

# BÖLÜM 13

## Mikroanjiyopatik Hemolitik Anemi

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### Giriş

Trombositopeni, hemolitik anemi ile seyreden ve diğer sistemik bozukluklara yol açabilen erken teşhis ve tedavisi hayati öneme sahip hastalık grubunun genel adıdır mikroanjiyopatik hemolitik anemi (MAHA). MAHA ve trombotik mikroanjiyopati (TMA) sıklıkla birbirlerinin yerine kullanılsalar da tam olarak birbirlerini karşılayan ifadeler değildir.

### Tanım

Mikroanjiyopatik hemolitik anemi (MAHA): intravasküler alanda kırmızı küre yıkımına sebep olan ve şistosit oluşumu ile karakterize non-immün bir hemoliz olayıdır (şekil-1) (1). Küçük arterioller ve kılcal damarlar gibi mikrovasküler dolaşım patolojileri neden olabilmekle beraber protez kalp kapakları, intravasküler cihazlar gibi nedenlerde MAHA'ya neden olabilmektedir.

Trombotik mikroanjiyopati (TMA): sıklıkla MAHA ile aynı klinik durumu tanımlamak için kullanılsalar da tüm TMA'lar MAHA'ya neden olsa da tersi durum doğru değildir. TMA tanım olarak arteriyoller ve/veya kapiller damar duvarındaki anormalliklerin mikrovasküler tromboza yol açtığı özel bir patolojik lezyonu tanımlamaktadır (2).

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## Renal Transplantasyon

Eculizumab tedavisine rağmen son dönem böbrek yetmeliği gelişen hastalarda renal transplantasyon düşünülebilir. Ancak canlı donör tercih edilmez çünkü alınan böbrekte C-TMA açısından risk altındadır.

CFH, CFI veya C3 gen mutasyonu olan hastalarda nakil sonuçları başarısızdır. %50 hastada rekürrens gelişirken bunların %90'ında graft kaybı gelişir. MCP muasyonunda veriler kısıtlı olmasına karşın başarı şansı daha yüksektir. CFH'a karşı otoantikör olan aHÜS vakalarında otoantikör eradikasyonu sonrasında nakil yapılmalıdır. DGKE mutasyonlu çocuklarda nakil sonrasında rekürrens gözlenmez. CFH, CFI veya C3 gen mutasyonu olan hastalarda karaciğer-böbrek kombine transplantasyonu ile kür sağlanabilir ancak veriler oldukça sınırlıdır.

## Kaynaklar

1. Brain, M., J. Dacie, and D.O.B. Hourihane, *Microangiopathic haemolytic anaemia: the possible role of vascular lesions in pathogenesis*. British journal of haematology, 1962. **8**(4): p. 358-374.
2. George, J.N. and C.M. Nester, *Syndromes of thrombotic microangiopathy*. New England Journal of Medicine, 2014. **371**(7): p. 654-666.
3. Moschcowitz, E. *Hyaline thrombosis of the terminal arterioles and capillaries: a hitherto undescribed disease*. in *Proc NY Pathol Soc*. 1924.
4. Singer, K., F.P. Bornstein, and S.A. Wile, *Thrombotic thrombocytopenic purpura: hemorrhagic diathesis with generalized platelet thromboses*. Blood, 1947. **2**(6): p. 542-554.
5. Gasser, C.v., *Hamolytisch-uramische Syndrome: Bilaterale Nierenrindennekrosen bei akuten erworbenen hamolytischen Anamien*. Schweiz Med Wochenschr, 1955. **85**: p. 905-909.
6. Moake, J.L., et al., *Unusually large plasma factor VIII: von Willebrand factor multimers in chronic relapsing thrombotic thrombocytopenic purpura*. New England Journal of Medicine, 1982. **307**(23): p. 1432-1435.
7. Furlan, M., R. Robles, and B. Lamie, *Partial purification and characterization of a protease from human plasma cleaving von Willebrand factor to fragments produced by in vivo proteolysis*. 1996.
8. Reese, J.A., et al., *Children and adults with thrombotic thrombocytopenic purpura associated with severe, acquired Adamts13 deficiency: comparison of incidence, demographic and clinical features*. Pediatric blood & cancer, 2013. **60**(10): p. 1676-1682.
9. Scully, M., et al., *Regional UK TTP registry: correlation with laboratory ADAMTS 13 analysis and clinical features*. British journal of haematology, 2008. **142**(5): p. 819-826.
10. Griffin, D., et al., *First symptoms in patients with thrombotic thrombocytopenic purpura (TTP): what are they and when do they occur?* Transfusion, 2013. **53**(1): p. 235.
11. Nokes, T., et al., *Pulmonary involvement in patients with thrombotic thrombocytopenic purpura*. European journal of haematology, 2014. **92**(2): p. 156-163.
12. Page, E.E., et al., *Thrombotic thrombocytopenic purpura: diagnostic criteria, clinical features, and long-term outcomes from 1995 through 2015*. Blood advances, 2017. **1**(10): p. 590-600.
13. Benhamou, Y., et al., *Cardiac troponin-I on diagnosis predicts early death and refractoriness in acquired thrombotic thrombocytopenic purpura. Experience of the French Thrombotic Mic*

