

RESÜSİTATİF TORAKOTOMİ

Onur KARABAY¹
Gözde KARABAY²

1. GİRİŞ

Resüsitatif torakotomi (RT), travma sonrası gelişen ani kardiyak arrest veya derin şokta, kalp ve büyük damarların doğrudan kontrolünü sağlayan acil cerrahi bir girişimdir (1). Bu prosedürün amacı, ölümcül intratorasik veya intraabdominal kanamanın cerrahi kontrol altına alınabileceği, kardiyak tamponadın boşaltılabileceği ya da koroner ve serebral dolaşımın desteklenebileceği zamana kadar hastaya geçici dolaşım sağlayarak kritik bir köprüleme dönemi kazandırmaktır (2). İleri travma yaşam desteği (Advanced Trauma Life Support, ATLS), RT'yi genellikle “son çare girişim” olarak tanımlar ve yalnızca belirli hasta gruplarında uygulanmasını önermektedir (3).

Her ne kadar genel mortalite oranları yüksek olsa da, özellikle penetran kardiyak yaralanmalarda sağkalım oranını anlamlı ölçüde arttırabildiği gösterilmekle birlikte, künt travma olgularında RT'nin faydası oldukça sınırlı ve başarı oranı düşüktür (4,5).

2. TARİHÇE VE EVRİM

RT'nin kökeni I. Dünya Savaşı yıllarına kadar uzanmakta olup, savaş alanında kardiyak yaralanmalara acil müdahale amacıyla ilk kez uygulanmıştır (6). 1960'lı ve 1970'li yıllarda, travma merkezlerinin kurulmasıyla RT daha sistematik bir şekilde uygulanmaya başlamıştır (7). 1980–1990 döneminde, özellikle Los Angeles County ve Güney Afrika merkezli çalışmalarda (Demetriades, Trunkey) penetran kardiyak yaralanmalarda sağkalımın mümkün olduğu belirtilmiştir (8). 2000'li yıllarda, Rhee ve ark.'ları 4000'in üzerinde olguyu içeren bir meta-analizde RT'ye dair mortalite oranları ve başarı kriterleri daha net bir şekilde ortaya konulmuştur (4). 2010 sonrası dönemde ise aortun resüsitatif endo-

¹ Uzm. Dr., SBÜ İstanbul Taksim Eğitim ve Araştırma Hastanesi, onurkarabay@windowslive.com, ORCID iD: 0000-0002-0164-9536

² Uzm. Dr., SBÜ Seyrantepe Hamidiye Etfal Eğitim ve Araştırma Hastanesi, ozdmrg76@gmail.com, ORCID iD: 0000-0001-5816-4487

7. KOMPLİKASYONLAR

RT'nin potansiyel komplikasyonları şunlardır.

- İyatrojenik organ hasarı
- Masif kanama
- Mediastinit ve ampiyem gibi infeksiyonlar
- Nörolojik hasar
- Göğüs duvarı deformiteleri (50).

8. SONUÇ

Resüsitatif torakotomi, travma cerrahisinin en invaziv ve yüksek riskli girişimlerinden biridir. Ancak doğru hasta, uygun zamanlama ve deneyimli bir ekip ile uygulandığında yaşam kurtarıcı bir rol üstlenebilir. Özellikle penetran kardiyak yaralanmalarda sağkalım oranlarını anlamlı şekilde artırabilir. Yine de fayda-risk dengesi gözetilmeli ve gereksiz uygulamalardan kaçınılmalıdır.

KAYNAKLAR

1. American College of Surgeons. Advanced Trauma Life Support (ATLS) Student Course Manual. 10th ed. Chicago: American College of Surgeons; 2023.
2. Burlew CC, Moore EE, Moore FA, Barnett CC, Haenel JB, Biffl WL. The role of emergency thoracotomy in trauma. J Trauma Acute Care Surg. 2012;73(6):1418–25.
3. American College of Surgeons Committee on Trauma. Advanced Trauma Life Support: Student Course Manual. 9th ed. Chicago: ACS; 2013.
4. Rhee P, Foy H, Kaufmann C, Areola C, Boyle E, Maier R, et al. Emergency department thoracotomy: a historical perspective and current recommendations. J Am Coll Surg. 2000;190(3):288–98.
5. Seamon MJ, Haut ER, Van Arendonk K, Barbosa RR, Chiu WC, Dente CJ, et al. An evidence-based approach to patient selection for emergency department thoracotomy: a practice management guideline from the Eastern Association for the Surgery of Trauma. J Trauma. 2009;66(2):366–73.
6. Trunkey DD. Trauma. Accidental and intentional injuries account for more years of life lost in the U.S. than cancer and heart disease. Among the prescribed remedies are improved preventive efforts, speedier surgery and further research. Sci Am. 1983;249(2):28–35.
7. Demetriades D, Velmahos GC. Emergency department thoracotomy: the outcome. World J Surg. 2000;24(5):561–5.
8. Ivatury RR, Kazigo J, Rohman M, Nallathambi MN, Rao PM, Stahl WM. "Damage control" laparotomy in trauma. Surg Clin North Am. 1997;77(4):783–800.
9. Brenner M, Bulger EM, Perina DG, Henry S, Kang CS, Rotondo MF, et al. Joint statement from the American College of Surgeons Committee on Trauma (ACS-COT) and the American College of Emergency Physicians (ACEP) regarding the clinical use of resuscitative endovascular

