

Bölüm 3

BULUNAMAYAN PARATİROİD ADENOMLARINDA RADYOLOJİK GÖRÜNTÜLEME VE CERRAHİ YAKLAŞIM

**Banu YİĞİT¹
Bülent ÇİTGEZ²**

GİRİŞ

Preoperatif veya intraoperatif olarak bulunamayan paratiroid adenomu, günümüzde hala cerrahi bir sorundur. Preoperatif görüntüleme ve intraoperatif hızlı parathormon (IOPTH) düzeylerinin tayini reoperasyon gereken hastalara yaklaşımda önemlidir. Sonuç olarak, paratiroid adenomunun bulunamaması veya yetersiz ilk ameliyatın yüksek maliyeti, kalan paratiroid bezinin fiziksel yan etkileri, iş gücü kaybı, invaziv lokalizasyon testlerinin gerekebilmesi, tekrar ameliyat ve artan komplikasyon riski gibi ek problemlere yol açabilir. Başarısızlık oranını azaltmak için doğru endikasyon, zamanlama ve cerrahi çeşidi, IOPTH testinin mevcudiyeti ve preoperatif lokalizasyon çalışmalarının geliştirilmesi esastır. Primer hiperparatiroidizm (PHPT) nedeniyle operasyon planlanan hastalarda ilk görüntüleme yaklaşımı ultrasonografi (USG) ve sestamibidir. Paratiroid adenomu bulunamadığında sırasıyla ek tamamlayıcı lokalizasyon yöntemleri, gerekirse sestamibi ve yüksek rezolüsyonlu USG tekrarı, deneyimli nükleer tıp ve radyoloji uzmanı tarafından değerlendirme, görüntüleme tekniği üzerinde hassasiyetle durulması, tek foton emisyon tomografi (SPECT), SPECT/bilgisayarlı tomografi (BT) yanı sıra yeni radyofarmasötik (RF) ajanlarla gelişen pozitron emisyon tomografisi (PET)/BT yöntemlerinin uygulanması, parathormon (PTH) ölçümü ile USG eşliğinde ince iğne aspirasyon biyopsisi (İİAB) , manyetik rezonans görüntüleme (MR) ve/veya BT görüntüleme, venöz PTH örnekleme ile lateralite araştırılması, sestamibide anormal mediastinal yerleşim kuşkusu varsa MR/BT ile korelasyon yöntemleri denenebilir. Ayrıca

¹ Dr, Elazığ Fethi Sekin Şehir Hastanesi Genel Cerrahi Kliniği, banuyigit149@gmail.com, ORCID iD: 0000-0001-7606-9352

² Prof. Dr, Üsküdar Üniversitesi Tıp Fakültesi, Memorial Hastanesi Genel Cerrahi Kliniği, bcitgez@yahoo.com, ORCID iD: 0000-0001-9759-8798

ekplorasyon için yardım istenebilir. Bulunamayan paratiroidin boyunda olmadığı kanaati olursa ve görüntülemelerde veya intraoperatif destekler bir bulgu yoksa lobektomi önerilmemektedir. Ayrıca BBE negatifse ilk girişimde sternotomi de önerilmemektedir. Ameliyatı sonlandırıp ileri lokalizasyon tetkikleri ile devam edilmelidir.

