

17

Diğer Ekokardiyografi Yöntemleri

Doç. Dr. Halil Tolga Koçum
Başkent Üniversitesi Kardiyoloji AD.
Adana Uygulama ve Araştırma Merkezi

Acil Serviste TEE

Ekokardiyografi, 20 yıldan fazla süredir Acil Servis uygulamalarının bir parçası olmuştur ve hem kardiyak hem de non-kardiyak problemleri olan hastaların değerlendirilmelerinde değerli bir tanı aracıdır. Ekokardiyografi, acil servise akut hastalığı nedeniyle başvuran hastalarda gerçek zamanlı yatakbaşı kardiyak görüntüleme sağlayan tek tanısal modalitedir.

Transtorasik ekokardiyografinin acil serviste perikardiyal sıvı tanısı ve boşaltımı, ejeksiyon fraksiyonu tespiti gibi rutin klinik uygulamaları yaygındır^{1,2}. Ancak, KPR esnasında kardiyak masaj yapılırken, morbid obez hastalarda, ya da çıkan aortanın kesin görüntülenmesinin istenmesi gibi bazı durumlarda TTE pratik olarak uygun ya da mümkün olmayabilir. Böyle vakalarda TEE uygun bir alternatif, hatta bazen de tercih edilen birinci basamak ekokardiyografik yaklaşım olabilir.

TEE uygulamasını yapan hekimlerin yeterli eğitimi almış olması önemlidir. Amerikan Ekokardiyografi Cemiyeti'nin acil serviste ekokardiyografi kullanımının temel politika ilkelerini ve uygulayıcıların yeterlilik düzeyini tanımlayan bir standartı mevcuttur³. Ekokardiyografinin klinik uygulaması hakkında ACC/AHA/ASE kılavuzunda akut klinik tablo ile başvuran hastalarda ekokardiyografinin kullanımı

hakkında öneriler sıralanmıştır. (Tablo 1) Kılavuzda, aort hasarı şüphesinde, hemodinamik instabilitede, ciddi göğüs travmasında, ve daha önceden bilinen kapak hastalığı ya da miyokart hastalığı olanlarda ekokardiyografinin uygun bir tanısal araç olabileceği önerilmiştir. Tablo 2'de acil serviste ekokardiyografinin yararlı bir tanısal araç olabileceği spesifik klinik durumlar listelenmiştir. Aynı kılavuzda, TEE yaklaşımının standart transtorasik ekokardiyografiye göre kesin tanıya ulaşmada daha uygun olabileceği durumlar da tanımlanmıştır. Bu durumlar arasında, suboptimal transtorasik ekokardiyografik penceresi olan hemodinamik instabil hastalar, ventilatördeki hastalar, majör travma hastaları, postoperatif hastalar, aort diseksiyonu şüphesi, kardiyak emboli kaynağı araştırılması ya da infektif endokardit şüphesi sayılabilir⁴.

TEE görece non-invazif bir tanısal modalitedir ve eko probu esofagusa yerleştirildikten sonra kardiyopulmoner resüsitasyon esnasında bile gerçek zamanlı görüntü alınmasını sağlayabilir. Deneyimli ellerde düşük komplikasyon oranlarına sahip güvenli bir araç olduğu ispatlanmıştır⁵; kullanıldığında klinik kararı etkileme oranı %80'e kadar çıkabilir⁶. Ancak acil serviste TEE uygulaması esnasında ortaya çıkabilecek komplikasyon oranlarının %12.6'ya kadar yükselebildiği rapor edilmiştir⁷ ve bu oran rutin TEE uygulamalarında beklenen oranlardan daha yüksektir⁸.