- roangiopathies Reference Center. Journal of Thrombosis and Haemostasis, 2015. 13(2): p. 293-302.*
14. Jamme, M. and E. Rondeau, *The PLASMIC score for thrombotic thrombocytopenic purpura. The Lancet Haematology, 2017. 4(4): p. e148-e149.*
  15. Bendapudi, P.K., et al., *Derivation and external validation of the PLASMIC score for rapid assessment of adults with thrombotic microangiopathies: a cohort study. The Lancet Haematology, 2017. 4(4): p. e157-e164.*
  16. Paydary, K., et al., *Diagnostic accuracy of the PLASMIC score in patients with suspected thrombotic thrombocytopenic purpura: A systematic review and meta-analysis. Transfusion, 2020. 60(9): p. 2047-2057.*
  17. Bell, W.R., et al., *Improved survival in thrombotic thrombocytopenic purpura-hemolytic uremic syndrome: clinical experience in 108 patients. New England Journal of Medicine, 1991. 325(6): p. 398-403.*
  18. Moake, J.L., *Thrombotic microangiopathies. New England Journal of Medicine, 2002. 347(8): p. 589-600.*
  19. Hovinga, J.A.K., et al., *Survival and relapse in patients with thrombotic thrombocytopenic purpura. Blood, 2010. 115(8): p. 1500-1511.*
  20. Zeigler, Z., et al., *Cryoprecipitate poor plasma does not improve early response in primary adult thrombotic thrombocytopenic purpura (TTP). Journal of Clinical Apheresis: The Official Journal of the American Society for Apheresis, 2001. 16(1): p. 19-22.*
  21. Toussaint-Hacquard, M., et al., *Type of plasma preparation used for plasma exchange and clinical outcome of adult patients with acquired idiopathic thrombotic thrombocytopenic purpura: a French retrospective multicenter cohort study. Transfusion, 2015. 55(10): p. 2445-2451.*
  22. Scully, M., et al., *The use of intermediate purity factor VIII concentrate BPL 8Y as prophylaxis and treatment in congenital thrombotic thrombocytopenic purpura. British journal of haematology, 2006. 135(1): p. 101-104.*
  23. Peyvandi, F., et al., *ADAMTS13 content in plasma-derived factor VIII/von Willebrand factor concentrates. American journal of hematology, 2013. 88(10): p. 895-898.*
  24. Som, S., et al., *Decreasing frequency of plasma exchange complications in patients treated for thrombotic thrombocytopenic purpura-hemolytic uremic syndrome, 1996 to 2011 (CME). Transfusion, 2012. 52(12): p. 2525-2532.*
  25. George, J.N., *How I treat patients with thrombotic thrombocytopenic purpura: 2010. Blood, 2010. 116(20): p. 4060-4069.*
  26. Blombery, P. and M. Scully, *Management of thrombotic thrombocytopenic purpura: current perspectives. Journal of blood medicine, 2014. 5: p. 15.*
  27. Allford, S.L., et al., *Guidelines on the diagnosis and management of the thrombotic microangiopathic haemolytic anaemias. British journal of haematology, 2003. 120(4): p. 556-573.*
  28. Sayani, F.A. and C.S. Abrams, *How I treat refractory thrombotic thrombocytopenic purpura. Blood, 2015. 125(25): p. 3860-3867.*
  29. Scully, M., et al., *A phase 2 study of the safety and efficacy of rituximab with plasma exchange in acute acquired thrombotic thrombocytopenic purpura. Blood, The Journal of the American Society of Hematology, 2011. 118(7): p. 1746-1753.*
  30. Scully, M., et al., *Remission in acute refractory and relapsing thrombotic thrombocytopenic purpura following rituximab is associated with a reduction in IgG antibodies to ADAMTS-13. British journal of haematology, 2007. 136(3): p. 451-461.*
  31. Scully, M., et al., *Caplacizumab treatment for acquired thrombotic thrombocytopenic purpura. New England Journal of Medicine, 2019. 380(4): p. 335-346.*
  32. Peyvandi, F., et al., *Caplacizumab for acquired thrombotic thrombocytopenic purpura. New England Journal of Medicine, 2016. 374(6): p. 511-522.*
  33. Rock, G.A., et al., *Comparison of plasma exchange with plasma infusion in the treatment of*