KAYNAKÇA

- 1) Berber E, Parikh RT, Ballem N, et al. Factors contributing to negative parathyroid localization: an analysis of 1000 patients. *Surgery*. 2008 Jul;144(1):74-9. doi: 10.1016/j.surg.2008.03.019.
- 2) Terris DJ, Stack BC Jr, Gourin CG. Contemporary parathyroidectomy: exploiting technology. *Am J Otolaryngol*. 2007 Nov-Dec;28(6):408-14. doi: 10.1016/j.amjoto.2006.10.013.
- 3) Catalfamo A, Famà F, Pergolizzi FP, et al. Management of undetectable and lost parathyroid adenoma. *Ann Thyroid*. 2018;3:1-1.
- 4) Vitetta GM, Neri P, Chiecchio A, et al. Role of ultrasonography in the management of patients with primary hyperparathyroidism: retrospective comparison with technetium-99m sestamibi scintigraphy. *J Ultrasound*. 2014 Jan 31;17(1):1-12. doi: 10.1007/s40477-014-0067-8.
- 5) Rampp RD, Mancilla EE, Adzick NS, et al. Single Gland, Ectopic Location: Adenomas are Common Causes of Primary Hyperparathyroidism in Children and Adolescents. *World J Surg*. 2020 May;44(5):1518-1525. doi: 10.1007/s00268-019-05362-8.
- 6) Sung JY. Parathyroid ultrasonography: the evolving role of the radiologist. *Ultrasonography*. 2015 Oct;34(4):268-74. doi: 10.14366/usg.14071.
- 7) Tay D, Das JP, Yeh R. Preoperative Localization for Primary Hyperparathyroidism: A Clinical Review. *Biomedicines*. 2021 Apr 6;9(4):390. doi: 10.3390/biomedicines9040390.
- 8) Mahajan A, Starker LF, Ghita M, et al. Parathyroid four-dimensional computed tomography: evaluation of radiation dose exposure during preoperative localization of parathyroid tumors in primary hyperparathyroidism. *World J Surg*. 2012 Jun;36(6):1335-9. doi: 10.1007/s00268-011-1365-3.
- 9) Nael K, Hur J, Bauer A, et al. Dynamic 4D MRI for Characterization of Parathyroid Adenomas: Multiparametric Analysis. *AJNR Am J Neuroradiol*. 2015 Nov;36(11):2147-52. doi: 10.3174/ajnr.A4425.
- 10) Becker JL, Patel V, Johnson KJ, et al. 4D-Dynamic Contrast-Enhanced MRI for Preoperative Localization in Patients with Primary Hyperparathyroidism. *AJNR Am J Neuroradiol*. 2020 Mar;41(3):522-528. doi: 10.3174/ajnr.A6482.
- 11) Lee JY, Song HS, Choi JH, et al. Detecting Synchronous Thyroid Adenoma and False-Positive Findings on Technetium-99m MIBI Single Photon-Emission Computed Tomography/Computed Tomography. *Diagnostics (Basel)*. 2019 Jun 1;9(2):57. doi: 10.3390/diagnostics9020057.
- 12) Lee NC, Norton JA. Multiple-gland disease in primary hyperparathyroidism: a function of operative approach? *Arch Surg*. 2002 Aug;137(8):896-9; discussion 899-900. doi: 10.1001/archsurg.137.8.896.

- 13) Dy BM, Richards ML, Vazquez BJ, et al. Primary hyperparathyroidism and negative Tc99 sestamibi imaging: to operate or not? *Ann Surg Oncol.* 2012 Jul;19(7):2272-8. doi: 10.1245/s10434-012-2325-3.
- 14) Acar N, Hacıyanlı M, Coskun M, et al. Diagnostic value of four-dimensional computed tomography and four-dimensional magnetic resonance imaging in primary hyperparathyroidism when first-line imaging was inadequate. *Ann R Coll Surg Engl.* 2020 Apr;102(4):294-299. doi: 10.1308/rcsann.2019.0182.
- 15) Giovanella L, Bacigalupo L, Treglia G, et al. Will 18F-fluorocholine PET/CT replace other methods of preoperative parathyroid imaging? *Endocrine.* 2021 Feb;71(2):285-297. doi: 10.1007/s12020-020-02487-y.
- 16) Abdelghani R, Noureldine S, Abbas A, et al. The diagnostic value of parathyroid hormone washout after fine-needle aspiration of suspicious cervical lesions in patients with hyperparathyroidism. *Laryngoscope.* 2013 May;123(5):1310-3. doi: 10.1002/lary.23863.
- 17) Stack BC Jr, Tolley NS, Bartel TB, et al. AHNS Series: Do you know your guidelines? Optimizing outcomes in reoperative parathyroid surgery: Definitive multidisciplinary joint consensus guidelines of the American Head and Neck Society and the British Association of Endocrine and Thyroid Surgeons. *Head Neck.* 2018 Aug;40(8):1617-1629. doi: 10.1002/hed.25023.
- 18) Turgut B, Elagoz S, Erselcan T, et al. Preoperative localization of parathyroid adenomas with technetium-99m methoxyisobutylisonitrile imaging: relationship with P-glycoprotein expression, oxyphilic cell content, and tumoral tissue volume. *Cancer Biother Radiopharm.* 2006 Dec;21(6):579-90. doi: 10.1089/cbr.2006.21.579.
- 19) Neumann DR, Esselstyn CB, MacIntyre WJ, et al. Comparison of FDG-PET and sestamibi-SPECT in primary hyperparathyroidism. *J Nucl Med.* 1996 Nov;37(11):1809-15.
- 20) Beheshti M, Hehenwarter L, Paymani Z, et al. 18F-Fluorocholine PET/CT in the assessment of primary hyperparathyroidism compared with 99mTc-MIBI or 99mTc-tetrofosmin SPECT/CT: a prospective dual-centre study in 100 patients. *Eur J Nucl Med Mol Imaging.* 2018 Sep;45(10):1762-1771. doi: 10.1007/s00259-018-3980-9.
- 21) Huber GF, Hüllner M, Schmid C, et al. Benefit of 18F-fluorocholine PET imaging in parathyroid surgery. *Eur Radiol.* 2018 Jun;28(6):2700-2707. doi: 10.1007/s00330-017-5190-4.
- 22) Araz M, Soydal Ç, Özkan E, et al. The efficacy of fluorine-18-choline PET/CT in comparison with 99mTc-MIBI SPECT/CT in the localization of a hyperfunctioning parathyroid gland in primary hyperparathyroidism. *Nucl Med Commun.* 2018 Nov;39(11):989-994. doi: 10.1097/MNM.0000000000000899.
- 23) Uslu-Beşli L, Sonmezoglu K, Teksoz S, et al. Performance of F-18 Fluorocholine PET/CT for Detection of Hyperfunctioning Parathyroid Tissue in Patients with Elevated Parathyroid Hormone Levels and Negative or Discrepant Results in conventional Imaging. *Korean J Radiol.* 2020 Feb;21(2):236-247. doi: 10.3348/kjr.2019.0268.
- 24) Lalire P, Ly S, Deguelte S, et al. Incremental Value of 18F-Fluorocholine PET/CT in the Localization of Double Parathyroid Adenomas. *Clin Nucl Med.* 2017 Mar;42(3):218-220. doi: 10.1097/RLU.0000000000001500.
- 25) Kluijfhout WP, Pasternak JD, Gosnell JE, et al. 18F Fluorocholine PET/MR Imaging in Patients with Primary Hyperparathyroidism and Inconclusive Conventional Ima-