Kaynaklar

1. Moore CL, Rose GA, Tayal VS, Sullivan DM, Arrowood JA, Kline JA. Determination of left ventricular function by emergency physician echocardiography of hypotensive patients. *Acad Emerg Med*. 2002;9:186-193.
2. Jones AE, Craddock PA, Tayal VS, Kline JA. Diagnostic accuracy of left ventricular function for identifying sepsis among emergency department patients with nontraumatic symptomatic undifferentiated hypotension. *Shock*. 2005;24:513-517.
3. Stewart WJ, Douglas PS, Sagar K, et al. Echocardiography in emergency medicine: a policy statement by the American Society of Echocardiography and the American College of Cardiology. The Task Force on Echocardiography in Emergency Medicine of the American Society of Echocardiography and the Echocardiography TPEC Committees of the American College of Cardiology. *J Am Soc Echocardiogr*. 1999;12:82-84.
4. Cheitlin MD, Armstrong WF, Aurigemma GP, et al. ACC/AHA/ASE 2003 guideline update for the clinical application of echocardiography: summary article: a report of the American College of Cardiology/American Heart Association Task Force on Practice Guidelines (ACC/AHA/ASE Committee to Update the 1997 Guidelines for the Clinical Application of Echocardiography). *Circulation*. 2003;108:1146-1162.
5. Kallmeyer IJ, Collard CD, Fox JA, Body SC, Shernan SK. The safety of intraoperative transesophageal echocardiography: a case series of 7200 cardiac surgical patients. *Anesth Analg*. 2001;92:1126-1130.
6. Khoury AF, Afridi I, Quinones MA, Zoghbi WA. Transesophageal echocardiography in critically ill patients: feasibility, safety, and impact on management. *Am Heart J*. 1994;127: 1363-1371.
7. Gendreau MA, Triner WR, Bartfield J. Complications of transesophageal echocardiography in the ED. *Am J Emerg Med*. 1999;17:248-251.
8. Daniel WG, Erbel R, Kasper W, et al. Safety of transesophageal echocardiography. A multicenter survey of 10,419 examinations. *Circulation*. 1991;83:817-821.
9. Varriale P, Maldonado JM. Echocardiographic observations during in hospital cardiopulmonary resuscitation. *Crit Care Med*. 1997;25:1717-1720.
10. Beaulieu Y. Bedside echocardiography in the assessment of the critically ill. *Crit Care Med*. 2007;35:235-249.
11. Cook CH, Praba AC, Beery PR, Martin LC. Transthoracic echocardiography is not cost-effective in critically ill surgical patients. *J Trauma*. 2002;52:280-284.
12. Hwang JJ, Shyu KG, Chen JJ, Tseng YZ, Kuan P, Lien WP. Usefulness of transesophageal echocardiography in the treatment of critically ill patients. *Chest*. 1993;104:861-866.
13. Parker MM, Cunnion RE, Parrillo JE. Echocardiography and nuclear cardiac imaging in the critical care unit. *JAMA*. 1985;254:2935-2939.
14. Breitzkreutz R, Walcher F, Seeger FH. Focused echocardiographic evaluation in resuscitation management: concept of an advanced life support-conformed algorithm. *Crit Care Med*. 2007;35:150-161.
15. van der Wouw PA, Koster RW, Delemarre BJ, de Vos R, Lampe-Schoenmaeckers AJ, Lie KI. Diagnostic accuracy of transesophageal echocardiography during cardiopulmonary resuscitation. *J Am Coll Cardiol*. 1997;30:780-783.
16. Nichol G, Thomas E, Callaway CW, et al. Regional variation in out-of-hospital cardiac arrest incidence and outcome. *JAMA*. 2008;300:1423-1431.
17. Brindley PG, Markland DM, Mayers I, Kutsogiannis DJ. Predictors of survival following in-hospital adult cardiopulmonary resuscitation. *CMAJ*. 2002;167:343-348.
18. Taffet GE, Teasdale TA, Luchi RJ. In-hospital cardiopulmonary resuscitation. *JAMA*. 1988;260:2069-2072.
19. Hernandez C, Shuler K, Hannan H, Sonyika C, Likourezos A, Marshall J. C.A.U.S.E.: Cardiac arrest ultra-sound exam—a better approach to managing patients in primary non-arrhythmogenic cardiac arrest. *Resuscitation*. 2008;76:198-206.
20. Memtsoudis SG, Rosenberger P, Löffler M, et al. The usefulness of transesophageal echocardiography during intraoperative cardiac arrest in noncardiac surgery. *Anesth Analg*. 2006;102: 1653-1657.
21. Blaivas M, Fox JC. Outcome in cardiac arrest patients found to have cardiac standstill on the