- thrombotic thrombocytopenic purpura*. New England Journal of Medicine, 1991. **325**(6): p. 393-397.
34. Kremer Hovinga, J.A. and J.N. George, *Hereditary thrombotic thrombocytopenic purpura*. New England Journal of Medicine, 2019. **381**(17): p. 1653-1662.
  35. Barbot, J., et al., *Ten years of prophylactic treatment with fresh-frozen plasma in a child with chronic relapsing thrombotic thrombocytopenic purpura as a result of a congenital deficiency of von Willebrand factor-cleaving protease*. British journal of haematology, 2001. **113**(3): p. 649-651.
  36. Zheng, X.L., et al., *ISTH guidelines for treatment of thrombotic thrombocytopenic purpura*. Journal of Thrombosis and Haemostasis, 2020. **18**(10): p. 2496-2502.
  37. George, J.N., *Congenital TTP: toward a turning point*. Blood, The Journal of the American Society of Hematology, 2019. **133**(15): p. 1615-1617.
  38. Tarr, P.I., C.A. Gordon, and W.L. Chandler, *Shiga-toxin-producing Escherichia coli and haemolytic uraemic syndrome*. The lancet, 2005. **365**(9464): p. 1073-1086.
  39. Legendre, C.M., et al., *Terminal complement inhibitor eculizumab in atypical hemolytic-uremic syndrome*. New England Journal of Medicine, 2013. **368**(23): p. 2169-2181.
  40. Adams, C., et al., *Shigella sonnei and hemolytic uremic syndrome: A case report and literature review*. IDCases, 2017. **8**: p. 6-8.
  41. Kaper, J.B. and A.D. O'Brien, *Overview and historical perspectives*. Enterohemorrhagic Escherichia coli and Other Shiga Toxin-Producing E. coli, 2015: p. 1-13.
  42. Ville, S., et al., *Shiga toxin-producing Escherichia coli-associated hemolytic uremic syndrome in solid organ transplant recipients*. Kidney international, 2019. **96**(6): p. 1423-1424.
  43. Gould, L.H. and S.C.L.D.W. Group, *Update: recommendations for diagnosis of Shiga toxin-producing Escherichia coli infections by clinical laboratories*. Clinical Microbiology Newsletter, 2012. **34**(10): p. 75-83.
  44. Servais, A., et al., *Primary glomerulonephritis with isolated C3 deposits: a new entity which shares common genetic risk factors with haemolytic uraemic syndrome*. Journal of medical genetics, 2007. **44**(3): p. 193-199.
  45. Nürnberger, J., et al., *Eculizumab for atypical hemolytic-uremic syndrome*. New England Journal of Medicine, 2009. **360**(5): p. 542-544.
  46. Rathbone, J., et al., *A systematic review of eculizumab for atypical haemolytic uraemic syndrome (aHUS)*. BMJ open, 2013. **3**(11).
  47. Prescott, H.C., et al., *Eculizumab therapy in an adult with plasma exchange-refractory atypical hemolytic uremic syndrome*. American journal of hematology, 2010. **85**(12): p. 976-977.
  48. McNamara, L.A., et al., *High risk for invasive meningococcal disease among patients receiving eculizumab (Soliris) despite receipt of meningococcal vaccine*. MMWR. Morbidity and mortality weekly report, 2017. **66**(27): p. 734.