

# BÖLÜM 53

## Akut Radyasyon Sendromunda Hemşirelik Bakımı

Vacide AŞIK ÖZDEMİR<sup>1</sup>

### GİRİŞ

Radyolojik veya nükleer kazalarda ya da kanser tedavilerinin bir parçası olarak radyasyon alan hastalarda akut olarak ortaya çıkan belirti ve semptomlar akut radyasyon sendromu (ARS) olarak adlandırılmasında olup, bu hastalarda acil tanı ile birlikte medikal ve cerrahi kondisyonların acil tedavisi gerekmektedir. Maruz kalınan radyasyonun dozu otomatik biyodozimetre ve klinik öykü, semptomların zamanı gibi çeşitli klinik parametreler ile çok parametrel biyokimyasal testler kullanılarak tahmin edilebilmektedir (1, 2). Akut, yüksek dozlu radyasyon maruziyeti genellikle çoklu organ yetmezliği gibi yönetilmektedir (3). **Bu nedenle ARS'de hemşirelik bakımı da çoklu organ yetmezliğindeki hemşirelik yönetimine benzemektedir.**

ARS uzun bir zamandan beri radyasyon tıbbının önemli bir parçası olmuştur. İnsanlar ve hayvanlarda radyasyon duyarlılığı konusunda mevcut veriler, ARS ile ilişkili semptomların daha kesin bir

şekilde tanımlanmasını sağlamakta ve ARS'nin yönetiminde yardımcı olmaktadır. ARS'de kullanılan 'yüksek maruziyet' terimi, >1 Gray (Gy)'lık radyasyon dozu olarak tanımlanmaktadır. Fizyolojik bakış açısıyla ARS bir alt sendromlar toplamıdır. Bu alt sendromlar evreler halinde görünür ve alınan radyasyon düzeyi ile doğrudan ilişkilidir. ARS'nin subklinik üç alt sendromu bulunmaktadır: 1-8 Gy arası hematopoietik sendrom, 6-20 Gy arası gastrointestinal sendrom ve 20-50 Gy arası nörovascular sendrom belirti ve semptomları ortaya çıkar. Bu bölümde ARS'nin değerlendirilmesi ve yönetimi ile birlikte ARS'de hemşirelik bakımı konularına yer verilmektedir.

### AKUT RADYASYON SENDROMU

Radyasyon maruziyeti, sızdırmaz bir radyasyon kaynağından gelen dış maruziyet şeklinde olabileceği gibi radyonüklitlerin vücuda alınması sonucu iç maruziyet olarak da meydana gelebilmektedir. Akut radyasyon sendromu (ARS) veya akut rad-

<sup>1</sup> Dr. Öğr. Üyesi, Recep Tayyip Erdoğan Üniversitesi Sağlık Bilimleri Fakültesi, İç Hastalıkları Hemşireliği AD., vacide.asikozdemir@erdogan.edu.tr



