

NÖROENDOKRİN TÜMÖRLER

Nimet YILMAZ¹

GİRİŞ

Nöroendokrin tümörler (NET) vücutun herhangi bir bölgesindeki nöroendokrin sistemden köken alan bir tümör grubudur. En sık gastrointestinal sistemde görülür. Obendorfer, ilk olarak 1907'de gastrointestinal sistemin tipik adenokarsinomlarına göre daha benign karakterde olduklarını belirtmek amacıyla 'karsinoid' terimini kullanmış ve NET'ler karsinoid tümörler olarak da adlandırılmıştır (1). Gastrointestinal (GI) sistemin NET'leri gastrointestinal nöroendokrin tümörler (GI-NET) ve pankreatik nöroendokrin tümörleri (pNET) içermektedir. GI-NET'ler tüm karsinoid tümörlerin yaklaşık %70'ini oluşturur. Diğerlerinin çoğu solunum sisteminde bulunur. GI-NET'ler en sık ince bağırsak, rektum, apendiks ve midede görülür. İnce bağırsakta, ileum en yaygın bölgedir, bunu duodenum ve jejunum takip eder. pNET'ler, tümörden salınan hormonun neden olduğu bir klinik sendromla ilişkili ise fonksiyonel veya hormon üretime neden olmayan non-fonksiyonel tümörlerden oluşur.

EPİDEMİYOLOJİ

GI-NET'lerin genel insidansı $25-50/10^6$, klinik olarak anlamlı GI-NET insidansı $7-13/10^6$, otopside herhangi bir GI-NET görülme insidansı $84/10^6$ 'dır

ve bunların çoğu klinik olarak sessizdir. GI-NET insidansı son 30 yılda önemli ölçüde artmıştır. Bu artışın ana nedeninin endoskopik prosedürlerin daha fazla kullanılması ve daha iyi görüntüleme teknikleriyle ilişkili olduğu düşünülmektedir. pNET'ler pankreastan kaynaklanan tümörlerin %1-10'unu oluşturur. Fonksiyonel pNET'lerin genel prevalansı düştür; yaklaşık $10/10^6$ olduğu bildirilmekle birlikte insidans değişkendir. En sık $0.5-3/10^6$ ile insülinoma ve gastrinomalar görülmektedir (2).

SINIFLANDIRMA VE PATOGENEZ

Nöroendokrin tümörlerler; histopatolojilerine, anatomin kökenine ve fonksiyonel olarak aktif olup olmadıklarına göre değerlendirilmiş ve sınıflandırılmıştır. GI-NET'ler anatominik ve embriyolojik kökenine göre üç grupta incelenmiştir; Forerugut; (Akciğer, mide, duodenum), Midgut; (ince barsak, apendiks, sağ kolon), Hindgut; (distal kolon, rektum).

2000 yılında Dünya Sağlık Örgütü (DSÖ), NET'leri anatominik bölgese bakılmaksızın üç histolojik kategoride tanımlamıştır. Bunlar, 1; iyi diferansiyeli nöroendokrin tümörler veya karşılıkları, 2; kötü diferansiyeli endokrin tümörler ve 3; mix ekzokrin-endokrin tümörler olarak sınıflandırıldı.

¹ Dr. Öğr. Üyesi Nimet YILMAZ, SANKO Üniversitesi, Tıp Fakültesi İç Hastalıkları AD. drnimet23@hotmail.com

larda ilk tercih endoskopik rezeksiyon olmalıdır. Endoskopik rezeksiyon için uygun olmayan vakalarda tedavinin temeli mümkünse küratif amaçlı cerrahidir. Cerrahinin mümkün olmadığı hastalarda ise oktreotid, lanreotid, everolimus ve sunitinib gibi medikal tedavi seçenekleri de bulunmaktadır.

