



BÖLÜM 30

PARATİROİD HASTALIKLARININ TANISINDA NÜKLEER TIPTA YENİLİKLER VE MİNİMAL İNVAZİV GAMA PROB CERRAHİSİ

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GİRİŞ VE GENEL BİLGİLER

Primer hiperparatiroidizm (PHPT) paratiroid glandının aşırı artmış fonksiyonuna bağlı parathormon (PTH) seviyesinin yüksekliği ile ortaya çıkan klinik tablodur. PHPT, %15-20 hastada hiperplazi, %1 paratiroid kanseri nedenli iken, vakaların %80-85'inde sebep paratiroid adenomlarıdır (1). Tüm paratiroid adenomları arasında ektopik paratiroid adenomlarının oranı %15-20'dir. Serum kalsiyum seviyesinin rutin olarak ölçülmesi beraberinde hastalığın yaygın tanısına imkan vermiştir. Klasik PHPT bulguları aşikar hiperkalsemi ile düşük serum fosfat düzeyine eşlik eden tekrarlayıcı nefrolitiazis, bozulmuş iskelet yapısı ve kas güçsüzlüğü olarak bilinmektedir. Kan kalsiyum testleri ile artan oranda hiperparatiroidi hastası asemptomatik dönemde iken tanı alabilmektedir. Tanıda görülen artışa paralel olarak hastalığın cerrahi tedavisi de artmaktadır.

Paratiroid bezleri 2 çift ve ortalama 6 x 4 x 2 mm boyutlarında olup yaklaşık 30 – 50 mg ağırlığındadır. Alt paratiroid bezleri daha geniş lokalizasyonlarda saptanabileceğinden, bazı olgularda cerrahi tedavisi de daha zor olabilmektedir (2).

PHPT'ye en sık sebep olan patoloji soliter paratiroid adenomudur. Paratiroid hiperplazisi çoklu bez patolojisini tanımlamakta olup ailesel hiperparatiroidi ve multipl endokrin neoplazileri (MEN) ile ilişkilendirilmiştir.

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SONUÇ

Nükleer tıp görüntüleme yöntemlerindeki yenilik ve gelişmeler minimal invaziv radioguided cerrahinin kullanımını yaygınlaştırmaktadır. Radioguided cerrahinin operasyon süresini azaltması yanı sıra kozmetik avantajları da bulunmaktadır. ^{99m}Tc MIBI sintigrafisi ile gama prob rehberliğinde uygulanan minimal invaziv paratiroid cerrahisi günümüzde geleneksel cerrahi eksplorasyonun yerini alarak standart tedavi yaklaşımı olarak uygulamada yerini almıştır. SPECT/BT görüntüleme ile gelecekte kullanıma sunulacak yeni teknolojik imkanlar ve de portabl gama kamera ile intraoperatif mobil SPECT olarak kullanılabilen cihazlarla lezyon tespiti istenilen düzeylerde kolaylaşarak başarı oranları artacaktır.

Teşekkür

Resim örneklerinde kullanılan görüntülerde Sağlık Bilimleri Üniversitesi İstanbul Eğitim ve Araştırma Hastanesi Nükleer Tıp Kliniği arşivinden katkı alınmıştır. Sağlık Bilimleri Üniversitesi İstanbul Eğitim ve Araştırma Hastanesi Nükleer Tıp Kliniğine görüntüler için teşekkürlerimi sunarım.

KAYNAKLAR

1. Salti GI, Fedorak I, Yashiro T, et al. Continuing evolution in the operative management of primary hyperparathyroidism. *Archives of Surgery*. 1992;127(7):831-836. doi: 10.1001/archsurg.1992.01420070095018.
2. Akerström G, Malmaeus J, Bergström R. Surgical anatomy of human parathyroid glands. *Surgery*. 1984;95(1):14-21.
3. Melloul M, Paz A, Koren R, et al. ^{99m}Tc-MIBI scintigraphy of parathyroid adenomas and its relation to tumour size and oxyphil cell abundance. *European Journal of Nuclear Medicine and Molecular Imaging*. 2001;28(2):209-213. doi: 10.1007/s002590000406.
4. Papathanassiou D, Flament JB, Pochart JM, et al. SPECT/CT in localization of parathyroid adenoma or hyperplasia in patients with previous neck surgery. *Clinical Nuclear Medicine*. 2008;33(6):394-397. doi: 10.1097/RLU.0b013e318170d4a5.
5. Wei WJ, Shen CT, Song HJ, et al. Comparison of SPET/CT, SPET and planar imaging using ^{99m}Tc-MIBI as independent techniques to support minimally invasive parathyroidectomy in primary hyperparathyroidism: A meta-analysis. *Hellenic Journal of Nuclear Medicine*. 2015;18(2):127-135. doi: 10.1967/s002449910207.
6. Wong KK, Fig LM, Gross MD, et al. Parathyroid adenoma localization with ^{99m}Tc-sestamibi SPECT/CT: a meta-analysis. *Nuclear Medicine Communications*. 2015;36(4):363-375. doi: 10.1097/MNM.0000000000000262.
7. Mihai R, Simon D, Hellman P. Imaging for primary hyperparathyroidism--an evidence-based analysis. *Langenbecks Archives of Surgery*. 2009;394(5):765-784. doi: 10.1007/s00423-009-0534-4.
8. Greenspan BS, Dillehay G, Intenzo C, et al. SNM practice guideline for parathyroid scintigraphy 4.0. *Journal of Nuclear Medicine Technology*. 2012;40(2):111-8. doi: 10.2967/jnmt.112.105122.

