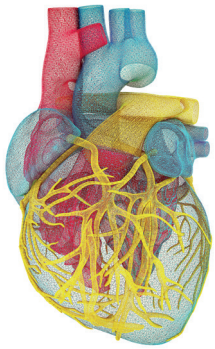

BÖLÜM **58**

Diyabetik Hastada Kardiyovasküler ve Dahili Preoperatif Değerlendirme

Sıla ÇETİK [1]

GİRİŞ

Günümüzde yaşam ömrünün uzaması ve obezitenin giderek yaygınlaşması nedeniyle cerrahi işlem yapılan hastalarda diyabeti olanların oranı giderek artmaktadır. Diyabetik hastaların genel tıbbi nedenlere ek olarak diyabete bağlı komplikasyonlar nedeniyle de çeşitli operasyonlar geçirmesi gerekebilmektedir. Örneğin, periferik arter hastalığında revaskülarizasyon, diyabetik ayakta debridman veya amputasyon, diyabetik göz tutulumunda vitrektomi, katarakt operasyonu, diyabetik nefropatide fistül açılması gibi cerrahi işlemler diyabetik hastalara sıklıkla uygulanmaktadır.

Peri-operatif dönemde miyokardiyal infarktüs (MI) gibi ciddi kardiyovasküler olaylar meydana gelebilmektedir. Bunun altında yatan mekanizma henüz tam olarak anlaşılamamakla birlikte cerrahi sırasında meydana gelen vücut sıvı dengesinde bozulma, katekolamin dalgalanmaları, hipotansiyon, anemi ve hipoksiye bağlı gelişen miyokardiyal arz-talep uyumsuzluğunun sorumlu olduğu düşünülmektedir. Alternatif olarak, ameliyat sırasında meydana gelen plak rüptürü de akut koroner sendroma neden olabilmektedir (1).

Diyabetik hastalarda perioperatif kardiyovasküler komplikasyon riski normal popülasyona göre daha yüksektir (2, 3). Ayrıca diyabetik hastalarda nöropatiye bağlı olarak sessiz iskemi daha sık görülmekte ve kardiyovasküler hastalık varlığı atlanabilmektedir (4).

Her cerrahi işlem ve anestezi uygulaması vücutta belirli bir stres cevabı oluşturur. Vücut bu stres cevabını epinefrin, glukagon, kortizol ve büyüme hormonu gibi hormonlar ve interlökin-6 ve tümör nekroz faktörü-alfa (TNF-α) gibi inflamatuar sitokinlerin salınımı ile ortaya çıkarmaktadır (5). İnflamatuar sitokinler, önceden var olan koroner plakların parçalanmasına, trombüs oluşumuna, damar oklüzyonuna ve miyokardiyal infarktüse yol açabilir (6). Bu nörohormonal değişiklikler, ek olarak insülin direnci, azalmış periferik glukoz kullanımı, bozulmuş insülin sekresyonu, artmış lipoliz ve protein katabolizması gibi bazı durumlarda hiperglisemiye ve hatta ketozise neden olabilmektedir (7, 8).

Cerrahinin büyüklüğüne ve anestezinin tipine göre bu stres cevabının büyüklüğü de değişmektedir. Genel anestezi, epidural anestezi ile karşılaş-

[1] Uzm. Dr., Sandıklı Devlet Hastanesi, İç Hastalıkları Kliniği, silakukner@gmail.com

5 ila 10 gram glukoz verilecek şekilde ayarlanır ve kısa etkili insülin kullanılarak ayrı bir solüsyon hazırlanır. İnsülin doğrudan damara uygulanmaz ve dekstrozun gittiği setten verilir. Birçok tip 1 diyabet hastası 1 ila 2 ünite/saat hızında bir infüzyona ihtiyaç duyarken, insülin direnci olan tip 2 diyabet hastaları daha yüksek insülin dozlarına ihtiyaç duyabilir. Örnek insülin ve glukoz infüzyon protokolü Tablo-1'de verilmiştir. İnsülin infüzyon hızı, prosedüre ve insülin direncinin derecesine bağlı olarak titre edilmelidir. Koroner arter by-pass prosedürlerinde, özellikle hipotermik dönemden çıktıktan sonra insülin ihtiyacı 10 kata kadar artabilmektedir.