KAYNAKLAR

- Schnirer I, Yao JC, Ajani JA. Carcinoid: A Comprehensive Review. *Acta Oncologica* 2003; 42: 672-692.
- Modlin IM, Oberg K, Chung DC, et al. Gastroenteropancreatic neuroendocrine tumours. *Lancet Oncol* 2008; 9: 61-72.
- Rindi G, Arnold R, Capella C, et al. Nomenclature and classification of digestive neuroendocrine tumours. World Health Organization classification of tumours, pathology and genetics of tumours of the digestive system 2010;10-12.
- Pavel ME, Hainsworth JD, Baudin E, et al. Everolimus plus octreotide long-acting repeatable for the treatment of advanced neuroendocrine tumours associated with carcinoid syndrome (RADIANT 2): a randomised, placebo-controlled, phase 3 study. *Lancet*. 2011;378: 2005-2012.
- Yao JC, Shah MH, Ito T, et al. Everolimus for advanced pancreatic neuroendocrine tumors. *N Engl J Med*. 2011;364: 514-523.
- Liu E, Marincola P, Öberg K. Everolimus in the treatment of patients with advanced pancreatic neuroendocrine tumors: latest findings and interpretations. *Therap Adv Gastroenterol*. 2013;6(5): 412-419.
- Singh S, Carnaghi C, Buzzoni R, et al. Efficacy and safety of everolimus in advanced, progressive, nonfunctional neuroendocrine tumors (NET) of the gastrointestinal (GI) tract and unknown primary: a subgroup analysis of the phase III RADIANT-4 trial. *J Clin Oncol*. 2016;34 (4): 315.
- Kulke MH, Lenz HJ, Meropol NJ, et al. Activity of sunitinib in patients with advanced neuroendocrine tumors. *J Clin Oncol*. 2008;26: 3403-3410.
- Raymond E, Dahan L, Raoul JL, et al. Sunitinib malate for the treatment of pancreatic neuroendocrine tumors. *N Engl J Med*. 2011;364:501-513.
- Di Domenico A, Wiedmer T, Marinoni I. Genetic and epigenetic drivers of neuroendocrine tumours (NET). *Endocr Relat Cancer* 2017 24(9), 315-334.
- Wolf P, Winhofer Y, Smajis S, et al. Clinical presentation in insulinoma predicts histopathological tumour characteristics. *Clin Endocrinol* 2015; 83(10), 67-71.
- Hirshberg B, Cochran C, Skarulis MC, et al. Malignant insulinoma: Spectrum of unusual clinical features. *Cancer* 2005; 104:264-272.
- Gill GV, Rauf O, MacFarlane IA. Diazoxide treatment for insulinoma: A national UK survey. *Postgrad Med J* 1997; 73: 640-641.
- Bernard V, Lombard-Bohas C, Taquet MC, et al. Efficacy of everolimus in patients with metastatic insulinoma and refractory hypoglycemia. *Eur J Endocrinol* 2013; 168:665-674.
- Norton JA, Doherty GD, Fraker DL, et al. Surgical treatment of localized gastrinoma within the liver: A prospective study. *Surgery* 1998; 124:1145-1152.
- Ito T, Igarashi H, Jensen RT. Pancreatic neuroendocrine tumors: Clinical features, diagnosis and medical treatment: Advances. *Best Pract Res Clin Gastroenterol* 2012; 26: 737-753.
- Roy PK, Venzon DJ, Shojamanesh H, et al. ZE syndrome: Clinical presentation in 261 patients. *Medicine (Baltimore)* 2000; 79: 379-411.
- Miller LS, Vinayek R, Frucht H, et al. Reflux esophagitis in patients with ZE syndrome. *Gastroenterology* 1990; 98: 341-346.
- Yang R-H and Chu Y-K. Zollinger-Ellison syndrome: revelation of the gastrinoma triangle. *Radiol Case Rep* 2015;10(1), 827
- Eldor R, Glaser B, Fraenkel M, et al. Glucagonoma and the glucagonoma syndrome Cumulative experience with an elusive endocrine tumour. *Clin Endocrinol* 2011;74: 593-598.
- Kindmark H, Sundin A, Granberg D, et al. Endocrine pancreatic tumors with glucagon hypersecretion: A retrospective study of 23 cases during 20 years. *Med Oncol* 2007;24: 330-337.
- Chastain MA. The glucagonoma syndrome: A review of its features and discussion of new perspectives. *Am J Med Sci* 2001; 321:306-320.
- Oberg K, Kvols L, Caplin M, et al. Consensus report on the use of somatostatin analogs for the management of neuroendocrine tumors of the gastroenteropancreatic system. *Ann Oncol* 2004; 15: 966-973.
- Oberg K. Somatostatin analog octreotide LAR in gastroentero- pancreatic tumors. *Expert Rev Anticancer Ther* 2009; 9: 557-566.
- Castro PG, de Leon AM, Trancón JG. Glucagonoma syndrome: a case report. *J Med Case Reports* 2011; 5, 402.
- Jensen RT, Norton JA. Endocrine tumors of the pancreas and gastrointestinal tract. In: Feldman M, Friedman LS, Brandt LJ, editors. Sleisenger and Fordtran's gastrointestinal and liver disease. 8th ed. Philadelphia: Saunders; 2006. 625-666.
- Takai A, Setoyama T, Miyamoto S. Pancreatic somatostatinoma with von Recklinghausen's disease. *Clin Gastroenterol Hepatol* 2009; 7:28.
- Moayedoddin B, Booya F, Wermers RA, et al. Spectrum of malignant somatostatin-producing neuroendocrine tumors. *Endocr Pract* 2006; 12: 394-400.
- Alvite-Canosa M, Alonso-Fernández L, Seoane-López M, et al. Benign pancreatic vipoma. *Rev Esp Enferm Dig* 2011;103(4), 224-225.
- Mortenson M and Bold RJ. Symptomatic pancreatic polypeptidesecreting tumor of the distal pancreas (PPoma). *Int J Gastrointest Cancer* 2002;32(2-3), 153-156.
- Delle Fave G, Capurso G, Milione M, et al. Endocrine tumours of the stomach. *Best Pract Res Clin Gastroenterol* 2005; 19: 659-673.
- Cao L, Mizoshita T, Tsukamoto T, et al.: Development of carcinoid tumors of the glandular stomach and effects of eradication in Helicobacter pylori-infected Mongolian

