

13. BÖLÜM

PULMONER EMBOLİ VE TROMBOEMBOLİ HAYVAN MODELLERİ

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Pulmoner emboli; genellikle alt ekstremitte derin venlerinden kaynaklanan trombüslerin veya trombüs dışı materyallerin (tümör parçacıkları, hava, yağ, septik materyal ve amniyotik sıvı) embolizasyonu sonucu pulmoner arter ve dallarının tıkanması durumu ile ortaya çıkan klinik tablodur. Pulmoner emboli sıklıkla (%90) derin bacak venlerinden kopan trombüs veya trombüs parçasına bağlı gelişmektedir (1).

Venöz tromboembolizm (VTE) hastalığının ana iki komponenti olan pulmoner embolizm ve derin ventrombozu (DVT), miyokard infarktüsü ve iskemik inme ile birlikte en önemli üç kardiyovasküler hastalık arasında yer almaktadır. VTE'nin yıllık insidansı 1000'de 1,2 ile 2,7 arasında değişmektedir (2). Amerika Birleşik Devletleri'nde (ABD) pulmoner emboli yıllık 100.000'den fazla ölüme sebep olmaktadır. Pulmoner emboli kaynaklı ölümlerin çoğu akut sağ kalp yetersizliği sebebiyle meydana gelmektedir ve 65 yaş üzeri hasta grubunda hastane içi mortalite %4,6 aylık mortalite oranı %20'dir. Bu hastaların %15'inde ise taburculuk sonrası ilk 30 günde yeniden hastaneye başvuru olduğu gözlenmiştir (3).

Avrupa toplumlarında da ABD'ye benzer şekilde pulmoner embolinin 30 günlük mortalite oranı %5'dir (4). Son yıllarda akut pulmoner embolinin tanı, tedavi ve korunması konularındaki ilerlemeler ve yeni nesil oral antikoagülanların (YOAK) kullanımının yaygınlaşması ile hastane yatış süreleri ve mortalite oranlarında ciddi düşüşler meydana gelmiştir (5).

Pulmoner emboli akut dönemde özellikle yüksek riskli hasta gruplarında ciddi mortalite ve morbidite oranlarına sahip olmakla birlikte, rekürren VTE,

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KAYNAKLAR

1. Grippi MA, Elias JA, Fishman JA, Kotloff RM, Pack AI, Senior RM, et al. Fishman's Pulmonary Diseases and Disorders [Internet]. Fishman's Pulmonary Diseases and Disorders, 5e.2015 Available from: <http://accessmedicine.mhmedical.com/content.aspx?aid=1122347234> eriřim tarihi 26.06.2020
2. Wendelboe AM, Raskob GE. Global burden of thrombosis: epidemiologic aspects. *CircRes*. 2016;118:1340-1347.
3. Minges KE, Bikkeli B, Wang Y, et al. National trends in pulmonary embolism hospitalization rates and outcomes for adults aged ≥ 65 years in the United states (1999 to 2010). *Am J Cardiol*. 2015;116:1436-1442.
4. Jimenez D, de Miguel-Diez J, Guijarro R, et al. Trends in the management and outcomes of acute pulmonary embolism: analysis from the riete registry. *J AmCollCardiol*. 2016;67:162-170.
5. Smith SB, Geske JB, Kathuria P, et al. Analysis of National trends in admissions for pulmonary embolism. *Chest*. 2016;150(1):35-45.
6. Klok FA, Dzikowska-Diduch O, Kostrubiec M, et al. Derivation of a clinical prediction Score for chronic Thromboembolic pulmonary hypertension after acute pulmonary embolism. *J Thromb Haemost*. 2016;14:121-128.
7. Mitchell RN, Cotran RS: Hemodynamic disorders, thrombosis and shock. In: Cotran RS, ed. Robbins pathologic basic of disease. 6th ed. Philadelphia: WV Saunders. 1999:13-130
8. Reddick RL, Bellinger DA. Hemostasis and thrombosis. In: Damjanov I, ed. Anderson's pathology, Vol 1. 10th ed. St. Louis: Mosby;1996: 472-81
9. Yenerman M. Genel Patoloji. Gstanbul Nobel Tip Kitabevleri; 1994: 526-34
10. Smulders YM. Contribution of pulmonary vasoconstriction to hemodynamic instability after acute pulmonary embolism. Complications for treatment?. *Neth J Med* 2001;58:241-7
11. Bobadilla RA, Garcia-Juarez JA, hong E, et al. Serotonergic receptors involved in the hemodynamic changes observed during pulmonary embolism. *Proc West PharmacolSoc* 1991; 34: 439-42
12. Dalen JE, Haffajee CI, Alpert JS, Howe III JP, Ockene IS, Paraskos JA. Pulmonary embolism, pulmonary hemorrhage and pulmonary infarction. *N Engl J Med*. 1977;296(25):1431-5.
13. Burrowes K, Clark A, Tawhai M. Blood flow redistribution and ventilation-perfusion mismatch during embolic pulmonary arterial occlusion. *PulmCirc*. 2011;1(3):365-76.
14. Zipes PD, Libby P, Bonow RO, et al. Braunwald's Heart Disease, a textbook of kardiovascularmedicine, 11th edition, 2018.
15. Seligsohn U, Lubetsky A. Genetic susceptibility to venous thrombosis. *N Engl J Med* 2001;344(16):1222-31.
16. Goldhaber SZ. Risk factors for venous thromboembolism. *J AmCollCardiol* 2010; 56(1):17.
17. Pollack CV, Schreiber D, Goldhaber SZ, et al. Clinical characteristics, management, and outcomes of patients diagnosed with acute pulmonary embolism in the emergency department: Initial report of EMPEROR (multicenter emergency medicine pulmonary embolism in the real world registry). *J AmCollCardiol* 2012 ;30(9):1774-81.
18. Barth BE, Waligora G, Gaddis GM. Rapid systematic review: age-adjusted D-Dimer for ruling out pulmonary embolism. *J EmergMed* 2018 Oct;55(4):586-592.
19. Becattini C, Vedovati MC, Agnelli G. Prognostic value of troponins in acute pulmonary embolism a meta-analysis. *Circulation* 2007;116(4):427-33
20. Jime'nez D, Uresandi F, Otero R, et al. Troponin-based risk stratification of patients with acute nonmassive pulmonary embolism. *Chest* 2009;136(4):974-82.
21. Essien EO, Rali P, Mathai SC. Pulmonary Embolism. *MedClin North Am*. 2019 May;103(3):549-564.
22. Zhang LJ, Wang ZJ, Lu L, et al. Dual energy CT ventilation imaging after aerosol inhalation of iodinated contrast medium in rabbits. *Eur J Radiol*. 2011;78(2):26671.