- bedside emergency department echocardiogram. *Acad Emerg Med.* 2001;8:616-621.
22. Rosenberger P, Shernan SK, Body SC, Eltzschig HK. Utility of intraoperative transesophageal echocardiography for diagnosis of pulmonary embolism. *Anesth Analg.* 2004;99:12-16.
 23. Vieillard-Baron A, Qanadli SD, Antakly Y, et al. Transesophageal echocardiography for the diagnosis of pulmonary embolism with acute cor pulmonale: a comparison with radiological procedures. *Intensive Care Med.* 1998;24:429-433.
 24. Fontes ML, Bellows W, Ngo L, Mangano DT. Assessment of ventricular function in critically ill patients: limitations of pulmonary artery catheterization. Institutions of the McSPI Research Group. *J Cardiothorac Vasc Anesth.* 1999;13:521-527.
 25. Sutton DC, Cahalan MK. Intraoperative assessment of left ventricular function with transesophageal echocardiography. *Cardiol Clin.* 1993;11:389-398.
 26. Cheung AT, Savino JS, Weiss SJ, Aukburg SJ, Berlin JA. Echocardiographic and hemodynamic indexes of left ventricular preload in patients with normal and abnormal ventricular function. *Anesthesiology.* 1994;81:376-387.
 27. Cicek S, Demirkilic U, Kuralay E, Arslan M, Tatar H, Ozturk OO. Prediction of intraoperative hypovolemia in patients with left ventricular hypertrophy: comparison of transesophageal echocardiography and Swan-Ganz monitoring. *Echocardiography.* 1997;14:257-260.
 28. Comunale ME, Body SC, Ley C, et al. The concordance of intraoperative left ventricular wall-motion abnormalities and electrocardiographic S-T segment changes: association with outcome after coronary revascularization. Multicenter Study of Perioperative Ischemia (McSPI) Research Group. *Anesthesiology.* 1998;88:945-954.
 29. Porter TR, Ornato JP, Guard CS, Roy VG, Burns CA, Nixon JV. Transesophageal echocardiography to assess mitral valve function and flow during cardiopulmonary resuscitation. *Am J Cardiol.* 1992;70:1056-1060.
 30. Redberg RF, Tucker KJ, Cohen TJ, Dutton JP, Callahan ML, Schiller NB. Physiology of blood flow during cardiopulmonary resuscitation. A transesophageal echocardiographic study. *Circulation.* 1993;88:534-542.
 31. Brown JM. Use of echocardiography for hemodynamic monitoring. *Crit Care Med.* 2002;30:1361-1364.
 32. Kurkciyan I, Meron G, Sterz F, et al. Pulmonary embolism as a cause of cardiac arrest: presentation and outcome. *Arch Intern Med.* 2000;160:1529-1535.
 33. Hochman JS, Boland J, Sleeper LA, et al. Current spectrum of cardiogenic shock and effect of early revascularization on mortality. Results of an international registry. SHOCK Registry Investigators. *Circulation.* 1995;91:873-881.
 34. Oh JK, Seward JB, Tajik AJ. *The Echo Manual.* Philadelphia: Lippincott Williams and Wilkins; 1999.
 35. Olasveengen TM, Samdal M, Steen PA, Wik L, Sunde K. Progressing from initial non-shockable rhythms to a shockable rhythm is associated with improved outcome after out-of-hospital cardiac arrest. *Resuscitation.* 2009;80:24-29.
 36. Szczygiel M, Wright R, Wagner E, Holcomb MS. Prognostic indicators of ultimate long-term survival following advanced life support. *Ann Emerg Med.* 1981;10:566-570.
 37. Meszaros I, Morocz J, Szlavi J, et al. Epidemiology and clinicopathology of aortic dissection. *Chest.* 2000;117:1271-1278.
 38. Feigenbaum H, Armstrong WF, Ryan T. In: Feigenbaum H, Armstrong WF, Ryan T, eds. *Feigenbaum's Echocardiography.* 6th ed. Philadelphia: Lippincott Williams & Wilkins; 2005.
 39. Erbel R, Alfonso F, Boileau C, et al. Diagnosis and management of aortic dissection. *Eur Heart J.* 2001;22:1642-1681.
 40. Willens HJ, Kessler KM. Transesophageal echocardiography in the diagnosis of diseases of the thoracic aorta: part 1. Aortic dissection, aortic intramural hematoma, and penetrating atherosclerotic ulcer of the aorta. *Chest.* 1999;116:1772-1779.
 41. Nienaber CA, von Kodolitsch Y, Nicolas V, et al. The diagnosis of thoracic aortic dissection by noninvasive imaging procedures. *N Engl J Med.* 1993;328:1-9.
 42. Keren A, Kim CB, Hu BS, et al. Accuracy of bip-plane and multiplane transesophageal echocardiog-

