and its segmental branches.

Major PE, defined as a large central embolism with haemodynamic instability, has a high mortality rate (17.4-28.0%).[7] The current treatment options are haemodynamic and respiratory support, thrombolysis, surgical pulmonary embolectomy, percutaneous catheter embolectomy and fragmentation, anti-coagulation and venous filters.[8] Although thrombolysis is the mainstay of therapy in high-risk PE; it was reported that bleeding complication of TT is high.[9] Additionaly, since it might result with unsuccessful thrombolysis, rescue surgical pulmonary embolectomy might be a life-saving strategy. In a prospective single-center registry of 488 patients with massive PE, it was shown that rescue surgical embolectomy (n=14) led to a better in-hospital course when compared with repeat thrombolysis (n=26) in those who have not responded to thrombolysis.[4] In that study, lack of response to thrombolysis (8.2%) within the first 36 h was prospectively defined as both persistent clinical instability and residual echocardiographic RVD. A trend for higher mortality in the medical group than in the surgical group was shown (10 vs 1 deaths, respectively; p=0.07). Additionally, it was reported that significantly more recurrent PEs and fatal bleeding events in the repeat-thrombolysis group were observed.[4] In another study, surgical embolectomy should be used as first-line therapy in the treatment for all patients with acute massive PE.[10] Catheter embolectomy is newly designed for removing small arterial clots rather than large massive emboli by devices. As such, surgical embolectomy can be the next option.[11] In a retrospective study, it was shown that a significantly dramatic reduction in the echocardiografic right ventricular systolic pressure after the surgical embolectomy in 16 patients with massive PE.[12] In a prospective study, it was shown that a significantly improvement of RVD and diameters, and a significant decrease in mean PAP before and after the surgical pulmonary embolectomy in 30 patients with PE (52.3±6.5 and 29.4±2.9 mmHg respectively, P<0.0001).[13] In that study, it was reported that indications for operation were contraindication for fibrinolytic therapy (30%), failure to respond to fibrinolysis (26.7%), cardiopulmonary arrest (20%), patent foramen ovale (20%), right atrium clot (10%), and cardiogenic shock (10%).[13] In a recent study, surgical embolectomy for acute high-risk PE patients has similar mortality, but better outcome on pulmonary end-points when compared to thrombolysis for 30-day and 5-year clinical follow-up.[14]

Patients with massive PE could be admitted to the ER presenting with not only dyspnea but also with predominant SVT. In such case, heart rate control with drugs may be more difficult, and may lead to hemodynamic instability, in addition to the overloaded right heart depends on PE. So, arterial bood gas analysis is required to show hypocapnia. In the patients with suspected PE, a CTPA should be performed to confirm PE. Also TTE may play an important role for risk stratification of patients with PE to show dilated right chambers, paradoxical movement of IVS, and increased PAPs presenting with the overloaded right heart. Thrombolytic therapy should be given as soon as possible, if it has no contraindication. However, rescue surgical embolectomy may be a life-saving altenative therapy, instead of repeat thrombolysis in patients with massive PE who have not responded to thrombolysis such as in the present case.

Conflict of Interest

Authors declared no conflict of interest or financial support.

Authorship Contributions

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REFERENCES

1. Sanford DB. Management of a pulmonary artery embolectomy and recurrent embolus. AANA J 2012;80(1):11-5.
2. Saleem T, Fatimi SH, Khalid U. Successful surgical embolectomy in acute massive bilateral pulmonary embolism. J Pak Med Assoc 2011;61(5):498-500.
3. Konstantinides SV, Torbicki A, Agnelli G, Danchin N, Fitzmaurice D, Galiè N, et al; The Task Force for the Diagnosis and Management of Acute Pulmonary Embolism of the European Society of Cardiology (ESC). 2014 ESC guidelines on the diagnosis and management of acute pulmonary embolism. Eur Heart J 2014;35(43):3033-69.
4. Meneveau N, Séronde MF, Blonde MC, Legalery P, Didier-Petit K, Briand F, et al. Management of unsuccessful thrombolysis in acute massive pulmonary embolism. Chest 2006;129(4):1043-50.
5. Kucher N, Rossi E, De Rosa M, Goldhaber SZ. Prognostic role of echocardiography among patients with acute pulmonary embolism and a systolic arterial pressure of 90 mm Hg or higher. Arch Intern Med 2005; 165(15):1777-81.
6. Sanchez O, Trinquart L, Colombet I, Durieux P, Huisman MV, Chatellier G, et al. Prognostic value of right ventricular dysfunction in patients with haemodynamically stable pulmonary embolism: a systematic review. Eur Heart J 2008;29(12):1569-77.
7. Yamada N, Nakamura M, Ito M. Current status and trends in the treatment of acute pulmonary thromboembolism. Circ J 2011; 75(12):2731-8.
8. Fukuda I, Taniguchi S, Fukui K, Minakawa M, Daitoku K, Suzuki Y. Improved outcome of surgical pulmonary embolectomy by aggressive intervention for critically ill patients. Ann Thorac Surg 2011;91(3):728-32.
9. Spirk D, Husmann M, Hayoz D, Baldi T, Frauchiger B, Engelberger R, et al. Predictors of in-hospital mortality in elderly patients with acute venous thrombo-embolism: the SWIss Venous ThromboEmbolism Registry (SWIVTER). Eur Heart J 2012;33(7): 921-6.
10. Chu SH, Andrews D, Watanabe Y. Emergency surgical embolectomy for pulmonary emboli after failed thrombolysis. Asian Cardiovasc Thorac Ann 2009;17(3):297-9.
11. Vohra HA, Whistance RN, Mattam K, Kaarne M, Haw MP, Barlow CW, et al. Early and late clinical outcomes of pulmonary embolectomy for acute massive pulmonary embolism. Ann Thorac Surg 2010;90(6):1747-52.
12. Salehi R, Parvizi R, Ansarin K, Imani S, Goldustet M. Surgical embolectomy in treating acute massive pulmonary embolism. J Pak Med Assoc (JPMA) 2013;63(8):969-72.
13. Azari A, Bigdelu L, Moravvej Z. Surgical embolectomy in the management of massive and sub-massive pulmonary embolism: the results of 30 consecutive ill patients. ARYA Atheroscler 2015;11(3):208-13.
14. Lehnert P, Møller CH, Mortensen J, Kjaergaard J, Olsen PS, Carlsen J. Surgical embolectomy compared to thrombolysis in acute pulmonary embolism: morbidity and mortality. Eur J Cardiothorac Surg 2017;51(2):354-61.