23. Chai X, Zhang LJ, Yeh BM, et al. Acute and subacute dual energy CT findings of pulmonary embolism in rabbits: correlation with histopathology. *Br J Radiol.* 2012 May;85(1013):613-22.
24. Zhang LJ, Chai X, Wu SY, et al. Detection of pulmonary embolism by dual energy CT: correlation with perfusion scintigraphy and histopathological findings in rabbits. *EurRadiol.* 2009 Dec;19(12):2844-54.
25. Zhang LJ, Zhao YE, Wu SY, et al. Pulmonary embolism detection with dual-energy CT: experimental study of dual-source CT in rabbits. *Radiology.* 2009 Jul;252(1):61-70.
26. Tang CX, Zhou CS, Zhao YE, et al. Detection of pulmonary fat embolism with dual-energy CT: an experimental study in rabbits. *EurRadiol.* 2017 Apr;27(4):1377-1385.
27. Davidson JT, Rosenmann E, Weinberg H, et al. The role of hypovolemic stress in the production of fat embolism in rabbits. 2. Changes in arterial blood gas levels and static compliance. *Chest.* 1976 May;69(5):660-4.
28. Karthick SR, Sen RK, Gopinathan NR, et al. Can IL-6 predict the development of fat embolism in polytrauma? A rabbit model pilot experimental study. *J ClinOrthopTrauma.* 2020 Feb;11(Suppl 1):S86-S92.
29. Woo OH, Yong HS, Oh YW, et al. Experimental pulmonary fat embolism: computed tomography and pathologic findings of the sequential changes. *J KoreanMedSci.* 2008 Aug;23(4):691-9.
30. Watts JA, Marchick MR, Kline JA. Right ventricular heart failure from pulmonary embolism: key distinctions from chronic pulmonary hypertension. *J Card Fail.* 2010 Mar;16(3):250-9.
31. Evlakhov VI, Poyassov IZ, Shaidakov EV. Peculiarities of Blood Flow Changes in Venae Cavae during Experimental Pulmonary Embolism. *BullExpBiolMed.* 2016 Oct;161(6):759-762.
32. Chen HM, Duan YY, Li J, et al. A rabbit model with acute thrombo-embolic pulmonary hypertension created with echocardiography guidance. *UltrasoundMedBiol.* 2008 Feb;34(2):221-7.
33. Nilsson KF, Gustafsson LE, Adding LC, et al. Increase in exhaled nitric oxide and protective role of the nitric oxide system in experimental pulmonary embolism. *Br J Pharmacol.* 2007;150:494-501.
34. Dias-Junior CA, Souza-Costa DC, Zerbini T, et al. The effect of sildenafil on pulmonary embolism-induced oxidative stress and pulmonary hypertension. *AnesthAnalg.* 2005 Jul;101(1):115-20,