

HEMODİYALİZDE AKUT KOMPLİKASYONLARIN YÖNETİMİ

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ÖĞRENİM HEDEFLERİ

- ▶ Hemodiyaliz esnasında sık karşılaşılan komplikasyonların nedenlerini öğrenme
- ▶ Hemodiyaliz esnasında karşılaşılan bu komplikasyonların yönetimlerini kavrama
- ▶ Komplikasyon riskini azaltmak için kullanılan önleyici yöntemleri öğrenme

GİRİŞ

Hemodiyalizin akut komplikasyonlarına, henüz aydınlatılamamış çok sayıda mekanizma neden olmaktadır. Patogenezleri, sıklıkla aynı anda meydana gelmeleri nedeniyle daha da karmaşık hale gelir. Örneğin olarak, birçok nedeni olan hemodiyaliz ilişkili hipotansiyona bulantı, kusma, baş ağrısı ve/veya göğüs ağrısı eşlik edebilmektedir. Benzer şekilde, kramplar hipotansiyon ile ilişkili olabilir ve genellikle tedavi edilmesi çok zordur (1).

En sık görülen ve genelde hayati risk taşımayan komplikasyonlar şunlardır (1,2):

- ▶ Hipotansiyon – %25-55
- ▶ Kramplar – %5-20

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ikincil yüksek venöz basınç ve uygun olmayan hazırlama yer alır. Çoğu yırtılma, sadece küçük bir miktar kan kaybıyla sonuçlanırken ve kendiliğinden kapanabilirken, büyük kayıp potansiyeli, acil düzeltici önlemlerin alınmasını gerektirir. Septisemi de bir risktir. Kan hatları klemlenmeli, hasta ekstrakorporeal devreden ayrılmalı ve diyaliz seti tam olarak değiştirilmelidir. Ayrıca diyalizat devresinin ve kan sızıntısı dedektörünün de temizlenmesi gereklidir (66).

Diyalizer Pıhtılaşması

Diyalizer pıhtılaşması daha yaygın bir olaydır ve genellikle yetersiz heparinizasyondan kaynaklanır. Bununla birlikte, antikoagülasyon olmadan hemodiyaliz, aralıklı veya sürekli tuzlu su ile durulama ile kolayca gerçekleştirildiğinden, bu tek neden olarak kabul edilmez. Ek faktörler arasında yüksek venöz basınç, düşük kan akışı, düşük diyalizat pH'ı, diyalize başlamadan önce uygun durulama prosedürlerine yeterince dikkat edilmemesi, damla haznelerinde veya diyalizör başlığında büyük miktarda sıvı bulunmasıdır. Ayrıca, heparin uygulamasından hemen sonra, sistemik antikoagülasyonun etki etmeye başlamasına izin vermeden hastanın ekstrakorporeal devreye hızlı bir şekilde bağlanması da katkıda bulunabilir (66).

KAYNAKLAR

1. Jean L Holley, MD, FACP. Acute complications during hemodialysis. *Up To Date*, Jan 31,2020.
2. Bregman H, Daugirdas JT, Ing TS. Complications during hemodialysis. In: Handbook of Dialysis, Dauugirdas JT, Ing TS (Eds), Little, Brown, New York 1994. p.149.
3. Saha M, Allon M Clin J Diagnosis, Treatment, and Prevention of Hemodialysis Emergencies. *Am Soc Nephrol*. 2017;12(2):357.
4. Kooman J et al. EBPG guideline on haemodynamic instability. *Nephrol Dial Transplant*. 2007 May;22 Suppl 2:ii22-44.
5. Reilly RF Clin J. Attending rounds: A patient with intradialytic hypotension. *Am Soc Nephrol*. 2014 Apr;9(4):798-803.
6. Masani, N.N., Miyawaki, N., Maesaka, J.K., 2005. A patient with an uncommon etiology of intradialytic hypotension. *Semin Dial*. 2018, 435-439.
7. Sands JJ et al. Intradialytic hypotension: frequency, sources of variation and correlation with clinical outcome. *Hemodial Int*. 2014 Apr;18(2):415-22.
8. Flythe JE et al. Factors associated with intradialytic systolic blood pressure variability. *Am J Kidney Dis*. 2012;59(3):409.
9. Roy PN, Danziger RS J. Dialysate magnesium concentration predicts the occurrence of intradialytic hypotension (abstract) . *Am Soc Nephrol*. 1996; 7:1496.