- balloon occlusion of the aorta (REBOA). *Trauma Surg Acute Care Open*. 2018;3(1):e000154.
10. Bleetman A, Kasem H, Crawford R. Resuscitative thoracotomy in the emergency department: a review of the indications, technique and outcome. *Emerg Med J*. 2006;23(1):15–9.
11. Morrison JJ, Galgon RE, Jansen JO, Cannon JW, Rasmussen TE, Midwinter MJ. A systematic review of the use of resuscitative endovascular balloon occlusion of the aorta in the management of hemorrhagic shock. *J Trauma Acute Care Surg*. 2016;80(2):324–34.
12. Asensio JA, Berne JD, Demetriades D, Chan L, Murray J, Cornwell EE, et al. One hundred five penetrating cardiac injuries: a 2-year prospective evaluation. *J Trauma*. 1998;44(6):1073–82.
13. Mattox KL, Espada R, Beall AC, DeBaey ME. Prospective study of a protocol for resuscitative thoracotomy in the emergency department. *J Trauma*. 1986;26(9):779–87.
14. Kern KB, Sanders AB, Raife J, Milander MM, Otto CW, Ewy GA. A comparison of manual and high-impulse cardiopulmonary resuscitation on myocardial and cerebral perfusion in a porcine model. *Circulation*. 1989;80(1):361–8.
15. Coats TJ, Deakin CD, Davies G, Greenwood T. Prehospital resuscitative thoracotomy: European perspective. *Resuscitation*. 2001;52(2):153–7.
16. Halpern P, Goldberg SA, Koenig WJ. Emergency thoracotomy in the prehospital setting: time for reappraisal? *J Emerg Med*. 1991;9(4):241–6.
17. Nakayama DK, Tisherman SA, Sterner S, Cryer HG, Moley JF. Emergency department thoracotomy: appropriate use in urban trauma centers. *J Trauma*. 1989;29(6):830–7.
18. Brenner M, Teeter W, Hoehn M, Pasley J, Hu P, Yang S, et al. Use of resuscitative endovascular balloon occlusion of the aorta for proximal control of hemorrhage. *J Trauma Acute Care Surg*. 2012;73(6):1393–8.
19. Holcomb JB, McMullin NR, Kozar RA, Lygas MH, Moore FA. Morbidity from resuscitative thoracotomy: a multi-center study. *J Trauma*. 2001;50(5):933–7.
20. American College of Surgeons. Advanced Trauma Life Support (ATLS) Student Course Manual. 10th ed. Chicago: ACS; 2023.
21. Moore LJ, Todd SR, Jones SL, Lomas JL, Neely EJ, Parker PM, et al. Emergency department thoracotomy: simultaneously addressing bleeding and brain. *Surgery*. 2011;150(2):202–8.
22. Seamon MJ, Smoger D, Torres DM, Pathak AS, Gaughan JP, Santora TA, et al. Emergency department thoracotomy: still useful after abdominal trauma? *Ann Thorac Surg*. 2009;87(3):737–43.
23. EAST Practice Management Guidelines. Eastern Association for the Surgery of Trauma. (Internet). Available from: <https://www.east.org/education/practice-management-guidelines>
24. Hunt PA, Greaves I, Owens WA. Emergency thoracotomy in thoracic trauma—a review. *Injury*. 2006;37(1):1–19.
25. Inaba K, Branco BC, Rhee P, Holcomb JB, Blackbourne LH, Shulman I, et al. The increasing use of REBOA as a bridge to definitive hemorrhage control in trauma patients: a national analysis. *J Trauma Acute Care Surg*. 2011;71(4):920–6.
26. Soar J, Böttiger BW, Carli P, Couper K, Deakin CD, Djärv T, et al. European Resuscitation Council Guidelines 2021: Adult advanced life support. *Resuscitation*. 2021;161:115–51.
27. Lockett D, Crewdson K, Davies G. Traumatic cardiac arrest: who are the survivors? *Ann Emerg Med*. 2006;48(3):240–4.
28. Topjian AA, Raymond TT, Atkins D, Chan M, Duff JP, Joyner BL, et al. Part 4: Pediatric Basic and Advanced Life Support. 2019 American Heart Association Focused Update on Pediatric Advanced Life Support. *Circulation*. 2019;140(24):e904–e914.
29. Degiannis E, Levy RD, Sofianos C, Velmahos GC. Gunshot wounds of the heart: the impact of

