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GİRİŞ

Yoğun bakımda en sık gözlenen hastane kökenli enfeksiyon, ventilatör ilişkili pnömonidir (VİP). Hastane kökenli pnömoni (HKP), 2. en sık görülen hastane enfeksiyonu olmasına rağmen, en yüksek mortaliteye sahip olması nedeni ile oldukça önemlidir (1,2).

Hastaneye yatıştan 48 saat sonra görülen ve tanı anında mekanik ventilasyon ihtiyacı göstermeyen, akciğer parankim enfeksiyonları HKP olarak adlandırılır (3,4). Mekanik ventilasyondan 48 saat sonra gelişen pnömoniler ise VİP olarak adlandırılırlar. Nozokomiyal pnömoni gelişen hastalarda 2005 IDSA kılavuzunda sağlık bakımı ilişkili pnömoniler (SBİP) bu grupta değerlendirilirken, 2017 yılında yayımlanan son kılavuzda her zaman dirençli etkenler saptanmaması nedeni ile bu tanım nozokomiyal pnömoni grubundan çıkarılmış ve toplum kökenli pnömoni alt grubu olarak sınıflandırılmıştır (5,6).

Bu bölümde amacımız, hastane kökenli pnömoni tanımlarını yaparak, yoğun bakımda sık olarak gözlediğimiz, ciddi mortalite, morbidite ve ekonomik kayıplara neden olan ventilatör ilişkili pnömoniyi güncel bilgiler ışığında gözden geçirmektir.

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Solunum devreleri her hasta değişiminde, mekanik hasar, gözle görülür kirler meydana geldiğinde değiştirilmelidir. Sık değişimlerin VİP insidansını azalttığı gösterilememiştir.

Hastaların supin pozisyonda yatırılması ve transfer esnasında entübasyon tüpünde meydana gelebilecek hareketler, VİP gelişimi ile ilişkili bulunmuştur. Hastaların muhakkak transferi gerekiyorsa beslenmeye ara verilerek, beslenme tüpleri 4 saat drenaja alınmalıdır.

Mikroaspirasyonun önlenmesi, her hastada yatak başının 30-45°C açı ile kaldırılmalıdır. Özel entübasyon tüplerinin kullanımı (örneğin: gümüş kaplı, subglottik aspirasyonlu) kolonizasyon ve VİP insidansında azalma nedeni ile etkili bulunmuştur. Yine de rutin kullanıma girmemiştir.

Entübasyon kaf basıncı 20-30 mmHg arasında tutulmalıdır. 20 mmHg altı basınçlarda aspirasyon olabileceği, 30 mmHg üzeri basınçlarda trakeada mukozal hasar gelişebileceği göz önünde bulundurulmalıdır.

Klorheksidinli solüsyonlar ile ağız hijyeninin sağlanması ile kolonizasyon önenebilir ve VİP azaltılabilir. Uygulama sıklığında farklı öneriler mevcut olmakla beraber, günde en az bir kez klorheksidinli ağız bakımı yapılması ile MRSA, *Pseudomonas aeruginosa* gibi bakterilerin kolonizasyonu azaltılabilir.

Selektif oral ve gastrik dekontaminasyon son zamanlarda gündeme gelmiştir. Olumlu sonuçlar bildirilmekle birlikte direnç riski nedeni ile uygulanması önerilmez.

Gastrik pH'nın yükselmesi sonucu midede bakteri miktarı artar. Ama 48 saatten uzun süre entübe kalan hastalarda stres ülseri iyi bilinen bir komplikasyondur. Bu bakteri yükü enteral beslenme ile azaltılabilir. H₂ blokerleri ya da proton pompa inhibitörleri için kesin bir öneri bulunmaz.

KAYNAKLAR

1. Torres A, Niederman MS, Chastre J, et al. International ERS/ESICM/ESCMID/ALAT guidelines for the management of hospital-acquired pneumonia and ventilator-associated pneumonia. *Eur Respir J.* 2017;50(3):1700582. doi:10.1183/13993003.00582-2017
2. Torres A, Niederman MS, Chastre J, et al. Summary of the international clinical guidelines for the management of hospital-acquired and ventilator-acquired pneumonia. *ERJ Open Res.* 2018;4(2):00028-02018. doi:10.1183/23120541.00028-2018
3. Blanquer J, Aspa J, Anzueto A, et al. Normativa SEPAR: neumonía nosocomial. *Arch Bronconeumol.* 2011;47(10):510-520. doi:10.1016/j.arbres.2011.05.013
4. Torres A, Niederman MS, Chastre J, et al. TASK FORCE REPORT ERS/ESICM/ESCMID/ALAT GUIDELINES. *Eur Respir J.* 2017;50:1700582. doi:10.1183/13993003.00582-2017
5. Kalil AC, Mettersky ML, Klompas M, et al. Management of Adults With Hospital-acquired and Ventilator-associated Pneumonia: 2016 Clinical Practice Guidelines by the Infectious Diseases Society of America and the American Thoracic Society. *Clin Infect Dis.* 2016;63(5):e61-e111. doi:10.1093/cid/ciw353

