

Survival Tips in CT-Angiography for Recurrent Pulmonary Embolism with Persistently High D-Dimer Levels: Case Report **Kalıcı Yüksek D-Dimer Düzeyli Tekrarlayan Pulmoner Emboli için BT-Anjiyografide Sağlık İpuçları: Olgu Sunumu**

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Summary

A patient with previously diagnosed pulmonary embolism (PE) and persistently high D-dimer levels who is having a new episode of PE in the emergency department (ED), was presented. Clinical decision rules are not relevant in such patients. A 50-year-old male patient who was admitted to the ED presented with a complaint of thoracic back pain who had a history of unprovoked PE one month prior to the current admission. He had normal vital signs and normal physical examination findings except prolonged expirium. His laboratory results were normal, except for a D-dimer value of 1217 ng/ml. CTA was ordered to evaluate for a suspected recurrent episode of PE. CTA revealed filling defects with both sharp and obtunded angles to the vessel wall, "Polo mint" and "Railway track" signs, both calcified and congested vessels on different locations and decreased aeration on some parts of both lungs. The patient was diagnosed as recurrent PE and admitted to the hospital. Patients at high risk of PE and also previously diagnosed as having PE with persistently high D-dimer levels must be evaluated with CTA in EDs. Awareness of imaging features on CTA is very important for emergency physicians.

Keywords: Computed tomography angiography, d-dimer, pulmonary embolism

Özet

Bu makalede, daha önce pulmoner emboli (PE) tanısı konmuş ve D-dimer seviyesi kalıcı olarak yüksek olan ve acil servise yeni bir PE atağı ile başvuran bir hasta sunulmuştur. Bu hastalarda klinik karar verme kuralları işe yaramamaktadır. Bir ay önce sebepsiz PE öyküsü olan 50 yaşında bir erkek hasta acil servise sırt ağrısı ile başvurdu. Hastanın tüm vital bulguları ve fizik muayenesi uzamış ekspirium dışında normaldi. Laboratuvar bulguları da, 1217 ng/ml saptanan D-dimer düzeyi dışında, normal bulundu. Hastada yeni bir PE atağı şüphesi ile BT-anjiyografi (BTA) istendi. BTA'de damar duvarı ile hem keskin, hem de dar açı oluşturan dolum defektleri; "Polo mint" ve "Railway track (demiryolu)" bulguları; farklı yerleşimlerde hem kalsifiye, hem de konjesyone damar yapıları; bazı akciğer alanlarında havalanma azalışı görüldü. Hastaya tekrarlayan PE atağı tanısı kondu ve yatışı yapıldı. PE için yüksek riskli olan, daha önce PE geçirmiş ve D-dimer düzeyleri kalıcı olarak yüksek olan hastalar acil servislerde BTA ile değerlendirilmelidir. Bu vakalarda izlenecek BTA bulguları açısından bilinçli olmak, acil servis hekimleri için çok önemlidir.

Anahtar kelimeler: Bilgisayarlı tomografi anjiyografi, d-dimer, pulmoner emboli

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Introduction

Routine diagnostic evaluations of the first episode in suspected pulmonary embolism (PE) patients are mainly composed of determining the pretest probability of the pathology and then ordering tests accordingly, such as D-dimer and

computed tomography pulmonary angiography (CTA) (1). Wells criteria, pulmonary embolism rule-out criteria and Geneva scores are the diagnostic decision rules most commonly used by emergency physicians (EPs) in acute PE cases (1). One of the drawbacks of these rules is that their presence is only beneficial in the first episodes of acute PE cases in stratifying them

according to disease prevalences (1). Unfortunately, these decision rules are not relevant in patients with recurrent PE and persistently high D-dimer levels. Although the best way is to compare the old and new CTA of the patient, in this group, prompt evaluation and differentiation of acute PE cases from chronic ones become more important in clinical practice when the patient's old CTA results are not present. In this case, we have presented a patient with previously diagnosed unprovoked PE and persistently high D-dimer levels who is diagnosed as having recurrent PE with the characteristic findings of the CTA in an emergency department (ED).

Case

A 50-year-old male patient who was admitted to the ED presented with a complaint of thoracic back pain between the scapulae. The pain was like a stabbing pain and changed with the position of the patient for six hours. His vital signs were as follows – arterial blood pressure: 125/80 mmHg; pulse: 89/minute; temperature: 36.8 °C; respiratory rate: 28/min; and oxygen saturation in room air: 93%. On physical examination, he had normal findings except for prolonged expiration on both hemithoraces.

The patient had no remarkable comorbid previous history other than chronic obstructive lung disease and a 20-years of smoking history. He was on medication with inhaler therapy and oral warfarin treatments. He had been admitted to the intensive care unit because of unprovoked PE on both lungs one month prior to the current admission to the ED. During his previous admission, CTA revealed a large filling defect distal to the right main pulmonary artery, which was extended inferiorly. Also, some smaller filling defects were seen in the distal branches of the left lower lobe posterior and anterior segments. Due to his normal right ventricular assessment on echocardiography and at the normotensive clinical situation, he had been admitted to the intensive care unit for anticoagulant therapy and inhaled bronchodilator therapy. After seven days of medical treatment, he was discharged at his request with oral warfarin treatment with an international normalized ratio (INR) value of 3.1.