9. Caveny SA, Klingensmith WC 3rd, Martin WE, et al. Parathyroid imaging: the importance of dual-radiopharmaceutical simultaneous acquisition with ^{99m}Tc -sestamibi and ^{123}I . *Journal of Nuclear Medicine Technology*. 2012;40(2):104-110. doi: 10.2967/jnmt.111.098400.
10. Woods AM, Bolster AA, Han S, et al. Dual-isotope subtraction SPECT-CT in parathyroid localization. *Nuclear Medicine Communications*. 2017;38(12):1047-1054. doi: 10.1097/MNM.0000000000000765.
11. Liddy S, Worsley D, Torreggiani W, et al. Preoperative Imaging in Primary Hyperparathyroidism: Literature Review and Recommendations. *Canadian Association of Radiologists Journal*. 2017;68(1):47-55. doi: 10.1016/j.carj.2016.07.004.
12. Thanseer N, Bhadada SK, Sood A, et al. Comparative Effectiveness of Ultrasonography, ^{99m}Tc -Sestamibi, and ^{18}F -Fluorocholine PET/CT in Detecting Parathyroid Adenomas in Patients With Primary Hyperparathyroidism. *Clinical Nuclear Medicine*. 2017;42(12):e491-e497. doi: 10.1097/RLU.0000000000001845.
13. Beheshti M, Hehenwarter L, Paymani Z, et al. ^{18}F -Fluorocholine PET/CT in the assessment of primary hyperparathyroidism compared with ^{99m}Tc -MIBI or ^{99m}Tc -tetrofosmin SPECT/CT: a prospective dual-centre study in 100 patients. *European Journal of Nuclear Medicine and Molecular Imaging*. 2018;45(10):1762-1771. doi: 10.1007/s00259-018-3980-9.
14. Amadou C, Bera G, Ezziane M, et al. ^{18}F -Fluorocholine PET/CT and Parathyroid 4D Computed Tomography for Primary Hyperparathyroidism: The Challenge of Reoperative Patients. *World Journal of Surgery*. 2019;43(5):1232-1242. doi: 10.1007/s00268-019-04910-6.
15. Broos WAM, van der Zant FM, Knol RJJ, et al. Choline PET/CT in parathyroid imaging: a systematic review. *Nuclear Medicine Communications*. 2019;40(2):96-105. doi: 10.1097/MNM.0000000000000952.
16. Winters R, Friedlander P, Noureldine S, et al. Preoperative parathyroid needle localization: a minimally invasive novel technique in reoperative settings. *Minimally Invasive Surgery*. 2011; 2011:487076. doi: 10.1155/2011/487076.
17. Stern S, Mizrahi A, Strenov Y, et al. Parathyroid adenoma: a comprehensive biochemical and histological correlative study. *Clinical Otolaryngology*. 2017 Apr;42(2):381-386. doi: 10.1111/coa.12761.
18. Chan RK, Ibrahim SI, Pil P, et al. Validation of a method to replace frozen section during parathyroid exploration by using the rapid parathyroid hormone assay on parathyroid aspirates. *Archives of Surgery*. 2005;140(4):371-373. doi: 10.1001/archsurg.140.4.371.
19. Murphy C, Norman J. The 20% rule: a simple, instantaneous radioactivity measurement defines cure and allows elimination of frozen sections and hormone assays during parathyroidectomy. *Surgery*. 1999;126(6):1023-1028; discussion 1028-9. doi: 10.1067/msy.2099.101578.
20. Norman J, Chheda H. Minimally invasive parathyroidectomy facilitated by intraoperative nuclear mapping. *Surgery*. 1997;122(6):998-1003; discussion 1003-4. doi: 10.1016/s0039-6060(97)90201-4.
21. Rubello D, Piotto A, Casara D, et al. Role of gamma probes in performing minimally invasive parathyroidectomy in patients with primary hyperparathyroidism: optimization of preoperative and intraoperative procedures. *European Journal of Endocrinology*. 2003;149(1):7-15. doi: 10.1530/eje.0.1490007.
22. Tobin K, Ayers RR, Rajaei M, et al. Use of the gamma probe to identify multigland disease in primary hyperparathyroidism. *International Journal of Endocrine Oncology*. 2016;3(1):13-19. doi: 10.2217/ije.15.27.
23. Desiato V, Melis M, Amato B, et al. Minimally invasive radioguided parathyroid surgery: A literature review. *International Journal of Surgery*. 2016;28 Suppl 1: S84-93. doi: 10.1016/j.ijsu.2015.12.037.
24. Chen H, Mack E, Starling JR. Radioguided parathyroidectomy is equally effective for both adenomatous and hyperplastic glands. *Annals of Surgery*. 2003;238(3):332-337; discussion 337-8. doi: 10.1097/01.sla.0000086546.68794.9a.