Tablo.1. Perioperatif ayrı yoldan insülin ve glukoz infüzyon protokolü

Glukoz (mg/dl).	**İnsülin hızı (Saat).**		
	Azaltılmış Oran İnsüline duyarlı diyabetli kişilerde (kırılganlıkla yaşayan yaşlı, böbrek hastaları veya genellikle günde 24 üniteden daha az insülin ihtiyacı olanlar).	**Standard Oran** Çoğu durumda ilk tercih	**Arttırılmış Oran** İnsüline dirençli diyabetli kişiler için (Günde > 100 IU kullanan veya VKI > 35 kg/m^2 olan hastalar için).
< 109	0*	0*	0*
110-144	0.5	1	2
145-199	1	2	4
200-270	2	4	6
271-360	3	5	7
361-504	4	6	8
>505	6	8	10

*Hastanın özellikleri, uygulanan insülin dozu, bazal insülin alıp almadığına göre karar verilir. İnsülin infüzyonu azaltılabilir (0,2-0,5 IU vb) veya kesilebilir. Hipoglisemi riskinin ciddiyetine göre IV dekstroz infüzyonu uygulanmalıdır.

Kaynak (değiştirilerek alınmıştır): Centre for Perioperative Care. Guideline for perioperative care for people with diabetes mellitus undergoing elective and emergency surgery. CPOC, 2021. https://cpoc.org.uk/sites/cpoc/files/documents/2021-03/CPOC-DiabetesGuideline2021_0.pd

KAYNAKLAR

1. Dowsley TF, Sheth T, Chow BJW. Complementary pre-operative risk assessment using coronary computed tomography angiography and nuclear myocardial perfusion imaging in non-cardiac surgery: A VISION-CTA sub-study. *Journal of Nuclear Cardiology*. 2020;27(4):1331-7 DOI: 10.1007/s12350-019-01779-9.
2. Lee TH, Marcantonio ER, Mangione CM, et al. Derivation and prospective validation of a simple index for prediction of cardiac risk of major noncardiac surgery. *Circulation*. 1999;100(10):1043-9 DOI: 10.1161/01.cir.100.10.1043.
3. Malone DL, Genuit T, Tracy JK, et al. Surgical site infections: reanalysis of risk factors. *Journal of Surgical Research*. 2002;103(1):89-95 DOI: 10.1006/jsre.2001.6343.
4. Barthelemy O, Le Feuvre C, Timsit J. Silent myocardial ischemia screening in patients with diabetes mellitus. *Arquivos Brasileiros de Endocrinologia & Metabologia*. 2007;51(2):285-93 DOI: 10.1590/s0004-27302007000200018.
5. Desborough JP. The stress response to trauma and surgery. *British Journal of Anaesthesia*. 2000;85(1):109-17 DOI: 10.1093/bja/85.1.109.
6. Mangano DT. Perioperative cardiac morbidity. *Anesthesiology*. 1990;72(1):153-84 DOI: 10.1097/00000542-199001000-00025.
7. Moitra VK, Meiler SE. The diabetic surgical patient. *Current Opinion in Anesthesiology*. 2006;19(3):339-45 DOI: 10.1097/01.aco.0000192820.76353.3e.
8. Schricker T, Gougeon R, Eberhart L, et al. Type 2 diabetes mellitus and the catabolic response to surgery. *Anesthesiology*. 2005;102(2):320-6 DOI: 10.1097/00000542-200502000-00013.
9. Drayton DJ, Birch RJ, D'Souza-Ferrer C, et al. Diabetes mellitus and perioperative outcomes: a scoping