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10. Van der Sande FM, Cheriex EC, van Kuijk WH, Leunissen KM. Effect of dialysate calcium concentrations on intradialytic blood pressure course in cardiac-compromised patients. *Am J Kidney Dis.* 1998 Jul;32(1):125-31.
11. William LH ,Jennifer EF. Intradialytic hypotension in an otherwise stable patient. *Up To Date* Mar 31, 2020.
12. Montagnac R et al. Use of midodrine (Gutron) to treat permanent hypotension in a chronic hemodialysis patient. *Nephrol.* 2001;56(2):162.
13. Prakash S, Garg AX, Heidenheim AP, House AA. Midodrine appears to be safe and effective for dialysis-induced hypotension: a systematic review. *Nephrol Dial Transplant.* 2004;19(10):2553. Epub 2004 Jul 27.
14. Emili S et al. A protocol-based treatment for intradialytic hypotension in hospitalized hemodialysis patients. *Am J Kidney Dis.* 1999;33(6):1107.
15. Mancini E et al. Intra-dialytic blood oxygen saturation (SO₂): association with dialysis hypotension (the SOGLIA Study). *J Nephrol.* 2016: 811-819.
16. Campos I et al. Intradialytic Hypoxemia in Chronic Hemodialysis Patients. *Blood Purif.* 2016;41(1-3):177.
17. Letteri JM. Symptomatic hypotension during hemodialysis. *Semin Dial.* 1998; 11:253.
18. Flythe, J.E et al. Symptom Prioritization among Adults Receiving In-Center Hemodialysis: A Mixed Methods Study. *Clin J Am Soc Nephrol* 2013, 735–745.
19. Chung YH et al. Association of leptin with hemodialysis-related muscle cramps: a cross-sectional study. *Blood Purif.* 2009;27(2):159-64.
20. Noordzij, M. et al. Disturbed mineral metabolism is associated with muscle and skin complaints in a prospective cohort of dialysis patients. *Nephrol Dial Transplant* 2007. 22, 2944–2949.
21. Chang, C.-T et al. Creatine monohydrate treatment alleviates muscle cramps associated with haemodialysis. *Nephrol Dial Transplant* 17, 1978–1981.
22. Sousa Melo, E., Carrilho Aguiar, F., Sampaio Rocha-Filho, P.A. Dialysis Headache: A Narrative Review. *Headache* 2017, 161–164.
23. Dumler, F. et al., 1992. Clinical experience with short-time hemodialysis. *Am J Kidney Dis* 2019, 49–56.
24. Gozubatik-Celik, G. et al. Hemodialysis-related headache and how to prevent it. *Eur J Neurol* 2019, 100–105.
25. Skroeder, N.R. et al. Acute symptoms during and between hemodialysis: the relative role of speed, duration, and biocompatibility of dialysis. *Artif Organs.* 1994, 880–887.
26. Hombrouckx, R. et al. Fibrin sheet covering subclavian or femoral dialysis catheters. *Artif Organs.* 1994: 322–324.
27. Tharmaraj, D., Kerr, P.G. Haemolysis in haemodialysis. *Nephrology (Carlton).* 2017: 22, 838–847.
28. Ramin S. Et al MD. Hemolysis During Hemodialysis. In : Handbook of Dialysis Therapy. Ramin S, Leila H, Carl M. K., Todd S. 2008. Elsevier Inc : 457–466.
29. Duffy, R. et al. Multistate outbreak of hemolysis in hemodialysis patients traced to faulty blood tubing sets. *Kidney Int.* 2000. 57, 1668–1674.
30. Francos, G.C et al. An unsuspected cause of acute hemolysis during hemodialysis. *Trans Am Soc Artif Intern Organs.* 1983. 29, 140–145.
31. Aqeel A, Kissner PZ, Sondheimer JH. Air embolism in hemodialysis: An old problem revisited. *J Am Soc Nephrol.* 1998; 9:165A.
32. Cardoso, M. et al. Hypoxemia during hemodialysis: a critical review of the facts. *Am J Kidney Dis.* 1988. 11, 281–297.
33. Patel, T.S., Freedman, B.I., Yosipovitch, G. An update on pruritus associated with CKD. *Am J Kidney Dis.* 2007. 50, 11–20.