25. Spiegel AM, Marx SJ, Doppman JL, et al. Intrathyroidal parathyroid adenoma or hyperplasia. An occasionally overlooked cause of surgical failure in primary hyperparathyroidism. *JAMA*. 1975;234(10):1029-1033. doi: 10.1001/jama.234.10.1029.
26. Weigel TL, Murphy J, Kabbani L, et al. Radioguided thoracoscopic mediastinal parathyroidectomy with *intraoperative parathyroid hormone testing*. *The Annals of Thoracic Surgery*. 2005;80(4):1262-1265. doi: 10.1016/j.athoracsur.2005.04.024.
27. McGreal G, Winter DC, Sookhai S, et al. Minimally invasive, radioguided surgery for primary hyperparathyroidism. *Annals of Surgical Oncology*. 2001;8(10):856-860. doi: 10.1007/s10434-001-0856-0.
28. Chen H, Sippel RS, Schaefer S. The effectiveness of radioguided parathyroidectomy in patients with negative technetium tc 99m-sestamibi scans. *Archives of Surgery*.2009;144(7):643-648. doi: 10.1001/archsurg.2009.104.
29. You CJ, Zapas JL. Diminished dose minimally invasive radioguided parathyroidectomy: a case for radioguidance. *The American Journal of Surgery*. 2007;73(7):669-672; discussion 673.
30. Pitt SC, Panneerselvan R, Sippel RS, et al. Radioguided parathyroidectomy for hyperparathyroidism in the reoperative neck. *Surgery*. 2009;146(4):592-598; discussion 598-9. doi: 10.1016/j.surg.2009.06.031.
31. Dudley NE. Methylene blue for rapid identification of the parathyroids. *British Medical Journal*. 1971;3(5776):680-681. doi: 10.1136/bmj.3.5776.680.
32. Cabanillas ME, McFadden DG, Durante C. Thyroid cancer. *Lancet*. 2016;388(10061):2783-2795. doi: 10.1016/S0140-6736(16)30172-6.
33. Reeve TS, Delbridge L, Brady P, et al. Secondary thyroidectomy: a twenty-year experience. *World Journal of Surgery*. 1988;12(4):449-453. doi: 10.1007/BF01655417.
34. Levin KE, Clark AH, Duh, QY, et al. Reoperative thyroid surgery. *Surgery*. 1992;111(6):604-609.
35. Erbil Y, Barbaros U, Deveci U, et al. Gamma probe-guided surgery for revision thyroidectomy: in comparison with conventional technique. *Journal of Endocrinological Investigation*. 2005;28(7):583-588. doi: 10.1007/BF03347255.
36. Bender O, Karyagar S, Levent Bİ, et al. Gamma probe (99m)Tc-pertechnetate assisted completion thyroidectomy vs conventional thyroidectomy in differentiated thyroid carcinoma. *Hellenic Journal of Nuclear Medicine*. 2009;12(2):138-141.
37. Aras G, Gültekin SS, Küçük NO, et al. Intraoperative gamma probe guidance with 99mTc-pertechnetate in the completion thyroidectomy. *Annals of Nuclear Medicine*. 2009;23(5):421-426. doi: 10.1007/s12149-009-0251-7.