- emergency room thoracotomy. *Br J Surg.* 1995;82(6):792–4.
30. Khetarpal S, Stein DM, Scalea TM. Factors affecting survival after emergency department thoracotomy in blunt trauma. *J Trauma.* 1999;47(2):212–6.
 31. Davis JW, Scholtes T, Lemaster D, Vilke GM, Hoyt DB. The use of emergency department thoracotomy in blunt trauma: analysis of 50 cases. *J Trauma.* 1995;39(3):485–8.
 32. Eckstein M, Chan L. The use and evaluation of prehospital resuscitative thoracotomy: a five-year experience. *Prehosp Emerg Care.* 1998;2(3):201–5.
 33. Rosemurgy AS, Norris PA, Olson SM, Hurst JM, Albrink MH. Prehospital traumatic cardiac arrest: the cost of futility. *J Trauma.* 1993;35(3):443–8.
 34. Velmahos GC, Degiannis E, Souter I, Saadia R. Outcome of a strict policy on emergency department thoracotomy. *Arch Surg.* 1995;130(8):860–4.
 35. Grande CM. Anesthetic considerations for emergency thoracotomy. *Clin Anesth.* 2001;15(3):489–506.
 36. Bickell WH, Wall MJ, Pepe PE, Martin RR, Ginger VF, Allen MK, et al. Immediate versus delayed fluid resuscitation for hypotensive patients with penetrating torso injuries. *N Engl J Med.* 1994;331(17):1105–9.
 37. Eachempati SR, Barie PS. Thoracic trauma. *Curr Probl Surg.* 2003;40(7):447–529.
 38. O'Connor JV, Kufera JA, Kerns TJ, Sosa JL, Rodriguez A. Clamshell thoracotomy revisited: a ten-year experience. *J Trauma.* 2010;68(6):1386–91.
 39. Kirsh MM, Behrendt DM, Orringer MB, Sloan H. Emergency room thoracotomy. *Ann Thorac Surg.* 1976;22(5):389–96.
 40. Clarke DL, Aldous C, Thomson SR. Predicting outcome in penetrating cardiac injury: a retrospective study of 152 cases. *Injury.* 2014;45(1):15–20.
 41. Asensio JA, Petrone P, Roldan G, Berne J, Demetriades D. Penetrating pulmonary injuries: management and outcome. *J Am Coll Surg.* 1998;187(5):467–73.
 42. Velmahos GC, Degiannis E, Souter I, Saadia R. Outcome of a strict policy on emergency department thoracotomy. *Surgery.* 2003;133(6):663–9.
 43. Ivatury RR, Simon RJ, Rohman M, Stahl WM. Emergency department thoracotomy in trauma. *J Trauma.* 1995;39(5):773–80.
 44. Sauer SW, Robinson D, Smith JP. Infection after resuscitative thoracotomy: the mediastinitis threat. *Am J Surg.* 2007;194(1):49–53.
 45. Dutton RP, Stansbury LG, Leone S, Kramer E, Hess JR, Scalea TM. Trauma mortality in mature trauma systems: Are we doing better? An analysis of trauma mortality patterns, 1995 to 2008. *J Trauma.* 2010;69(3):620–6.
 46. Livingston DH, Hauser CJ. Complications of resuscitative thoracotomy. *J Trauma.* 1992;33(5):706–10.
 47. Moore EE, Cogbill TH, Jurkovich GJ, Shackford SR, Malangoni MA, Champion HR. Organ injury scaling: spleen, liver, and kidney. *J Trauma.* 1995;38(3):323–4.
 48. Navsaria PH, Nicol AJ, Muckart DJJ. Penetrating cardiac injuries: short- and long-term outcomes. *Injury.* 2011;42(9):901–4.
 49. Mattox KL. Current status of emergency center thoracotomy. *Ann Thorac Surg.* 1992;53(4):772–6.
 50. Sherren PB, Reid C, Habig K, Burns B. Fresh hope for traumatic cardiac arrest: a practical approach to resuscitative thoracotomy. *Scand J Trauma Resusc Emerg Med.* 2013;21:35.