A 12-lead electrocardiogram (ECG) showed no additional changes to the previous ECG; arterial

blood-gas analysis indicated no specific abnormality in regard to PE, with normal right ventricular dimensions and left ventricular ejection fraction on bedside echocardiography. His laboratory results were normal, including troponin-I and INR values, except for a D-dimer value of 1217 ng/ml. CTA was ordered to evaluate for a suspected recurrent episode of PE (Somatom® Definition AS+® 128 slice, ®Siemens Healthcare GmbH, Erlangen, Germany). The CTA depicted both acute and chronic PE placed in different parts of the lungs through special CTA imaging features. The patient was consulted to the chest physician due to his ineffective anticoagulation profile and high risk of recurrent PE with persistently high D-dimer levels. He was admitted to hospital for maintenance therapy and discharged from the hospital after a week.

Discussion

There is plenty of evidence and several recommendations for the first episode of suspected PE patients via the tripod approach, composed of clinical decision rules, D-dimer use and diagnostic radiology tests (1). Although the benefits and drawbacks are studied a lot in the emergency clinical practices, the knowledge and competency in the third leg is the most important step in the diagnostic journey of patients with PE (1). There are a number of challenges for patients with PE, including, in particular, the recurrence and persistence of high D-dimer levels (2). D-dimer use in the diagnostic pathway of suspected PE patients is useless both in first episodes of highly suspected PE and also recurrent episodes of PE in these patients. Palareti et al. showed in a randomized controlled trial that patients with elevated D-dimer values after the first unprovoked episode of PE, and who continued with treatment, had a significantly lower incidence of recurrence than patients with normal D-dimer values who had discontinued treatment (3). So, D-dimer levels can be used as a risk indicator for recurrent episodes of PE in patients without treatment rather than a part of the diagnostic pathway (2). Also, the clinical decision rules are not validated for recurrent episodes of PE patients, so we have no clear evidence regarding using them in this group. The only tool for recurrent attacks of PE in patients with persistently high D-dimer levels is radiologic modalities. CTA is the most commonly used test rather than ventilation and

perfusion imaging of the lung due to its availability and faster results (4). Also, CTA enables us to diagnose possible pathologies of dyspnea other than PE (4). EPs should know the

specific findings for acute and chronic PE and be able to differentiate them on CTA.

Figure.1A Computed tomography angiography (CTA) scan demonstrates a pulmonary embolism (PE) that results in an eccentrically positioned partial filling defect, which is surrounded by contrast material and forms acute angles with the arterial wall (arrow)

Figure.1B The artery is enlarged compared with adjacent patent vessels in acute PE as shown by the arrow

Figure.1C This partial filling defect surrounded by contrast material produces the Polo mint sign (arrow)

Figure.1D CTA scan shows an acute PE that causes a partial filling defect surrounded by contrast material (railway track sign) (arrow)