- ging: A Prospective Pilot Study. *Radiology*. 2017 Aug;284(2):460-467. doi: 10.1148/radiol.2016160768.
- 26) Elaraj D, Sturgeon C. Operative treatment of primary hyperparathyroidism: balancing cost-effectiveness with successful outcomes. *Surg Clin North Am*. 2014 Jun;94(3):607-23. doi: 10.1016/j.suc.2014.02.011.
 - 27) Wei B, Inabnet W, Lee JA, et al. Optimizing the minimally invasive approach to mediastinal parathyroid adenomas. *Ann Thorac Surg*. 2011 Sep;92(3):1012-7. doi: 10.1016/j.athoracsur.2011.04.091.
 - 28) Silberfein EJ, Bao R, Lopez A, et al. Reoperative parathyroidectomy: location of missed glands based on a contemporary nomenclature system. *Arch Surg*. 2010 Nov;145(11):1065-8. doi: 10.1001/archsurg.2010.230.
 - 29) Levin KE, Clark OH. The reasons for failure in parathyroid operations. *Arch Surg*. 1989 Aug;124(8):911-4; discussion 914-5. doi: 10.1001/archsurg.1989.01410080041006.
 - 30) Shin JJ, Milas M, Mitchell J, et al. Impact of localization studies and clinical scenario in patients with hyperparathyroidism being evaluated for reoperative neck surgery. *Arch Surg*. 2011 Dec;146(12):1397-403. doi: 10.1001/archsurg.2011.837.
 - 31) Wojtczak B, Syrycka J, Kaliszewski K, et al. Surgical implications of recent modalities for parathyroid imaging. *Gland Surg*. 2020 Feb;9(Suppl 2):S86-S94. doi: 10.21037/gs.2019.11.10.
 - 32) Ilahi A, Muco E, Ilahi TB. Anatomy, Head and Neck, Parathyroid. [Updated 2022 Aug 8]. In: StatPearls [Internet]. Treasure Island (FL): StatPearls Publishing; 2022 Jan-. Available from: <https://www.ncbi.nlm.nih.gov/books/NBK537203/>
 - 33) Rosen RD, Bordoni B. Embryology, Parathyroid. [Updated 2022 May 8]. In: StatPearls [Internet]. Treasure Island (FL): StatPearls Publishing; 2022 Jan-. Available from: <https://www.ncbi.nlm.nih.gov/books/NBK554580/>
 - 34) Udelsman R. Approach to the patient with persistent or recurrent primary hyperparathyroidism. *J Clin Endocrinol Metab*. 2011 Oct;96(10):2950-8. doi: 10.1210/jc.2011-1010.
 - 35) Machado NN, Wilhelm SM. Parathyroid Cancer: A Review. *Cancers (Basel)*. 2019 Oct 28;11(11):1676. doi: 10.3390/cancers11111676.