34. Okada, K., Matsumoto, K. Effect of skin care with an emollient containing a high water content on mild uremic pruritus. *Ther Apher Dial.* 2004. 419–422.
35. Jaber BL, Pereira BJG. Dialysis reactions. *Semin Dial.* 1997;10:158-165
36. Lata, C., et al. Catheter-related bloodstream infection in end-stage kidney disease: a Canadian narrative review. *Can J Kidney Health Dis.* 2016; 3: 24.
37. Arieff, A.I. Dialysis disequilibrium syndrome: current concepts on pathogenesis and prevention. *Kidney Int.* 1994;45: 629–635.
38. Osgood, M. et al. Rapid unexpected brain herniation in association with renal replacement therapy in acute brain injury: caution in the neurocritical care unit. *Neurocrit Care.* 2015; 2:176-83
39. Zepeda-Orozco, D., Quigley, R. Dialysis disequilibrium syndrome. *Pediatr Nephrol.* 2012; 27: 2205–2211.
40. Rajiv A. Dialysis disequilibrium syndrome. *Up To Date.* 2021.
41. Silver SM et al. Dialysis disequilibrium syndrome (DDS) in the rat: role of the “reverse urea effect”. *Kidney Int.* 1992;42(1):161.
42. Sitprija V, Holmes Jh . Preliminary observations on the change in intracranial pressure and intraocular pressure during hemodialysis. *Trans Am Soc Artif Intern Organs.* 1962;8:300.
43. Port, F.K., Johnson, W.J., Klass, D.W. Prevention of dialysis disequilibrium syndrome by use of high sodium concentration in the dialysate. *Kidney Int.* 1973; 3: 327–333.
44. Ali II, Pirzada NA. Neurologic complications associated with dialysis and chronic renal insufficiency. In: Principles and Practice of Dialysis, Henrich WL (Ed), Lippincott, Williams & Wilkins, Philadelphia 2004. p.507.
45. Daugirdas, J.T., Ing, T.S. First-use reactions during hemodialysis: a definition of subtypes. *Kidney Int Suppl.* 1988; 24, S37-43.
46. Alessandro B, Steve JS, Shveta M. Reactions to the hemodialysis membrane. *Up To Date* 2021.
47. Rosanna C et al. Bradykinin and nitric oxide generation by dialysis membranes can be blunted by alkaline rinsing solutions. *Kidney International.* 2000;2: 881-888
48. Lemke, H.D., Heidland, A., Schaefer, R.M. Hypersensitivity reactions during haemodialysis: role of complement fragments and ethylene oxide antibodies. *Nephrol Dial Transplant.* 1990; 5, 264–269.
49. Maurice, F. et al. Anaphylactic shock caused by formaldehyde in a patient undergoing long-term hemodialysis. *J Allergy Clin Immunol.* 1986; 77: 594–597.
50. Rantanen JM, et al. Arrhythmias in Patients on Maintenance Dialysis: A Cross-sectional Study. *Am J Kidney Dis* 2020; 75:214.
51. Fabbian, F. et al. Clinical characteristics associated to atrial fibrillation in chronic hemodialysis patients. *Clin Nephrol.* 2000; 54, 234–239.
52. Karnik, J.A. et al. Cardiac arrest and sudden death in dialysis units. *Kidney Int.* 2001; 60, 350–357.
53. Jassal SV, et al. Autonomic neuropathy predisposing to arrhythmias in hemodialysis patients. *Am J Kidney Dis.* 1997; 30:219.
54. Shurmur, S.W. et al. Cardiac conduction defects associated with aortic and mitral valve calcification in dialysis patients. *Ren Fail.* 1990; 12: 103–107.
55. Munger, M.A et al. Cardiopulmonary events during hemodialysis: effects of dialysis membranes and dialysate buffers. *Am J Kidney Dis.* 2000; 36: 130–139.
56. Locatelli, F. et al. Optimal composition of the dialysate, with emphasis on its influence on blood pressure. *Nephrol Dial Transplant.* 2004; 19: 785–796.
57. Brian DH. Cardiac tamponade. *Up To Date.* 2019.
58. Baldwin, J.J., Edwards, J.E. Uremic pericarditis as a cause of cardiac tamponade. *Circulation.* 1976; 53: 896–901.

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59. Su, H.-M et al. Heparin-Induced Cardiac Tamponade and Life-Threatening Hyperkalemia in a Patient with Chronic Hemodialysis. *The Kaohsiung Journal of Medical Sciences*. 2005; 21, 128–133.
60. Janssen, M.J., van der Meulen, J. The bleeding risk in chronic haemodialysis: preventive strategies in high-risk patients. *Neth J Med*. 1996; 48: 198–207.
61. Swartz RD, Port FK. Preventing hemorrhage in high-risk hemodialysis: regional versus low-dose heparin. *Kidney Int*. 1979;16(4):513-8.
62. Eugene CK . Anticoagulation for the hemodialysis procedure. *Up To Date*. 2020.
63. Glenn, C.M., Astley, S.J., Watkins, S.L. Dialysis-associated seizures in children and adolescents. *Pediatr Nephrol*. 1992; 6: 182–186.
64. Swash M, Rowan AJ. Electroencephalographic criteria of hypocalcemia and hypercalcemia. *Arch Neurol*. 1972;26:218-228.
65. Schwartz RD. Hemodialysis associated seizures. In Nissensen AR, Fine RN (EDS) Dialysis therapy. *Philadelphia Hanley Balfus*, 1993:88-90.
66. Winchester, J.F., Jacobs, C., Kjellstrand, C., Koch, K.-M. In: JACOBS C., Kjellstrand C.M., Koch K.M., Winchester J. F. Replacement of Renal Function by Dialysis, 4th ed. London: Kluwer Academic Publishers, 1996: 688-726.