- raphy in diagnosis of typical acute aortic dissection and intramural hematoma. *J Am Coll Cardiol*. 1996;28:627-636.
43. Erbel R, Engberding R, Daniel W, Roelandt J, Visser C, Rennollet H. Echocardiography in diagnosis of aortic dissection. *Lancet*. 1989;1:457-461.
 44. Ballal RS, Nanda NC, Gatewood R, et al. Usefulness of transesophageal echocardiography in assessment of aortic dissection. *Circulation*. 1991;84:1903-1914.
 45. Barbant SD, Eisenberg MJ, Schiller NB. The diagnostic value of imaging techniques for aortic dissection. *Am Heart J*. 1992;124:541-543.
 46. Sommer T, Fehske W, Holzknecht N, et al. Aortic dissection: a comparative study of diagnosis with spiral CT, multiplanar transesophageal echocardiography, and MR imaging. *Radiology*. 1996;199:347-352.
 47. Nienaber CA, von Kodolitsch Y, Petersen B, et al. Intramural hemorrhage of the thoracic aorta. Diagnostic and therapeutic implications. *Circulation*. 1995;92:1465-1472.
 48. Vignon P, Spencer KT, Rambaud G, et al. Differential transesophageal echocardiographic diagnosis between linear artifacts and intraluminal flap of aortic dissection or disruption. *Chest*. 2001;119:1778-1790.
 49. Pretre R, Chilcott M. Blunt trauma to the heart and great vessels. *N Engl J Med*. 1997;336:626-632.
 50. Fulda G, Brathwaite CE, Rodriguez A, Turney SZ, Dunham CM, Cowley RA. Blunt traumatic rupture of the heart and pericardium: a ten-year experience (1979-1989). *J Trauma*. 1991;31:167-172.
 51. Santavirta S, Arajärvi E. Ruptures of the heart in seatbelt wearers. *J Trauma*. 1992;32:275-279.
 52. Chirillo F, Totis O, Cavarzerani A, et al. Usefulness of transthoracic and transoesophageal echocardiography in recognition and management of cardiovascular injuries after blunt chest trauma. *Heart*. 1996;75:301-306.
 53. Catoire P, Orliaguet G, Liu N, et al. Systematic transesophageal echocardiography for detection of mediastinal lesions in patients with multiple injuries. *J Trauma*. 1995;38:96-102.
 54. Cinnella G, Dambrosio M, Brienza N, Tullo L, Fiore T. Transesophageal echocardiography for diagnosis of traumatic aortic injury: an appraisal of the evidence. *J Trauma*. 2004;57: 1246-1255.
 55. Frykberg ER, Crump JM, Dennis JW, Vines FS, Alexander RH. Nonoperative observation of clinically occult arterial injuries: a prospective evaluation. *Surgery*. 1991;109:85-96.
 56. Pretre R, LaHarpe R, Cheretakis A, et al. Blunt injury to the ascending aorta: three patterns of presentation. *Surgery*. 1996;119:603-610.
 57. Greendyke RM. Traumatic rupture of aorta; special reference to automobile accidents. *JAMA*. 1966;195:527-530.
 58. Fabian TC, Richardson JD, Croce MA, et al. Prospective study of blunt aortic injury: Multicenter Trial of the American Association for the Surgery of Trauma. *J Trauma*. 1997;42:374-380.
 59. Minard G, Schurr MJ, Croce MA, et al. A prospective analysis of transesophageal echocardiography in the diagnosis of traumatic disruption of the aorta. *J Trauma*. 1996;40:225-230.
 60. Balm R, Hoornweg LL. Traumatic aortic ruptures. *J Cardiovasc Surg (Torino)*. 2005;46:101-105.
 61. Parmley LF, Mattingly TW, Manion WC, Jahnke EJ Jr. Nonpenetrating traumatic injury of the aorta. *Circulation*. 1958;17:1086-1101.
 62. Vignon P, Gueret P, Vedrinne JM, et al. Role of transesophageal echocardiography in the diagnosis and management of traumatic aortic disruption. *Circulation*. 1995;92:2959-2968.
 63. Smith MD, Cassidy JM, Souther S, et al. Transesophageal echocardiography in the diagnosis of traumatic rupture of the aorta. *N Engl J Med*. 1995;332:356-362.
 64. Vignon P, Lagrange P, Boncoeur MP, Francois B, Gastinne H, Lang RM. Routine transesophageal echocardiography for the diagnosis of aortic disruption in trauma patients without enlarged mediastinum. *J Trauma*. 1996;40:422-427.
 65. Ben-Menachem Y. Assessment of blunt aortic-brachiocephalic trauma: should angiography be supplanted by transesophageal echocardiography? *J Trauma*. 1997;42:969-972.
 66. Cowley RA, Turney SZ, Hankins JR, Rodriguez A, Attar S, Shankar BS. Rupture of thoracic aorta caused by blunt trauma. A fifteen-year experience. *J Thorac Cardiovasc Surg*. 1990;100:652-660.
 67. Rosenberg JM, Bredenberg CE, Marvasti MA,