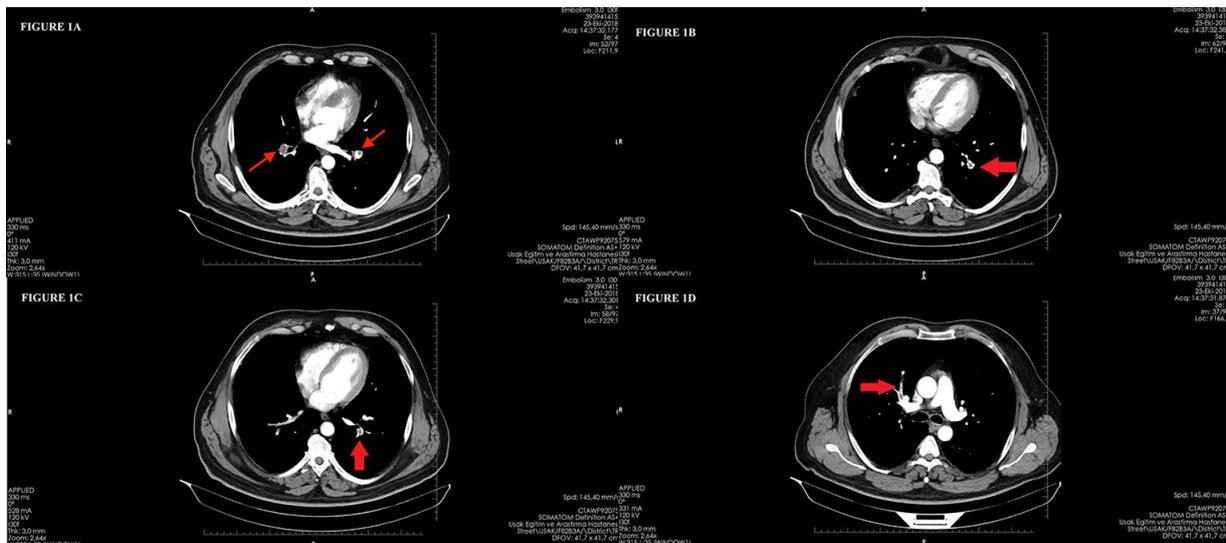
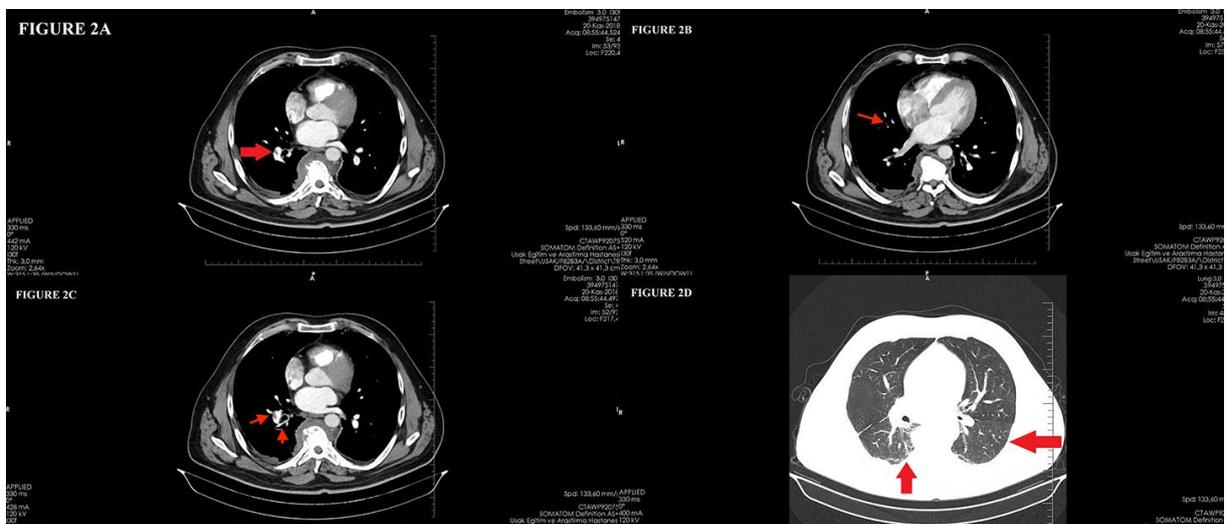


Figure.2A CTA scan shows an eccentrically located thrombus that forms obtuse angles with the vessel wall (arrow)

Figure.2B The artery in chronic PE is not congested compared to the unaffected adjacent vessel (arrow)

Figure.2C CTA depicted the dilated collateral bronchial artery as a marker of the chronicity of the case (arrows)

Figure.2D CTA depicted the underperfused area affected by chronic PE (arrows)



Acute and chronic thrombus may lead to partial and complete filling defects in the targeted vessel lumen (4). Acute filling defects reveal sharper angles with the vessel walls compared to chronic ones (Figure 1a), which show obtunded angles and merge with a broader surface (Figure 2a) (4). Besides the merging angle of the thrombus in relation to the vessel wall, there are some other features of acute and chronic PE in CTA, such as the venous congestion in acute cases compared to the neighborhood vessels (Figure 1b), in contrast to the chronic PE in which the diameter of the targeted vessel does not change widely in relation to the adjacent vessels (Figure 2b) (4). When the filling defect stands in the middle of the lumen with a contrast medium around the thrombus, it gives an appearance of a polo mint and is called a “Polo mint sign” in acute PE cases (Figure 1c) (4). Some images are also specific for acute PE on CTA, such as the “railway track sign” as seen in Figure 1d (4). In this case, the affected vessel is imaged along its longitudinal axis so that the filling defect is seen as elongated in its way.

In chronic cases, the vessel wall sometimes can be detected and also the presence of collateral vessels due to chronically increased pulmonary pressures in patients with old PE (Figure 2c) (4). The decreased aeration of the involved side can also give a clue about the age of the pathology, which is seen in patients with chronic PE (Figure 2d) (4). In this case, an eccentrically located thrombus that forms obtuse angles with the vessel wall and dilated collateral bronchial arteries consistent with the old PE can be seen, and these findings with persistently elevated D-dimer levels without ongoing oral anticoagulant treatment were considered to be high-risk features for future PE episodes and we consulted the pulmonology department to make a decision on further anticoagulation treatment for the patient. He has started on oral warfarin therapy and been admitted to hospital.

Conclusion

Patients at high risk of PE and also previously diagnosed as having PE with persistently high D-dimer levels must be evaluated with CTA in EDs. Prompt evaluation and awareness of characteristic features of acute and old PE in CTA is very important to be able distinguish these entities for EPs.

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