review of the literature. *British Journal of Anaesthesia*. 2022;128(5):817-28 DOI: 10.1016/j.bja.2022.02.013.
10. Shuman CR. Management of diabetes mellitus in surgical patients. *Dia Med*. 1954;26(66):1898-906.
11. Miller JD, Richman DC. Preoperative Evaluation of Patients with Diabetes Mellitus. *Anesthesiology Clinics*. 2016;34(1):155-69 DOI: 10.1016/j.anclin.2015.10.008.
12. Sreedharan R, Abdelmalak B. Diabetes Mellitus: Preoperative Concerns and Evaluation. *Anesthesiology Clinics*. 2018;36(4):581-97 DOI: 10.1016/j.anclin.2018.07.007.
13. Halkos ME, Puskas JD, Lattouf OM, et al. Elevated preoperative hemoglobin A1c level is predictive of adverse events after coronary artery bypass surgery. *The Journal of Thoracic and Cardiovascular Surgery*. 2008;136(3):631-40 DOI: 10.1016/j.jtcvs.2008.02.091.
14. Dronge AS, Perkal MF, Kancir S, et al. Long-term glycemic control and postoperative infectious complications. *The Archives of Surgery*. 2006;141(4):375-80; discussion 80 DOI: 10.1001/archsurg.141.4.375.
15. Smilowitz NR, Berger JS. Perioperative Cardiovascular Risk Assessment and Management for Noncardiac Surgery: A Review. *Journal of the American Medical Association*. 2020;324(3):279-90 DOI: 10.1001/jama.2020.7840.
16. Weber M, Luchner A, Seeberger M, et al. Incremental value of high-sensitive troponin T in addition to the revised cardiac index for peri-operative risk stratification in non-cardiac surgery. *European Heart Journal*. 2013;34(11):853-62 DOI: 10.1093/eurheartj/ehs445.
17. Halvorsen S, Mehilli J, Cassese S, et al. 2022 ESC Guidelines on cardiovascular assessment and management of patients undergoing non-cardiac surgery. *European Heart Journal*. 2022;43(39):3826-924 DOI: 10.1093/eurheartj/ehac270.
18. Mureddu GF. Current multivariate risk scores in patients undergoing non-cardiac surgery. *Monaldi Archives for Chest Disease*. 2017;87(2):848 DOI: 10.4081/monaldi.2017.848.
19. Saraste A, Knuuti J. ESC 2019 guidelines for the diagnosis and management of chronic coronary syndromes : Recommendations for cardiovascular imaging. *Herz*. 2020;45(5):409-20 DOI: 10.1007/s00059-020-04935-x.
20. Cullen MW, McCully RB, Widmer RJ, et al. Preoperative Dobutamine Stress Echocardiography and Clinical Factors for Assessment of Cardiac Risk after Noncardiac Surgery. *Journal of the American Society of Echocardiography*. 2020;33(4):423-32 DOI: 10.1016/j.echo.2019.11.015.
21. Beattie WS, Abdelnaem E, Wijeysundera DN, et al. A meta-analytic comparison of preoperative stress echocardiography and nuclear scintigraphy imaging. *Anesthesia & Analgesia*. 2006;102(1):8-16 DOI: 10.1213/01.ane.0000189614.98906.43.
22. Metz LD, Beattie M, Hom R, et al. The prognostic value of normal exercise myocardial perfusion imaging and exercise echocardiography: a meta-analysis. *Journal of the American College of Cardiology*. 2007;49(2):227-37 DOI: 10.1016/j.jacc.2006.08.048.
23. Ramjattan NA, Lala V, Kousa O, et al. Coronary CT Angiography. *StatPearls*. Treasure Island (FL)2022.
24. Sheth T, Chan M, Butler C, et al. Prognostic capabilities of coronary computed tomographic angiography before non-cardiac surgery: prospective cohort study. *British Medical Journal*. 2015;350:h1907 DOI: 10.1136/bmj.h1907.
25. Hwang JW, Kim EK, Yang JH, et al. Assessment of perioperative cardiac risk of patients undergoing noncardiac surgery using coronary computed tomographic angiography. *Circulation: Cardiovascular Imaging*. 2015;8(3) DOI: 10.1161/CIRCIMAGING.114.002582.
26. Bittencourt MS, Hulten E, Ghoshhajra B, et al. Prognostic value of nonobstructive and obstructive coronary artery disease detected by coronary computed tomography angiography to identify cardiovascular events. *Circulation: Cardiovascular Imaging*. 2014;7(2):282-91 DOI: 10.1161/CIRCIMAGING.113.001047.
27. Frisch A, Chandra P, Smiley D, et al. Prevalence and clinical outcome of hyperglycemia in the perioperative period in noncardiac surgery. *Diabetes Care*. 2010;33(8):1783-8 DOI: 10.2337/dc10-0304.
28. Underwood P, Askari R, Hurwitz S, et al. Preoperative A1C and clinical outcomes in patients with diabetes undergoing major noncardiac surgical procedures. *Diabetes Care*. 2014;37(3):611-6 DOI: 10.2337/dc13-1929.
29. Galway U, Chahar P, Schmidt MT, et al. Perioperative challenges in management of diabetic patients undergoing non-cardiac surgery. *World Journal of Diabetes*. 2021;12(8):1255-66 DOI: 10.4239/wjd.v12.i8.1255.
30. Aldam P, Levy N, Hall GM. Perioperative management of diabetic patients: new controversies. *British Journal of Anaesthesia*. 2014;113(6):906-9 DOI: 10.1093/bja/aeu259.
31. Tennyson C, Lee R, Attia R. Is there a role for HbA1c in predicting mortality and morbidity outcomes after coronary artery bypass graft surgery? *Interdisciplinary CardioVascular and Thoracic Surgery*. 2013;17(6):1000-8 DOI: 10.1093/icvts/ivt351.
32. Knapik P, Ciesla D, Filipiak K, et al. Prevalence and clinical significance of elevated preoperative glycosylated hemoglobin in diabetic patients scheduled for coronary artery surgery. *European Journal of Cardio-Thoracic Surgery*. 2011;39(4):484-9 DOI: 10.1016/j.ejcts.2010.07.037.
33. Halkos ME, Lattouf OM, Puskas JD, et al. Elevated preoperative hemoglobin A1c level is associated with reduced long-term survival after coronary artery bypass surgery. *The Annals of Thoracic Surgery*. 2008;86(5):1431-7 DOI: 10.1016/j.athoracsur.2008.06.078.
34. Sethuraman RM, Parida S, Sethuramachandran A, et al. A1C as a Prognosticator of Perioperative Complications of Diabetes: A Narrative Review. *Turkish Journal of Anaesthesiology & Reanimation*. 2022;50(2):79-85 DOI: 10.5152/TJAR.2021.854.