6. Guidelines for the management of adults with hospital-acquired, ventilator-associated, and healthcare-associated pneumonia. *Am J Respir Crit Care Med.* 2005;171(4):388-416. doi:10.1164/rccm.200405-644ST
7. Pneumonia H. Guidelines for the management of adults with hospital-acquired, ventilator-associated, and healthcare-associated pneumonia. *Am J Respir Crit Care Med.* 2005;171(4):388-416. doi:10.1164/rccm.200405-644ST
8. Chastre J, Fagon JY. Ventilator-associated pneumonia. *Am J Respir Crit Care Med.* 2002;165(7):867-903. doi:10.1164/ajrccm.165.7.2105078
9. Celis R, Torres A, Gatell JM, Almela M, Rodriguez-Roisin R, Agusti-Vidal A. Nosocomial pneumonia: A multivariate analysis of risk and prognosis. *Chest.* 1988;93(2):318-324. doi:10.1378/chest.93.2.318
10. Torres A, Aznar R, Gatell JM, et al. Incidence, risk, and prognosis factors of nosocomial pneumonia in mechanically ventilated patients. *Am Rev Respir Dis.* 1990;142(3):523-528. doi:10.1164/ajrccm/142.3.523
11. Safdar N, Dezfulian C, Collard HR, Saint S. Clinical and economic consequences of ventilator-associated pneumonia: A systematic review. *Crit Care Med.* 2005;33(10). doi:10.1097/01.CCM.0000181731.53912.D9
12. Beyersmann J, Gastmeier P, Grundmann H, et al. Use of Multistate Models to Assess Prolongation of Intensive Care Unit Stay Due to Nosocomial Infection. *Infect Control Hosp Epidemiol.* 2006;27(5):493-499. doi:10.1086/503375
13. Bekaert M, Vansteelandt S, Mertens K. Adjusting for time-varying confounding in the subdistribution analysis of a competing risk. *Lifetime Data Anal.* 2010;16(1):45-70. doi:10.1007/s10985-009-9130-8
14. Nguile-Makao M, Zahar JR, Français A, et al. Attributable mortality of ventilator-associated pneumonia: Respective impact of main characteristics at ICU admission and VAP onset using conditional logistic regression and multi-state models. *Intensive Care Med.* 2010;36(5):781-789. doi:10.1007/s00134-010-1824-6
15. (No Title).
16. Nseir S, Di Pompeo C, Pronnier P, et al. Nosocomial tracheobronchitis in mechanically ventilated patients: Incidence, aetiology and outcome. *Eur Respir J.* 2002;20(6):1483-1489. doi:10.1183/09031936.02.00012902
17. Oliveira J, Zagalo C, Cavaco-Silva P. Prevention of ventilator-associated pneumonia. *Rev Port Pneumol.* 2014;20(3):152-161. doi:10.1016/j.rppneu.2014.01.002
18. IDSA. *Management of Adults With Hospital-Acquired and Ventilator-Associated Pneumonia: 2016 Clinical Practice Guidelines by the Infectious Diseases Society of America and the American Thoracic Society.*
19. Alp E, Güven M, Yildiz O, Aygen B, Voss A, Doganay M. Incidence, risk factors and mortality of nosocomial pneumonia in intensive care units: A prospective study. *Ann Clin Microbiol Antimicrob.* 2004;3(1):1-7. doi:10.1186/1476-0711-3-17
20. Fagon JY, Chastre J, Domart Y, et al. Nosocomial pneumonia in patients receiving continuous mechanical ventilation. Prospective analysis of 52 episodes with use of a protected specimens brush and quantitative culture techniques. *Am Rev Respir Dis.* 1989;139(4 Pt 1):877-884. doi:10.1164/ajrccm/139.4.877
21. Tejerina E, Esteban A, Fernández-Segoviano P, et al. Accuracy of clinical definitions of ventilator-associated pneumonia: Comparison with autopsy findings. *J Crit Care.* 2010;25(1):62-68. doi:10.1016/j.jcrc.2009.05.008
22. Claessens YE, Debray MP, Tubach F, et al. Early chest computed tomography scan to assist diagnosis and guide treatment decision for suspected community-acquired pneumonia. *Am J Respir Crit Care Med.* 2015;192(8):974-982. doi:10.1164/rccm.201501-0017OC
23. CDC. *Ventilator-Associated Event (VAE).*; 2020.
24. Pugin J, Auckenthaler R, Mili N, Janssens JP, Lew PD, Suter PM. Diagnosis of ventilator-associated pneumonia by bacteriologic analysis of bronchoscopic and nonbronchoscopic "blind" bronchoalveolar lavage fluid. *Am Rev Respir Dis.* 1991;143(5 Pt 1):1121-1129. doi:10.1164/ajrccm/143.5_pt_1.1121