## KAYNAKLAR

1. Blakely WF, Ossetrova NI, Whitnall MH, et al. Multiple parameter radiation injury assessment using a non-human primate radiation model-biodosimetry applications. *Health Physics*. 2010;98(2):153–159.
2. Bader JL, Nemhauser J, Chang F, et al. Radiation event medical management (REMM): website guidance for health care providers. *Prehospital Emergency Care: Official Journal of the National Association of EMS Physicians and the National Association of State EMS Directors*. 2008;12(1):1–11.
3. Hatchett RJ, Kaminski JM, Goans RE, et al. Nuclear and radiological events. In: Koenig K.L., Schultz C.H., eds. *Koenig and Schultz's Disaster Medicine: Comprehensive Principles and Practices*. 2009;477–510, Cambridge, England: Cambridge University Press.
4. Linet MS, Kazzi Z, Paulson JA. Council on environmental health. Pediatric considerations before, during, and after radiological or nuclear emergencies. *Pediatric*. 2018;142(6):e20183001.
5. Garau MI, Calduch ML, López EC. Radiobiology of the acute radiation syndrome. *Reports of Practical Oncology and Radiotherapy: Journal of Greatpoland Cancer Center in Poznan and Polish Society of Radiation Oncology*. 2011;16(4):123–130.
6. De-Coursey E. Human pathological anatomy of ionizing radiation effects of the atomic bomb explosions. *Mil Surg*. 1948;102:427–32.
7. Denham JW, Hauer-Jensen M, Peters LJ. Is it time for a new formalism to categorize normal tissue radiation injury? *Int J Radiat Oncol Biol Phys*. 2001;50:1105–1106.
8. Pedigo T. (2005) Radiological weapons in Currance PL. Medical response to weapons of mass destruction. Mosby/Jems,wyd.1.
9. Menon SS, Uppal M, Randhawa S, et al. Radiation Metabolomics: Current Status and Future Directions. *Frontiers in Oncology*. 2016;6:20.
10. Dainiak N, Waselenko JK, Armitage JO, et al. The hematologist and radiation casualties. *Hematology*. American Society of Hematology. Education Program. 2003:473–496.
11. Gourmelon P, Benderitter M, Bertho JM, et al. European consensus on the medical management of acute radiation syndrome and analysis of the radiation accidents in Belgium and Senegal. *Health Physics*. 2010;98(6):825–832.
12. Singh VK, Seed TM. An update on sargramostim for treatment of acute radiation syndrome. *Drugs of Today* (Barcelona, Spain: 1998). 2018;54(11):679–693.
13. Wang H, Mu X, He H, et al. Cancer Radiosensitizers. *Trends in Pharmacological Sciences*. 2018;39(1):24–48.
14. Mettler FA, Royal HD, Drum DE. (2006) Radiation accidents. In: *Textbook of Pediatric Emergency Medicine*, 5th ed, Fleisher GR, Ludwig S, Henretig FM (Eds), p.1033. Lippincott Williams & Wilkins, Philadelphia.
15. Newburger PE, Dale DC. Evaluation and management of patients with isolated neutropenia. *Seminars in Hematology*. 2013;50(3):198–206.
16. Kato TA. Human Lymphocyte Metaphase Chromosome Preparation for Radiation-Induced Chromosome Aberration Analysis. *Methods in Molecular Biology* (Clifton, NJ.), 2019;1984:1–6.
17. Cavallero, Riccobono D, Drouet M. MSC-Derived Extracellular Vesicles: New emergency treatment to limit the development of radiation-induced hematopoietic syndrome? *Health Physics*. 2020;119(1):21–36.
18. Qian L, Cen J. Hematopoietic stem cells and mesenchymal stromal cells in acute radiation syndrome. *Oxidative Medicine and Cellular Longevity*. 2020;2020:8340756.
19. Igaki H, Nakagawa K, Uozaki H, et al. Pathological changes in the gastrointestinal tract of a heavily radiation-exposed worker at the Tokai-mura criticality accident. *Journal of Radiation Research*. 2008;49(1):55–62.
20. Guo H, Chou WC, Lai Y, et al. Multi-omics analyses of radiation survivors identify radioprotective microbes and metabolites. *Science*. 2020;370(6516):eaay9097.
21. Meineke V, van Beuningen D, Sohns T, et al. Medical management principles for radiation accidents. *Military Medicine*. 2003;168(3):219–222.
22. Ye F, Ning J, Fardous Z, et al. Citrulline, A Potential Biomarker of Radiation-Induced Small Intestine Damage. *Dose-Response: a Publication of International Hormesis Society*. 2020;18(3): 1559325820962341.
23. Ende M. Management of the acute radiation syndrome. *Ann Intern Med*. 2004;141(11):89.
24. Nair V, Karan DN, Makhani CS. Guidelines for medical management of nuclear/radiation emergencies. *Medical Journal Armed Forces India*. 2017;73(4):388–393.
25. Cerveny TJ, MacVittae TJ, Young RW. (1989). Acute radiation syndrome in humans. In: Walker RI, Cerveny TJ, eds. *Medical Consequences of Nuclear Warfare*. In: Zajtchuk R, Bellamy RF, eds. *Textbook of Military Medicine*. Washington, DC: Department of the Army, Office of The Surgeon General, Borden Institute.
26. Hall EJ. (2000) Acute effects of total-body irradiation. In: Hall EJ, eds. *Radiobiology for the Radiologist*. 5th ed.:124-135. Philadelphia Lippincott Williams & Wilkins.
27. Kato M, Chida K, Ishida T, et al. Occupational radiation exposure of the eye in neurovascular interventional physician. *Radiation Protection Dosimetry*. 2019;185(2):151–156.