35. Teo LM, Lim WY, Ke Y, et al. A prospective observational prevalence study of elevated HbA1c among elective surgical patients. *Scientific Reports*. 2020;10(1):19067 DOI: 10.1038/s41598-020-76105-2.
36. American Diabetes Association Professional Practice C, American Diabetes Association Professional Practice C, Draznin B, et al. 16. Diabetes Care in the Hospital: Standards of Medical Care in Diabetes-2022. *Diabetes Care*. 2022;45(Suppl 1):S244-S53 DOI: 10.2337/dc22-S016.
37. Umpierrez G, Cardona S, Pasquel F, et al. Randomized Controlled Trial of Intensive Versus Conservative Glucose Control in Patients Undergoing Coronary Artery Bypass Graft Surgery: GLUCO-CABG Trial. *Diabetes Care*. 2015;38(9):1665-72 DOI: 10.2337/dc15-0303.
38. Sathya B, Davis R, Taveira T, et al. Intensity of peri-operative glycemic control and postoperative outcomes in patients with diabetes: a meta-analysis. *Diabetes Research and Clinical Practice*. 2013;102(1):8-15 DOI: 10.1016/j.diabres.2013.05.003.
39. Hamblin PS, Wong R, Ekinci EI, et al. SGLT2 Inhibitors Increase the Risk of Diabetic Ketoacidosis Developing in the Community and During Hospital Admission. *Journal of Clinical Endocrinology and Metabolism*. 2019;104(8):3077-87 DOI: 10.1210/jc.2019-00139.
40. Dogra P, Jialal I. Diabetic Perioperative Management. *StatPearls*. Treasure Island (FL)2022.
41. Duggan EW, Carlson K, Umpierrez GE. Perioperative Hyperglycemia Management: An Update. *Anesthesiology*. 2017;126(3):547-60 DOI: 10.1097/ALN.0000000000001515.
42. Simha V, Shah P. Perioperative Glucose Control in Patients With Diabetes Undergoing Elective Surgery. J*ournal of American Medical Association*. 2019;321(4):399-400 DOI: 10.1001/jama.2018.20922.
43. Himes CP, Ganesh R, Wight EC, et al. Perioperative Evaluation and Management of Endocrine Disorders. *Mayo Clinic Proceedings*. 2020;95(12):2760-74 DOI: 10.1016/j.mayocp.2020.05.004.
44. Joshi GP, Chung F, Vann MA, et al. Society for Ambulatory Anesthesia consensus statement on perioperative blood glucose management in diabetic patients undergoing ambulatory surgery. *Anesthesia & Analgesia*. 2010;111(6):1378-87 DOI: 10.1213/ANE.0b013e3181f9c288.
45. Inoue S, Egi M, Kotani J, et al. Accuracy of blood-glucose measurements using glucose meters and arterial blood gas analyzers in critically ill adult patients: systematic review. *Critical Care*. 2013;17(2):R48 DOI: 10.1186/cc12567.
46. Bhoraskar A. Inpatient management of diabetes mellitus. *Journal of the Association of Physicians of India*. 2011;59 Suppl:29-31.
47. Hoogwerf BJ. Perioperative management of diabetes mellitus: how should we act on the limited evidence? *Cleveland Clinic Journal of Medicine*. 2006;73 Suppl 1:S95-9 DOI: 10.3949/ccjm.73.suppl_1.s95.
48. Marks JB. Perioperative management of diabetes. *American Family Physician*. 2003;67(1):93-100.
49. Yen PM, Young AS. Review of Modern Insulin Pumps and the Perioperative Management of the Type 1 Diabetic Patient for Ambulatory Dental Surgery. *Anesthesia Progress*. 2021;68(3):180-7 DOI: 10.2344/anpr-68-03-16.