25. Kuti EL, Patel AA, Coleman CI. Impact of inappropriate antibiotic therapy on mortality in patients with ventilator-associated pneumonia and blood stream infection: A meta-analysis. *J Crit Care*. 2008;23(1):91-100. doi:10.1016/j.jccr.2007.08.007
26. Iregui M, Ward S, Sherman G, Fraser VJ, Kollef MH. Clinical importance of delays in the initiation of appropriate antibiotic treatment for ventilator-associated pneumonia. *Chest*. 2002;122(1):262-268. doi:10.1378/chest.122.1.262
27. Berton DC, Kalil AC, Teixeira PJZ. Quantitative versus qualitative cultures of respiratory secretions for clinical outcomes in patients with ventilator-associated pneumonia. *Cochrane Database Syst Rev*. 2014;2014(10). doi:10.1002/14651858.CD006482.pub4
28. Hyllienmark P, Martling CR, Struwe J, Petersson J. Pathogens in the lower respiratory tract of intensive care unit patients: Impact of duration of hospital care and mechanical ventilation. *Scand J Infect Dis*. 2012;44(6):444-452. doi:10.3109/00365548.2011.645504
29. Klevens RM, Edwards JR, Gaynes RP. The impact of antimicrobial-resistant, health care-associated infections on mortality in the United States. *Clin Infect Dis*. 2008;47(7):927-930. doi:10.1086/591698
30. Depuydt P, Benoit D, Vogelaers D, et al. Systematic surveillance cultures as a tool to predict involvement of multidrug antibiotic resistant bacteria in ventilator-associated pneumonia. *Intensive Care Med*. 2008;34(4):675-682. doi:10.1007/s00134-007-0953-z
31. Moreira MR, Cardoso RL, Almeida AB, Gontijo Filho PP. Risk factors and evolution of Ventilator-associated pneumonia by *Staphylococcus aureus* sensitive or resistant to oxacillin in patients at the intensive care unit of a Brazilian University Hospital. *Brazilian J Infect Dis*. 2008;12(6):499-503. doi:10.1590/S1413-86702008000600011
32. Sanchez G V, Master RN, Clark RB, et al. *Klebsiella pneumoniae* Antimicrobial Drug Resistance, United States, 1998–2010. *Emerg Infect Dis*. 2013;19(1):133-136.
33. Verhamme KMC, De Coster W, De Roo L, et al. Pathogens in Early-Onset and Late-Onset Intensive Care Unit–Acquired Pneumonia. *Infect Control Hosp Epidemiol*. 2007;28(4):389-397. doi:10.1086/511702
34. Vincent J, Marshall J, Anzueto A, Martin CD, Gomersall C. International Study of the Prevalence and Outcomes of Infection in Intensive Care Unit. *JAMA*. 2009;302(21):2323-2329.
35. Giantsou E, Liratzopoulos N, Efraimidou E, et al. Both early-onset and late-onset ventilator-associated pneumonia are caused mainly by potentially multiresistant bacteria. *Intensive Care Med*. 2005;31(11):1488-1494. doi:10.1007/s00134-005-2697-y
36. Gomes JCP, Pedreira WL, Araújo EMPA, et al. Impact of BAL in the management of pneumonia with treatment failure: Positivity of BAL culture under antibiotic therapy. *Chest*. 2000;118(6):1739-1746. doi:10.1378/chest.118.6.1739
37. El-Ebiary M, Torres A, Fabregas N, et al. Significance of the isolation of *Candida* species from respiratory samples in critically ill, non-neutropenic patients. An immediate postmortem histologic study. *Pneumologie*. 1997;51(11):583-590.
38. Meersseman W, Lagrou K, Spriet I, et al. Significance of the isolation of *Candida* species from airway samples in critically ill patients: A prospective, autopsy study. *Intensive Care Med*. 2009;35(9):1526-1531. doi:10.1007/s00134-009-1482-8
39. Lambotte O, Timsit JF, Garrouste-Orgeas M, Misset B, Benali A, Carlet J. The significance of distal bronchial samples with commensals in ventilator-associated pneumonia: Colonizer or pathogen? *Chest*. 2002;122(4):1389-1399. doi:10.1378/chest.122.4.1389
40. Markowicz P, Wolff M, Djedaini K, et al. Multicenter prospective study of ventilator-associated pneumonia during acute respiratory distress syndrome: Incidence, prognosis, and risk factors. *Am J Respir Crit Care Med*. 2000;161(6):1942-1948. doi:10.1164/ajrccm.161.6.9909122
41. Hotchkiss RS, Monneret G, Payen D. Sepsis-induced immunosuppression: From cellular dysfunction to immunotherapy. *Nat Rev Immunol*. 2013;13(12):862-874. doi:10.1038/nri3552
42. Shorr AF, Zilberberg MD, Micek ST, Kollef MH. Prediction of infection due to antibiotic-resistant bacteria by select risk factors for health care-associated pneumonia. *Arch Intern Med*. 2008;168(20):2205-2210. doi:10.1001/archinte.168.20.2205