28. Jackson WL Jr, Gallagher C, Myhand RC, et al. Medical management of patients with multiple organ dysfunction arising from acute radiation syndrome. *BJR Suppl.* 2005;27:161–168.
29. Gourmelon P, Marquette C, Agay D, et al. Involvement of the central nervous system in radiation-induced multi-organ dysfunction and/or failure. *BJR Suppl.* 2005;27:62–68.
30. López M, Martín M. Medical management of the acute radiation syndrome. *Reports of practical oncology and radiotherapy: Journal of Greatpoland Cancer Center in Poznan and Polish Society of Radiation Oncology.* 2011;16(4):138–146.
31. West CM, Davidson SE, Elyan SA, et al. Lymphocyte radiosensitivity is a significant prognostic factor for morbidity in carcinoma of the cervix. *International Journal of Radiation Oncology, Biology, Physics.* 2001;51(1):10–15.
32. Dainiak N. Medical management of acute radiation syndrome and associated infections in a high-casualty incident. *Journal of Radiation Research.* 2018;59(suppl\_2):ii54–ii64.
33. Liu X, Li C, Zheng K, et al. Chromosomal aberration arises during somatic reprogramming to pluripotent stem cells. *Cell Division.* 2020;15(1):12.
34. Okunieff P, Morgan D, Niemierko A, et al. Radiation dose-response of human tumors. *International Journal of Radiation Oncology, Biology, Physics.* 1995;32(4):1227–1237.
35. Petersen OB, Smith E, Van Opstal D, et al. Nuchal translucency of 3.0-3.4 mm an indication for NIPT or microarray? Cohort analysis and literature review. *Acta Obstetricia et Gynecologica Scandinavica.* 2020;99(6):765–774.
36. Elhajouji A, Lukamowicz-Rajska M. Flow cytometric determination of micronucleus frequency. *Methods in Molecular Biology* (Clifton, NJ.). 2013;1044:209–235.
37. Fliedner TM, Friescke I, Beyrer K. (2001) (Eds): *Medical Management of Radiation Accidents—Manual on the Acute Radiation Syndrome* London: British Institute of Radiology.
38. Waselesko JK, MacVittie TJ, Blakely WF, et al. Medical management of the acute radiation syndrome: recommendations of the Strategic National Stockpile Radiation Working Group. *Annals of Internal Medicine.* 2004;140(12):1037–1051.
39. Williams JP, McBride WH. After the bomb drops: a new look at radiation-induced multiple organ dysfunction syndrome (MODS). *International Journal of Radiation Biology.* 2011;87(8):851–868.
40. Dumont F, Le Roux A, Bischoff P. Radiation countermeasure agents: an update. *Expert Opinion on Therapeutic Patents.* 2010;20(1):73–101.
41. Müller K, Meineke V. Advances in the management of localized radiation injuries. *Health Physics.* 2010;98(6):843–850.
42. Rong X, Zhang G, Yang Y, et al. Transplanted antler stem cells stimulated regenerative healing of radiation-induced cutaneous wounds in rats. *Cell Transplantation.* 2020;29:963689720951549.
43. Messerschmidt O. Combined effects of radiation and trauma. *Advances in Space Research: The Official Journal of the Committee on Space Research (COSPAR).* 1989;9(10):197–201.
44. Tierney L, McPhee S, Papadakis M. (2002) *Current medical diagnosis & treatment*, 41st ed. 2002:1601–1603. New York, NY: Lange/McGraw-Hill.
45. Holdstock D, Waterston L. Nuclear weapons, a continuing threat to health. *Lancet* (London, England). 2000;355(9214):1544–1547.
46. Chan RJ, Webster J, Chung B, et al. (2014). Prevention and treatment of acute radiation-induced skin reactions: a systematic review and meta-analysis of randomized controlled trials. *BMC Cancer.* 2014;14:53.
47. Marazziti D, Baroni S, Catena-Dell'Osso M, et al. Cognitive, psychological and psychiatric effects of ionizing radiation exposure. *Current Medicinal Chemistry.* 2012;19(12):1864–1869.
48. Adams TG, Sumner LE, Casagrande R. Estimating risk of hematopoietic acute radiation syndrome in children. *Health Physics.* 2017;113(6):452–457.
49. Medhora M, Gao F, Gasperetti T, et al. delayed effects of acute radiation exposure (deare) in juvenile and old rats: Mitigation by lisinopril. *Health Physics.* 2019;116(4):529–545.
50. Le Heron J, Padovani R, Smith I, et al. Radiation protection of medical staff. *Eur J Radiol.* 2010;76(1):20–23.