- Bucknam C, Conti C, Parker FB Jr. Blunt injuries to the aortic arch vessels. *Ann Thorac Surg.* 1989;48:508-513.
68. Jimenez E, Martin M, Krukenkamp I, Barrett J. Subxiphoid pericardiotomy versus echocardiography: a prospective evaluation of the diagnosis of occult penetrating cardiac injury. *Surgery.* 1990;108:676-679.
69. Nagy KK, Lohmann C, Kim DO, Barrett J. Role of echocardiography in the diagnosis of occult penetrating cardiac injury. *J Trauma.* 1995;38:859-862.
70. Meyer DM, Jessen ME, Grayburn PA. Use of echocardiography to detect occult cardiac injury after penetrating thoracic trauma: a prospective study. *J Trauma.* 1995;39:902-907.
71. Huttemann E, Schelenz C, Kara F, Chatzinikolaou K, Reinhart K. The use and safety of transoesophageal echocardiography in the general ICU—a minireview. *Acta Anaesthesiol Scand.* 2004;48:827-836.
72. Burns JM, Sing RF, Mostafa G, et al. The role of transesophageal echocardiography in optimizing resuscitation in acutely injured patients. *J Trauma.* 2005;59:36-40.
73. Colreavy FB, Donovan K, Lee KY, Weekes J. Transesophageal echocardiography in critically ill patients. *Crit Care Med.* 2002;30:989-996.
74. Bruch C, Comber M, Schermund A, Eggebrecht H, Bartel T, Erbel R. Diagnostic usefulness and impact on management of transesophageal echocardiography in surgical intensive care units. *Am J Cardiol.* 2003;91:510-513.
75. Chan KL. Transesophageal echocardiography for assessing cause of hypotension after cardiac surgery. *Am J Cardiol.* 1988;62:1142-1143.
76. Heidenreich PA, Stainback RF, Redberg RF, Schiller NB, Cohen NH, Foster E. Transesophageal echocardiography predicts mortality in critically ill patients with unexplained hypotension. *J Am Coll Cardiol.* 1995;26:152-158.
77. Jardin F, Valtier B, Beauchet A, Dubourg O, Bourdarias JP. Invasive monitoring combined with two-dimensional echocardiographic study in septic shock. *Intensive Care Med.* 1994;20: 550-554.
78. Parker MM, Shelhamer JH, Bacharach SL, et al. Profound but reversible myocardial depression in patients with septic shock. *Ann Intern Med.* 1984;100:483-490.
79. Troianos CA, Porembka DT. Assessment of left ventricular function and hemodynamics with transesophageal echocardiography. *Crit Care Clin.* 1996;12:253-272.
80. Comess KA, DeRook FA, Russell ML, Tognazzi-Evans TA, Beach KW. The incidence of pulmonary embolism in unexplained sudden cardiac arrest with pulseless electrical activity. *Am J Med.* 2000;109:351-356.
81. McConnell MV, Solomon SD, Rayan ME, Come PC, Goldhaber SZ, Lee RT. Regional right ventricular dysfunction detected by echocardiography in acute pulmonary embolism. *Am J Cardiol.* 1996;78:469-473.
82. Torbicki A, Pruszczyk P. The role of echocardiography in suspected and established PE. *Semin Vasc Med.* 2001;1:165-174.
83. Kjaergaard J, Schaadt BK, Lund JO, Hassager C. Quantification of right ventricular function in acute pulmonary embolism: relation to extent of pulmonary perfusion defects. *Eur J Echocardiogr.* 2008;9:641-645.
84. Fremont B, Pacouret G, Jacobi D, Puglisi R, Charbonnier B, de Labriolle A. Prognostic value of echocardiographic right/left ventricular end-diastolic diameter ratio in patients with acute pulmonary embolism: results from a monocenter registry of 1,416 patients. *Chest.* 2008;133:358-362.
85. Wittlich N, Erbel R, Eichler A, et al. Detection of central pulmonary artery thromboemboli by transesophageal echocardiography in patients with severe pulmonary embolism. *J Am Soc Echocardiogr.* 1992;5:515-524.