43. Shorr AF, Zilberberg MD, Reichley R, et al. Validation of a clinical score for assessing the risk of resistant pathogens in patients with pneumonia presenting to the emergency department. *Clin Infect Dis.* 2012;54(2):193-198. doi:10.1093/cid/cir813
44. Schreiber MP, Chan CM, Shorr AF. Resistant pathogens in nonnosocomial pneumonia and respiratory failure: Is it time to refine the definition of health-care-associated pneumonia? *Chest.* 2010;137(6):1283-1288. doi:10.1378/chest.09-2434
45. Sopena N, Sabrià M. Multicenter study of hospital-acquired pneumonia in non-ICU patients. *Chest.* 2005;127(1):213-219. doi:10.1378/chest.127.1.213
46. Vallés J, Mesalles E, Mariscal D, et al. A 7-year study of severe hospital-acquired pneumonia requiring ICU admission. *Intensive Care Med.* 2003;29(11):1981-1988. doi:10.1007/s00134-003-2008-4
47. Mohan S, Hamid NS, Cunha BA. A Cluster of Nosocomial Herpes Simplex Virus Type 1 Pneumonia in a Medical Intensive Care Unit. *Infect Control Hosp Epidemiol.* 2006;27(11):1255-1257. doi:10.1086/508843
48. Sartor C, Zandotti C, Romain F, et al. Disruption of Services In An Internal Medicine Unit Due To A Nosocomial Influenza Outbreak. *Infect Control Hosp Epidemiol.* 2008;23(10):615619.
49. CDC. Suspected Nosocomial Influenza Cases in an Intensive Care Unit. *MMWR Morb Mortal Wkly Rep.* 1988;34:3-4,9.
50. Choi SH, Hong SB, Ko GB, et al. Viral infection in patients with severe pneumonia requiring intensive care unit admission. *Am J Respir Crit Care Med.* 2012;186(4):325-332. doi:10.1164/rccm.201112-2240OC
51. Bousbia S, Papazian L, Saux P, et al. Repertoire of intensive care unit pneumonia microbiota. *PLoS One.* 2012;7(2):1-14. doi:10.1371/journal.pone.0032486
52. Klompas M. Nosocomial pneumonia. In: *Mandell, Douglas, and Bennett's Principles and Practice of Infectious Diseases.* ; 2010.
53. Khilnani GC, Zirpe K, Hadda V, et al. Guidelines for antibiotic prescription in intensive care unit. *Indian J Crit Care Med.* 2019;23(Suppl 1):1-63. doi:10.5005/jp-journals-10071-23101
54. Dandona P, Nix D, Wilson MF, Aljada A, Love J, Assicot M. Procalcitonin increase after endotoxin injection in normal subjects. *J Clin Endocrinol Metab.* 1994;79(6):1605-1608. doi:10.1210/jcem.79.6.7989463
55. Assicot M, Bohuon C, Gendrel D, Raymond J, Carsin H, Guilbaud J. High serum procalcitonin concentrations in patients with sepsis and infection. *Lancet.* 1993;341(8844):515-518. doi:10.1016/0140-6736(93)90277-N
56. Dahyot-Fizelier C, Frasca D, Lasocki S, et al. Prevention of early ventilation-acquired pneumonia (VAP) in comatose brain-injured patients by a single dose of ceftriaxone: PROPHY-VAP study protocol, a multicentre, randomised, double-blind, placebo-controlled trial. *BMJ Open.* 2018;8(10). doi:10.1136/bmjopen-2018-021488