- gerbils. *Asian Pac J Cancer Prev* 2008;9(1):25-30.
33. Poynter D, Pick CR, Harcourt RA, et al.: Association of long lasting unsurmountable histamine H₂ blockade and gastric carcinoid tumours in the rat. *Gut* 1985;26(12):1284-1295.
 34. Modlin IM, Lye KD, Kidd M: A 50-year analysis of 562 gastric carcinoids: small tumor or larger problem? *Am J Gastroenterol* 2004;99(1):23-32.
 35. Thomson AB, Sauve MD, Kassam N, et al.: Safety of the longterm use of proton pump inhibitors. *World J Gastroenterol* 2010;16(19):2323-2330.
 36. Merola E, Sbrozzi-Vanni A, Panzuto F, et al. Type I gastric carcinoids: A prospective study on endoscopic management and recurrence rate. *Neuroendocrinology* 2011; 95: 207-213.
 37. Rindi G, Azzoni C, La Rosa S, et al. ECL cell tumor and poorly differentiated endocrine carcinoma of the stomach: Prognostic evaluation by pathological analysis. *Gastroenterology* 1999; 116:532-542.
 38. Scherubl H, Cadiot G, Jensen RT, et al. Neuroendocrine tumors of the stomach (gastric carcinoids) are on the rise: Small tumors, small problems? *Endoscopy* 2010; 42: 664-671.
 39. Granberg D, Wilander E, Stridsberg M, et al. Clinical symptoms, hormone profiles, treatment, and prognosis in patients with gastric carcinoids. *Gut* 1998; 43: 223-228.
 40. Rindi G, Bordi C, Rappel S, et al. Gastric carcinoids and neuroendocrine carcinomas: Pathogenesis, pathology, and behavior. *World J Surg* 1996; 20: 168-172.
 41. Ruszniewski P, Delle Fave G, Cadiot G, et al. Well-differentiated gastric tumors/carcinomas. *Neuroendocrinology* 2006; 84: 158-164.
 42. Lawrence B, Kidd M, Svejda B, et al. A clinical perspective on gastric neuroendocrine neoplasia. *Curr Gastroenterol Rep* 2011; 13: 101-109.
 43. Zar N, Garmo H, Holmberg L. Long-term Survival of Patients with Small Intestinal Carcinoid Tumors. *World J Surg.* 2004; 28: 1163-1168.
 44. Bernick PE, Klimstra DS, Shia J, et al. Neuroendocrine carcinoma of the colon and rectum. *Dis Colon rectum* 2004; 47, 163-169.
 45. Jensen RT, Doherty GM. Carcinoid tumors and the carcinoid syndrome. In: DeVita VT Jr, Hellman S, Rosenberg SA, editors. *Cancer: Principles and practice of oncology*. 7th ed. Philadelphia: Lippincott Williams and Wilkins; 2005. 1559-1574.
 46. Ramage JK, Ahmed A, Ardill J, et al. Guidelines for the management of gastroenteropancreatic neuroendocrine (including carcinoid) tumours (NETs). *Gut* 2012;61, 6-32.
 47. Janson ET, Holmberg L, Stridsberg M, et al. Carcinoid tumors. Analysis of prognostic factors and survival in 301 patients from a referral center. *Ann Oncol.* 1997;8: 685-690.
 48. Tiensuu Janson EM, Ahlström H, Andersson T, Oberg KE. Octreotide and interferon alfa: a new combination for the treatment of malignant carcinoid tumours. *Eur J Cancer.* 1992;28A(10):1647-1650
 49. Oberg K, Kvols L, Caplin M, et al. Consensus report on the use of somatostatin analogs for the management of neuroendocrine tumors of the gastroenteropancreatic system. *Ann Oncol* 2004; 15: 966-973.
 50. Kwekkeboom DJ and Krenning EP. Peptide receptor radionuclide therapy in the treatment of neuroendocrine tumors. *Hematol Oncol Clin North Am* 2016;30(1), 179-191.
 51. Harring TR et. al. Treatment of liver metastases in patients with neuroendocrine tumors: a comprehensive review. *Int J Hepatol* 2011; 154541.
 52. Raymond E, Dahan L, Raoul JL, et al. Sunitinib malate for the treatment of pancreatic neuroendocrine tumors. *N Engl J Med* 2011;364, 501-513.
 53. Chan J and Kulke M. Targeting the mTOR signaling pathway in neuroendocrine tumors. *Curr Treat Options Oncol* 2014;15(3), 365-379.
 54. Liu E, Marincola P, and Öberg K. Everolimus in the treatment of patients with advanced pancreatic neuroendocrine tumors: latest findings and interpretations. *Therap Adv Gastroenterol* 2013; 6(5), 412-419.
 55. Basu Roy Ron, Srirajaskanthan Rajaventhan, and Ramage John K. A multimodal approach to the management of neuroendocrine tumour liver metastases. *Int J Hepatol* 2012, 819193